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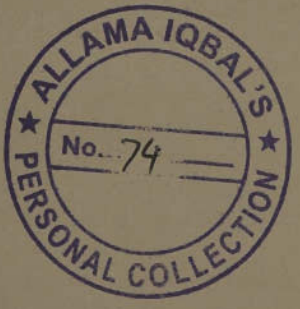

PREFACE.

THE present work contains an exposition of Psychology from a genetic point of view. A glance at the table of contents will show that the order followed is that of the successive stages of mental development. The earlier stages have been copiously illustrated by reference to the mental life of animals. The phases through which the ideal construction of Self and the world has passed are illustrated by reference to the mental condition of the lower races of mankind.

The shortcoming which I have been most anxious to avoid is sketchiness. I am convinced that the study of Psychology is of no use to the student unless he is able to live himself into psychological problems, so as to acquire a real power of thinking for himself on psychological topics. For this purpose cut-and-dried statements skimming important questions are of no avail. An effective introduction to Psychology must be clothed in living flesh and blood, both for the student's own sake, and for the sake of his success in examinations. Nothing is more dreary and exasperating to the examiner than to read papers by a candidate who has evidently crammed books on Psychology, but who has never done a genuine bit of psychological thinking. The most essential gift to be imparted to the beginner is a real interest in the subject, and a real power of dealing with it even when familiar formulas fail him. He ought to be able to do riders in

Psychology as he does riders in Euclid. It is true that there are students who cannot advance so far from lack of natural endowment. But even for them a treatment full enough to be interesting and so rememberable is better than arid and dogmatic statements which have to be read over feverishly the day before an examination in order that they may not slip out of the mind. Certainly the teacher who needs Psychology for educational purposes would do much better to leave the subject alone altogether than to learn it in a merely external way.

My greatest debt here as elsewhere is to my teacher, Professor James Ward. In treating the special sensations I have found the fourth volume of Professor Foster's *Text-Book of Physiology* very useful. The special chapters on Light-Sensation and Sound-Sensation are abbreviated and adapted with modifications from Professor Ebbinghaus' *Grundzüge der Psychologie*. In general I have found much help in the writings of James, Baldwin, Ladd, Royce, and Lloyd Morgan. My proofs have been read by Mr. J. Welton, Lecturer in Education in the Yorkshire College, Victoria University, by Professor J. S. Mackenzie, of the University College of South Wales, and by Mr. M. C. W. Irvine, Mental and Moral Science Tutor in the University Correspondence College. I have found their services invaluable, and in particular I feel that the book owes much to the suggestions of Mr. Welton. My brother, Mr. J. F. Stout, has rendered me great assistance in preparing for the press, and has compiled the Index.

G. F. Stout.

Aberdeen, *November*, 1898.

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A MANUAL OF PSYCHOLOGY.

INTRODUCTION.

CHAPTER I.

THE SCOPE OF PSYCHOLOGY.

§ 1. *The Psychological Point of View.*—Let us suppose that a man is engaged in *examining* a material object. Let us say that he is *testing* the quality of a cigar. He *looks* at it; he *feels* it; he puts it to his ear and *listens* to the crackle which is a mark of dryness; he *smells* it before commencing to smoke; if he is not discouraged by these preliminaries, he may then proceed to smoke it; he thus brings into play the functions of *smelling* and *tasting*. Now in describing the man's procedure, we have had to use words such as *examining*, *testing*, *looking*, *feeling*, *listening*, *smelling*, and *tasting*. These are all terms standing for psychological facts.

So far as the man is pre-occupied with the object, he will not think of his own acts of looking, feeling, listening, etc. The qualities of the cigar itself are what he is aware of throughout the process. He is not aware of his own sensations, as such; sensations are qualifications

of his own consciousness, and not of the cigar; inasmuch as he is thinking of the cigar, he does not think about sensations.

On the other hand, the bystander who describes what the man is doing, naturally uses psychological terms. He is thinking, not only of the cigar, but the man in relation to it. What he has to describe is just this relation in its varying phases; he is not concerned with either the man or the cigar independently of each other. He thinks of the cigar merely as an object to which the man's activity is directed; and in consequence he thinks of the man as a subject which becomes aware of the qualities of this object, and adjusts his actions accordingly. But the man himself takes no note of the fact that the cigar is an object, and that he is a subject; he could not take note of the one fact without taking note of the other. But he is so wholly absorbed in the object, that he does not stop to consider its relation to himself as subject; in other words, though it is an object to him, he does not think of it as such. His point of view is essentially the same with that of the physical sciences. The point of view of the spectator is essentially that of psychology. Psychology is concerned with the relation of what is perceived, or in any way thought of, to the percipient or thinker.

It thus appears that psychology must take into account not only the subject but also the object. This is necessary because subjective states and processes cannot be adequately described without reference to their objects. It is impossible to name a thought without naming it as the thought of something or other. But psychology is only concerned with objects, if and so far as they are necessarily implied in the existence of corresponding states and processes in the subject. The object with which it has to

deal is always an object as perceived or thought about by some individual at some time. Of course, an object is always actually much more than this; the sensible qualities of the cigar belong to it both before and after the man has seen, smelt, touched, and tasted it. Not only is this true as a physical fact; but it is also recognised by the subject himself in perceiving or thinking about the object. The man only perceives the odour of the cigar in actually smelling it; but he regards it as a permanent quality, existing and persisting independently of his momentary perception. The question never occurs to him unless he begins to philosophise or psychologise. But if anybody should tell him that the odour, flavour, texture, dampness, or dryness of the cigar, only exist in the moment in which he thinks of them or perceives them, he would at once recognise, though perhaps dimly, that he had perceived them or thought of them as being something different from what they are now said to be. He had perceived them or thought of them as having a permanence and independence which is entirely irreconcilable with the supposition that they exist only if and so far as he is actually perceiving or thinking of them. But psychology is mainly concerned with the perceiving or thinking itself, and it therefore only takes account of the object so far as it is actually perceived or thought of. It is concerned, in the first instance, not with what is known, but with the process of knowing, not with what is willed, but with the process of willing, not with what is agreeable or disagreeable, but with the process of being pleased or displeased. Hence it takes no account of the object, except in so far as somebody is supposed to be actually knowing it or willing it, or being satisfied or dissatisfied with it. For the physical sciences the object is something that is to become

known; for psychology it is something which is actually in process of being known. *Psychology is the science of the processes whereby an individual becomes aware of a world of objects and adjusts his actions accordingly.*

§ 2. *Distinction from other Sciences.*—We have already marked off psychology from all physical sciences. The world of material facts and processes is the object of physical science; its whole aim is to know this object more completely and precisely. Psychology, on the contrary, does not directly and primarily aim at increasing our knowledge of the material world or any part of it. The cognitive process itself is an object of psychology. But psychology cannot itself take the place or fulfil the function of the cognitive process which it investigates. In turning its attention upon the function of knowing, it necessarily withdraws its attention from the special nature of the objects known. It must indeed constantly recognise the existence of these objects; but this is only because their existence is involved in the very conception of cognitive process.

This line of demarcation separates not only psychology, but also other departments of philosophy, from the physical sciences. We have now to distinguish the psychological point of view from that which characterises logic, theory of knowledge, ethics, and aesthetics. These are all concerned with knowledge, feeling, and will, rather than with their objects. But their attitude is different from that of psychology. Logic is a normative science; it is pre-occupied with the distinction between truth and error. It has to show how thought must proceed in order to represent its object correctly. Psychology, on the contrary, deals only with the laws that govern the cognitive process as it actually takes place. It is no

business of psychology to inquire how it ought to take place. The principles which it lays down account equally for correct thinking and for incorrect thinking. It deals with objects as they are actually presented to consciousness. It has no concern with the nature of the object as it may be apart from its actual presentation. It cannot, therefore, inquire whether or not the actual presentation corresponds to the true nature of the object as it exists in the real world.

Theory of knowledge pushes the question of truth and falsehood further back than logic. It inquires how truth and falsehood are possible at all; in other words, it investigates how the private thought of an individual can apprehend a reality independent of his own individual existence, either truly or falsely; how, for instance, can a finite consciousness, composed of a series of fleeting states, beginning to exist at a certain date and ending at a certain date, connected with and dependent on a body which forms only a small fragment of the infinite extension of the material world,—how can such a finite and particular being contain in itself the thought of the universe as a whole? How can it become a spectator of all time and all existence? Obviously, such questions are very far removed from the province of psychology. The possibility of thought is assumed by the psychologist. The relation of subject and object is pre-supposed by him as a datum. He simply investigates the actual laws which regulate the processes through which the subject passes in knowing, willing, feeling, in relation to the object.

Ontology may be regarded as an offshoot from theory of knowledge. Theory of knowlege inquires how the finite individual can be aware of the universe to which he belongs. It appears to some philosophers that this question cannot be

answered unless we give an account of the nature of the universe as well as of the individual. But an attempt to give an account of the nature of the universe, as such, is ontology. Evidently this is very far removed from psychology, which has only to do with the natural history of subjective processes as they occur in time.

What has been said of logic, theory of knowledge, and ontology applies also to ethics. Ethics inquires how we ought to will, not how we actually do will. It may push its investigation further, and inquire how the distinction between right willing and wrong willing is possible at all; and finally, it may attempt to answer this question by giving an account of the nature of the universe as a whole. Psychology, on the other hand, deals only with the process of volition as it actually occurs, without reference to its rightness or wrongness, or to the ultimate conditions which make rightness and wrongness possible.

Aesthetics is precisely analogous to ethics, except that the distinction between beauty and ugliness is substituted for that between right and wrong. Psychology has nothing to do with this distinction, as such. It only inquires how things actually come to appear beautiful or ugly; it has no concern with such questions as whether what appears beautiful really is beautiful, or how the distinction between beauty and ugliness is constituted. Perhaps what appears beautiful therefore is beautiful; if this be so, then psychology solves the problems of aesthetics; but it does so only by accident. It cannot itself show that it has solved these problems. In order to do so, it would have to prove that in aesthetics appearance and reality coincide; but whether this be true or false, it is certainly beyond the province of psychology to discuss the question.

§ 3. *Consciousness.*—If we analyse such processes as those of looking, listening, smelling, or tasting, we find that they involve two distinct and disparate groups of facts. On the one hand, they are modes of consciousness, specific kinds of experience; on the other, they imply occurrences taking place in the bodily organs of sense which do not, as such, enter into the conscious experience of the subject. For instance, a man in looking at an object moves his eyeballs; this involves the existence and operation of a muscular apparatus; but the operation of this muscular apparatus is not, as such, a constituent of his conscious state. It exists for the consciousness of the psychologist or physiologist, who is analysing the visual process; but it does not form part of the act of looking at an object so far as this is an experience of the subject who sees the object. The subjective experience is conditioned by, but it does not contain the muscular process. We may express this by saying that though the muscular process is a psychological fact, in the sense that it is a fact that psychology must take account of, yet it is not a psychical fact, viz., a fact of consciousness. The term *psychological* is wider than *psychical*: all psychical facts are psychological facts, but not all psychological facts are psychical facts. A psychical fact must be in some way or other an experience of the subject whose processes the psychologist is investigating.

A psychical fact is a fact of consciousness; but what is consciousness? Properly speaking, definition is impossible. Everybody knows what consciousness is because everybody is conscious. It is not, however, enough simply to say this. Confusion would be sure to arise if we passed the question by in this manner. The difficulty is that consciousness has manifold modes and degrees; and there is

always a danger of restricting the term so as to make it apply to certain modes and degrees and not to others. Historically, the word has been used by certain writers for the awareness which we have of ourselves and of our own experiences, as states of the self. Indeed, consciousness has been called an inner sense, and has been regarded as a special function by which we perceive the mind and its processes; just as sight and hearing are outer senses for the perception of material facts. In opposition to all such views, we must state definitely that consciousness includes not only awareness of our own states, but these states themselves, whether we have cognisance of them or not. If a man is angry, that is a state of consciousness, even though he does not know that he is angry. If he does know that he is angry, that is another modification of consciousness, and not the same.

Wherever there is not total unconsciousness in the sense in which we attribute unconsciousness to a table or a log of wood, consciousness in some mode or degree is present. As Professor Baldwin says, it is "the common and necessary form of all mental states; . . . it is the point of division between mind and not-mind."* To quote Professor Ladd: "What we are when we are awake, as contrasted with what we are when we sink into a profound and perfectly dreamless sleep, . . . *that* it is to be conscious. What we are less and less, as we sink gradually down into dreamless sleep, or as we swoon slowly away: and what we are more and more, as the noise of the crowd outside tardily arouses us from our after-dinner nap, or as we come out of the midnight darkness of the typhoid-fever crisis—"† *that* is consciousness. The becoming conscious

* *Elements of Psychology*, p. 57.

† *Psychology, Descriptive and Explanatory*, p. 30.

and the becoming unconscious are in all their phases and gradations states of consciousness. They are not states of unconsciousness, nor are they transition states between consciousness and unconsciousness. There are no such transition states. The very dimmest and vaguest feeling accompanying the last stage of sinking into dreamless sleep, or the first stage of gradual awakening, is already consciousness. It may become fuller consciousness, but it cannot become consciousness, for it is that to begin with. If, as some suppose, the dreamless sleep itself is accompanied by some dim feeling, this dim feeling is dim consciousness.

It should be noted that though there are psychological facts which are not psychical, their psychological character is derivative and subsidiary. The psychologist takes account of them only if, and so far as, they are necessary in the formulation and explanation of processes which are in the proper sense psychical, which in some way enter into consciousness.

CHAPTER II.

THE DATA AND METHODS OF PSYCHOLOGY.

§ 1. *Presented Objects as Data.*—Psychology has to discuss mental processes, such as sensation, perception, attention, volition, and the like. But except in the case of pure sensation,* none of these processes can either exist or be conceived apart from a presented object. We cannot attend, perceive, or will, without perceiving, willing, or attending to something. Now, the object which is presented to any individual subject at any moment exists for it at that moment only in virtue of subjective processes which are then occurring, or which have occurred previously. The development of an individual mind is at the same time the development of the objective world as presented to that individual mind. The limits of its possible development are also the limits of the real world as a possible presentation to its consciousness. It follows from this that presented objects are most essential and important data for psychology. Being the effects of psychological causes, they form an indispensable starting-point in investigating the nature of these causes. In this respect psychology presents an analogy to other sciences of development, such as geology and biology. Geology finds an actual formation of the earth's crust: it finds a certain arrangement of strata, and it inquires by what processes this arrangement has arisen.

* This exception will be explained in Book ii., Ch. 1.

Similarly, psychology finds a certain world of objects presented, let us say, to an educated Englishman of the twentieth century, and it inquires how this world has come to be presented. The geologist finds different strata arranged according to the successive periods of their formation. Similarly, the psychologist finds different psychological strata. The world of the young child, or the world of the Australian aborigine, are comparatively primitive formations; and the psychological problem is to discover how the transition has been made from these earlier stages to the later stages with which civilised adults are now familiar. Sometimes the arrangement of geological strata is disturbed by volcanic conditions; similar upheavals also take place in the case of mind, in the various forms of insanity.

Let us take a single example of a presented object as a psychological datum. A man looks into a stereoscope, and he is asked what he sees. He replies that he sees a cathedral, looking solid in the same manner as an actual cathedral would look solid. He may go on to describe the object in detail, and he need not at any point in his description use psychological terms. He will speak, not of perceptions, feelings, and sensations, but of the spire, the roof, the windows, etc. Now spire, roof, and windows, whether of an actual church, or of one seen through a stereoscope, are not subjective processes; nevertheless, solid figure as seen through a stereoscope is a most important datum for the psychological theory of the processes by which we perceive the third dimension of space. The appearance of solidity is produced, not by a solid thing, but by two flat surfaces on which are drawn representations of the cathedral or other object as seen from different points of view; we know therefore that the perception

of a solid object depends on processes which do not involve as their necessary condition the operation on the organ of vision of that solid object itself. We find by a process of exclusion that the only essential conditions which can be operative in producing the distinctive stereoscopic effect are certain peculiar experiences connected with the use of the two eyes. These experiences are not of course part of the object; they only become known through the psychological inquiry which attempts to account for the presentation of the object. The special importance of this case arises from the presentation of the object taking place under experimental conditions which can be precisely analysed.

But the general method is by no means confined to experimental cases. "Since the whole world, as it exists for an individual consciousness, whether from a practical, theoretical, or aesthetic point of view, has come so to exist through prior mental process, it may be said that there is no objective fact which is not capable of being utilised by the psychologist. From this point of view we may say, with Dr. Ward, that 'the whole choir of heaven and furniture of earth,' so far as they are known, are data for psychology. (Article 'Psychology,' *Encyclopaedia Britannica*, 9th ed., vol. xx., p. 38). So too, are all works of imagination, *e.g.*, the *Iliad* or *Hamlet* or Grimm's *Fairy Tales*, and all rules of conduct, *e.g.*, Roman law, the Brahman ritual, the four books of Confucius and Mencius. We must, however, carefully note that mere examination of mental products is valueless for psychology, except in so far as it helps us to trace mental process. This purpose is best served when we can arrange the products as parts of a historical series, in which each may be treated as the goal of preceding, and the starting-point of succeeding,

development. Thus we may profitably compare the views of the world as it presented itself to Homer, to Socrates, and to Darwin respectively. Hence the great importance of philology and anthropology to the science of mind. The products of thought are embodied in language, so that the comparison of the vocabulary and of the syntactic structure of different languages is a means of comparing different stages of mental evolution. The comparative study of the religious and other beliefs of primitive races has the same kind of psychological value, and the same holds good as regards their technical and artistic productions. Again, apart from any reference to historical order, we may compare the same object as it is presented to different minds, or to the same mind under different conditions. This course yields important results, when we can assign definite circumstances on which the variation depends. Thus, by comparing space as it exists for persons possessed both of sight and touch, with space as it exists for the blind, we may obtain valuable data for determining the part played by visual experience in the development of this perception. A flood of light is thrown on the conditions of mental development in general by examination of the cases of such abnormal individuals as Laura Bridgman or Helen Keller.* Under the same head come the data supplied by mental pathology, including cases of aphasia, psychic blindness, and so forth."†

It should be borne in mind that a presented object as a datum of psychology need have no actual existence in the

* Laura Bridgman and Helen Keller were deprived almost from birth of the senses of sight and hearing; and yet both reached a high degree of mental development. For Laura Bridgman see Stanley Hall's article in *Mind*, O.S. iv., p. 149. For Helen Keller see *Mind*, O.S. xiii., p. 314, xiv., p. 305, and N.S. i., p. 574, ii., p. 280.

† *Analytic Psychology*, vol. i., pp. 9-11.

real world. The solid figure seen in the stereoscope is not actually present; but it is none the less perceived, and that is all with which psychology has any concern. Its real presence or absence is a matter of physical fact, not of psychical fact. Its absence is important for psychology only because it involves the absence of certain conditions which might otherwise be supposed to be essential to the presentation of solidity.

§ 2. *Introspection.*—To introspect is to attend to the workings of one's own mind. When instead of asking what we perceive or will, we inquire how we perceive or will, or how we come to perceive or will, the answer, so far as it can be obtained by direct observation, depends on introspection. Thus, to take once more the case of the stereoscope. Because the solid object is not physically present, someone may say that its presence is merely inferred. From a purely logical point of view, this may be true. If a man, deceived by the stereoscopic appearance, were called upon to define his reasons for believing the solid object to be physically present, he would no doubt say that it looks solid, just as if it were really so. He would then be assigning a peculiar visible appearance as a reason for assuming a physical fact. But if it is meant that the actual visible presentation of solidity is itself an inference, appeal must be made to introspection. Inferring is a mental process with which we are familiar. In it we proceed to a conclusion, which is mentally distinguished or distinguishable from its premises. But in the stereoscopic illusion there is no distinguishing between premises and conclusion, or transition between them. On the evidence of introspection, therefore, we say that inference as a psychological process is not present. Take another example. A man shows us a pretty chess

problem and its solution. Neither his mental attitude nor ours is introspective while he is telling us about the problem. But suppose that he goes on to describe how he came to invent the problem, or how he came to discover its solution; he will then be describing the workings of his own mind. He will speak of his disappointment and perplexity, his renewed hopes, his despair when all possible ways appeared futile. He will perhaps tell us how the understanding of the whole problem flashed upon him suddenly with the key-move, every element in it then assuming its right place, so that his subsequent mental activity became smooth and easy. All this is introspection. Consider next an example from the sphere of practice. A general gives an important order, or a responsible statesman puts before the world a scheme of policy. Neither the general's order nor the statesman's scheme directly expresses psychical facts; but if the general begins to tell us how he was led to give the order, he will, in all probability, describe the process of his own consciousness. He may tell us that his mind for a time oscillated between alternative lines of conduct; now one appearing better, and now the other. He may tell us that the state of indecision, where there was need for prompt action, became unbearable; and that he suddenly put an end to it by fixing on one definite decision, without any real conviction that it was the best. Or again, he may describe how the decision emerged gradually out of his previous hesitation, so that he awoke one morning with a clear conviction that a certain course was the right one.

Much has been written about the difficulty and untrustworthiness of introspection. It is often urged that psychology, in so far as it rests on an introspective basis, must always be in an unsatisfactory condition. But it

must be remembered that quite apart from any aid which he may receive from physiology, the psychologist has at his command a vast mass of data which are not due to introspection. This we have brought out in the preceding section on presented objects as data for psychology. It is conceivable that this class of data alone would serve as the basis of hypotheses explanatory of the development of mind. Thus we might have a kind of psychology without introspection, and yet quite distinct from physiology. What introspection does is to supply us with a direct instead of a hypothetical knowledge of mental process. It thus forms a source of psychological material which is invaluable and unattainable by any other means. But the ultimate test of psychological theories is their power to explain how the world comes to exist for the individual mind. The ultimate data of the science are therefore objects as presented to the individual mind, in successive phases, and under varying conditions of its development.

Turning now to the alleged obscurities, fallacies, and difficulties of introspection, we may note at the outset that these do not exist when the questions which it has to answer are made sufficiently broad and simple. There is no fallacy, obscurity, or ambiguity in the statement that when I have toothache I dislike it very much, or that I was afraid when I saw a white figure in a churchyard. There is no fallacy or ambiguity in the statement that feeling pleased is different from feeling displeased, or that when we are fully convinced that an action is totally impossible, we cannot voluntarily determine to perform it. Facts of this kind can be observed with ease and certainty by everyone. Now if introspection could only supply us with such simple and obvious data, it would none the less be of essential value. It would supply us with the general

terms in which to describe mental process. The more precise determination of such process in detail might be hypothetical, and dependent on other data as the ultimate test of its correctness. To a large extent this is the case. In this respect psychology is on a footing with other sciences. If we ask for the actual observations of the process of natural selection on which the Darwinian theory is based, we find what appear very slender foundations of fact for a very large superstructure. There are the experiences of the breeder, and very little more. The real data which support the weight of the theory consist in the nature of the actual products which the process is assumed to explain,—the actual constitution of animal and vegetable species in their higher and lower forms.

The deliverances of introspection are not, however, limited to such simple and obvious issues as we have mentioned. Like all other modes of observation, it is capable of being immensely improved by systematic training and practice. The plain man, as Dr. Sidgwick calls him, has, as a rule, no permanent and absorbing interest in the workings of his own mind. His attention is mainly engrossed by other objects. Thus, the introspective attitude is unfamiliar to him. This unfamiliarity is the chief reason why he seems so helpless when called on to observe the finer details of his own mental operations. Like a person passing from full illumination into a dimly-lighted room, he can at first discern little; but in time his power of discrimination may increase. By repeating his observations again and again, and comparing them with each other, he makes gradual progress. The result of previous observation becomes the basis of a new advance. This is of course in no way peculiar to introspection. A man who is only beginning to observe in a systematic way fine distinctions

between tastes, smells, and colours, shows at first the same helplessness. Advance is made as the cumulative result of a series of successive efforts of attention, each paving the way for the next. It is indeed a commonplace that the practised observer notices at once what the untrained fail to see even when it is pointed out. But besides individual practice there is yet another element in the training of the introspective psychologist. He derives immense help from the work of his predecessors. They teach him what to look for, and how and where to look for it. Thus what the introspection of one generation has achieved becomes the starting-point for fresh progress in the introspection of the next. The advance that has actually been made in this way is immense, as at once appears on comparing from this point of view the work, let us say, of Aristotle, with that of William James.

Nevertheless, it must be admitted that there are certain drawbacks attaching to the introspective process which cannot wholly be overcome even by sustained practice and systematic training. The most important drawback is that the mind in watching its own workings must necessarily have its attention divided between two objects,—on the one hand, the mental operation itself which is to be observed, and on the other, the object to which this mental operation is directed. If I observe the process of seeing, I must attend at once to what is seen, and to the seeing of it. If I observe what takes place in attending, I must first attend to something, and then to the process of attention. Thus if the introspective effort is sustained and strenuous, it is apt to destroy the very object which it is examining. For by concentrating attention on the mental process, we withdraw it from the object of that process, and so arrest the process itself. Thus, introspection, when it is directly

concerned with a mental operation that is in itself more or less absorbing, can only proceed by taking a series of transient side-glimpses. This difficulty is, however, not so serious as it appears; for, in the first place, retrospection is to a large extent free from it. By calling up a process in memory immediately after it is over we are often able to notice much that escaped us when it was actually going on. In like manner the astronomer can call up in memory the image of a star which has just passed before his vision; and can then notice details which had escaped him at the moment of its actual appearance. In the next place, we must bear in mind that it is not the isolated observation which is of importance in introspective psychology, but rather the accumulation of a vast number of observations, each helping the others. Thus, what is important is to acquire a general habit of alertness, a perpetual readiness to attend to the workings of our own minds whenever opportunity presents itself; and it must be noted that opportunities are constantly presenting themselves; the subject-matter which we have to observe is perpetually with us. This may be set down as a grand advantage of introspection, compensating in a high degree for its drawbacks. Finally, introspection, to be effective for the advancement of science, must, like other modes of observation, be carried on by a number of experts in co-operation. Each must communicate to the rest his own results, for confirmation or rejection. Thus, it is an essential part of his business to state his results in such a form that they can be tested by others. He must be able to point out to others exactly where and how to look for what he himself has observed. This is most easy when the method of experiment, as distinguished from mere observation, is followed, and constitutes one of

the main advantages of that method. Of course, what is true of one individual, A, may not hold good of another, B; but B's inability to confirm A by his own experience should deter A from setting down as true for all men, or most men, what holds good only for some persons, possibly only for himself.

§ 3. *Manifestations of Mental Process in Others.*—No one can directly observe what is passing in the mind of another. He can only interpret external signs on the analogy of his own experience. These external signs always consist in some kind of bodily action or attitude. Thus when a man clenches his fist, stamps, etc., we infer that he is angry. When a dog wags its tail, we infer that it is pleased. The knowledge acquired in this way must be carefully distinguished from that which is obtained through intercommunication by means of language. When a man tells us that he is or was angry, he is not directly expressing his anger, but his knowledge of his anger. He is conveying to us the result of his own introspection. This source of information is in no way peculiar to psychology. It does not differ from any other communication of observed facts by means of words. The peculiarly psychological inference rests on signs which may or may not be noticed or understood by the subject who displays them. On the other hand, communication by means of language necessarily pre-supposes that the person communicating the information is himself aware of the meaning of the words which he uses. He must first understand himself in order to make others understand him. It may happen that the inference from the direct expression of the mental state may contradict the subject's own assertion about it. He may show most unambiguous symptoms of anger, and at the same time declare vehemently that he is not angry.

In the case of the lower animals and young children, it is impossible, and in the case of savages it is difficult, to obtain verbal descriptions of their own mental states and processes. This is partly because they either do not use language, or use a language inadequate for the purpose, and partly because they are not introspective. Under such conditions our only course is to rely on the interpretation of the appropriate external manifestations of the processes themselves. Interpretation becomes more difficult in proportion to the difference between the mind of the psychologist and the mind which he is investigating. The interpretation must rest on some analogy between the two. But if the analogy is only partial and accompanied by great diversity, a constructive process is necessary. It is in his own mind alone that the psychologist has the constituent elements from which an interpretation can be framed. "All depends on accurate resolution of his own complex consciousness into its constituents, and on re-compounding these in such a way and in such proportions as to explain the nature and order of the signs which indicate to him the mental processes of others."* For instance, he finds among savages a wide-spread belief in the power of all kinds of odds and ends to influence the fortunes of the person possessing them. This is a prevailing tendency of savage thought; if the psychologist looks for analogies in his own mental life, he will find them few and far between. But they are not likely to be wholly absent. There are moments in which he either has been influenced or has felt strongly inclined to be influenced, by considerations in themselves as meaningless as those on which the savage relies. The fall of a picture, or the spilling of salt, or the presence of thirteen at table, may make him uneasy in spite of

* *Analytic Psychology*, vol. i., p. 15.

reason. If he has ever been carried away by the gambling impulse, he must have been almost irresistibly prompted to regard quite irrelevant details as having an essential bearing on his winning or losing. In order to construct the mental state of a savage, he must carefully observe and analyse these transient and occasional mental attitudes in which he approximates to savagery. He must then attempt to represent a mind in which tendencies, that, in him, are so overborne by other conditions as to be transient and occasional, are unchecked by opposing forces, and for that reason prominent and permanent. It sometimes happens that a man is so destitute of a certain kind of mental tendency himself, that he is unable to understand its presence in others. Thus, Charles Lamb tells us that his friend, George Dyer, could never be brought to say anything in condemnation of the most atrocious crimes, except that the criminal must have been very eccentric.

The besetting snare of the psychologist is the tendency to assume that an act or attitude which in himself would be the natural manifestation of a certain mental process must, therefore, have the same meaning in the case of another. The fallacy lies in taking this or that isolated action apart from the totality of the conditions under which it appears. It is particularly seductive when the animal mind is the object of inquiry. The economy of a beehive displays such adaptation of means to ends, as to suggest strongly far-reaching prevision and political faculty of a human kind in the bees. But it would be very rash to trust this first impression. We must first consider all the other actions of bees and similar insects; we must also examine in detail how the individuals concerned severally perform the separate acts which in their combination constitute the orderly scheme of organization of bee society.

We shall then find that the most essential modes of behaviour, especially on the part of the queen-bee, are due to congenital tendencies, which operate independently of previous experience. We must further take into account the physical organisation of the bees. Their nervous system differs so widely and in such a manner from the human as to make us hesitate before ascribing to them so very large a share of processes especially characteristic of human beings. Finally, we find that the division of labour which makes the bee community possible is directly determined by congenital differences of physical organisation. The queen-bee, the worker, and the drone differ not only in their actual behaviour, but in their bodily constitution. The bodily constitution is so prearranged by nature as to be adapted for certain special functions. Here all analogy with the political organisation of human beings breaks down. This is a typical instance. The lesson to be learnt from it is that in investigating the mental conditions of persons or animals widely removed in their general circumstances and conditions from our own we must assume an attitude of critical suspense until we have taken into account everything which can have a bearing on the problem.

This warning is the more important because human language is especially constructed to describe the mental states of human beings, and this means that it is especially constructed so as to mislead us when we attempt to describe the workings of minds that differ in any great degree from the human. The very implications of the words we are almost compelled to use in describing what we suppose to go on in the mind of a dog or a cat surreptitiously introduce interpretations which may be quite false and often are so. It is therefore above all things necessary

in these cases to criticise our language, avoiding popular phraseology, and substituting technical terms with fixed meanings carefully defined. A horse, having had a feed at a certain place on one day, stops of his own accord at that place on the second journey. People say that it remembers being fed there before, and infers that it will be fed there again. In all probability these words with their human implications are quite misleading. Suppose that the driver of the horse is a bibulous person, who takes a drink as a matter of course whenever he comes to a public-house on the road. In order to do this he need not go through the process of remembering that he has had a drink at a public-house before or of inferring that he can have a drink at a public-house again. He simply has a bias to stop at a public-house whenever he comes to one. Probably the horse's act implies just as little of remembering or inferring.

§ 4. *Experiment and Observation.*—To experiment is to observe under conditions which we have ourselves pre-arranged. The pre-arrangement is intended to simplify the issue that is to be decided, by excluding irrelevant conditions. In this wide sense psychology has always been to some extent experimental. What is especially modern is the introduction of apparatus and of exact measurement, such as are employed by the physical sciences. Experiment may be used in connexion with any of the modes of observation which we have described. It generally involves more than one of them, and often all three. The primary question may be, what kind of object will be presented under certain assignable conditions. A simple illustration is afforded by the old Aristotelian experiment of holding an object between the second finger and the forefinger of the hand, not in their usual position, but with

the second finger crossing backwards over the forefinger. Under these circumstances, there arises a perception of doubleness, so that we appear to be touching two distinct objects instead of one. Here the question is, what object do we perceive under the given conditions? Is it single or double? We may also put a question to introspection proper, and ask how far our mental attitude resembles that which exists in ordinary cases in which two objects are perceived by touch, *e.g.*, when two opposite sides of the same finger are touched. In my own case, for instance, I find that when two opposite sides of the same finger are touched, the appearance of doubleness is more definite and unmistakable. With the crossed fingers there is a certain sense of strangeness and hesitancy which is absent in the ordinary perception of doubleness. Another case in which the primary question relates to the presented object is that of our stock example—the stereoscope. Here the conditions of perception are pre-arranged by means of a special apparatus, and the question is, what, under these conditions, is the nature of the object apprehended? Here, too, the introspective inquiry may be also raised, if we ask whether our apprehension of the object is direct or due to a process of inference. It is also possible to make experiments in which the primary issue is introspective. Thus, we may attempt to will something which we know to be impossible, in order to find out whether we *can* do so or not. Or again, we may deliberately attempt to attend simultaneously to two disconnected objects, with the view of discovering whether attention can be so divided.

Finally, we may experiment on the connexion between a mental state and its external manifestation. In this way, it is possible to discover many subtle signs and symptoms of mental process which evade ordinary observation.

For instance, variations in the circulation of the blood, and in respiration, and in muscular power, accompanying various phases of emotion, may be accurately measured by physical apparatus. In principle, this kind of experiment often occurs in ordinary life. Whenever we say a thing or do a thing to a person, in order to see how he will take it, we are performing a psychological experiment.

It is clear that the experimental method does not disclose any essentially new source of psychological data. It is only observation under test conditions, deliberately pre-arranged for the purpose of settling a definite question. It is not quite accurate to define it merely as observation under test conditions. For test conditions may arise in the ordinary course of things, without any deliberate pre-arrangement on our part. All pathological cases come under this head. In such cases as those of Laura Bridgman or Helen Keller we have an opportunity of observing, under test conditions, what the sense of touch alone can effect, in the absence of sight, hearing, smell, and taste. But the test conditions are such as could not be pre-arranged by the psychologist. He is not permitted to make people blind and deaf from their birth in order to watch the consequences.

The experimental method has often great advantages; but it has also certain drawbacks. The very conditions which we wish to investigate are often such as occur only in the normal course of mental life, and are interfered with by artificial arrangements. For instance, experiments on the association of ideas labour under this defect. The question which interests us is how the succession of ideas is determined in ordinary thinking. But experiment subjects the mind to conditions which are quite remote

from those of the normal flow of thought. In experiment, isolated words or other objects are successively presented to a person, and he is called on to name the first idea which each of them suggests to him. Thus, continuity of interest, which is all-important in ordinary thinking, is excluded. Another question in which the experimental method is seriously defective is that relating to the mental imagery accompanying the use of words. When we deliberately select a word, and ask ourselves what imagery it calls up in our minds, we are by the very process of our inquiry interfering with the result. We are looking for mental imagery, and we have no right to affirm that the imagery which we find would be present if we had not been looking for it. The only safe course in such a case as this is to cultivate the habit of watchfulness, so that we may frequently catch ourselves in the act of using words in a natural manner in the ordinary course of thought. This perpetual readiness to notice what is taking place in our own minds, without deliberately resolving to do so, on this or that special occasion, is at once a most difficult and a most necessary equipment of the introspective psychologist.

The special function of the experimental method has been well stated by one of its most enthusiastic advocates, Professor Titchener. "An experiment is a trial, test, or observation, carefully made under certain special conditions: the object of the conditions being (1) to render it possible for any one who will to *repeat* the test, in the exact manner in which it was first performed, and (2) to help the observer to rule out disturbing influences during his observation, and so to get at the desired result in a *pure* form. If we say precisely how we have worked, other investigators can go through the same processes, and judge whether our conclusions are right or wrong; and if

we do the work in a fitting place, with fitting instruments, without hurry or interruption, guarding against any influence which is foreign to the matter in hand, and which might conceivably alter our observation, we may be sure of obtaining 'pure' results, results which follow directly from the conditions laid down by us, and are not due to the operation of any unforeseen or unregulated causes. Experiment thus secures accuracy of observation, and the connection of every result with its own conditions; while it enables observers in all parts of the world to work together upon one and the same psychological problem."*

§ 5. *Quantitative Methods.*—A science becomes more exact in proportion as it deals with exactly measured quantities. Of late years, a strenuous effort has been made to measure the duration and intensity of psychical process. What are called reaction-time experiments are intended to measure the duration of simple mental operations. "It is agreed between two persons, the 'experimenter' and the 'reactor,' that on the occurrence of a certain sensory stimulus† (given by the experimenter) a certain movement shall be made (by the reactor)."‡ The time elapsing between the occurrence of the sensory stimulus and the execution of the movement in response to it is accurately measured. The responsive movement may follow at once upon the becoming aware of the effect of the stimulus, or "be restrained until certain connections have been formed in consciousness. In the former case, we speak of a *simple*, in the latter, of a *compound*, reaction."§ The simple reaction has two forms, the muscular and the sensory. "In the muscular,.....the reactor is

* *An Outline of Psychology*, p. 35

† Such as the sound of a falling body. A sensory stimulus is a stimulus acting on an organ of sense such as the eye or the ear.

‡ *Op. cit.*, p. 319. § *Ibid*, p. 320.

directed to hold his attention from the outset upon the movement which is to be made in response to the stimulus."* In the sensory, "the reactor is directed to hold his attention from the outset upon the sensory stimulus, and to withhold the reaction movement until he has sensed that stimulus."† One result of these experiments is that the muscular reaction occurs in a distinctly shorter time than the sensory. When the attention of the reactor is fixed in preparation for a coming sensation, he waits until he is distinctly aware of the presence of the sensation before reacting. On the other hand, in the muscular reaction, the reactor, being pre-occupied with making ready for his own reaction, need not wait till he is fully aware of the presence of the sensation. Hence he becomes with practice able to react before he has any distinct consciousness of it. The stimulus, as soon as it begins to operate, produces simultaneously sensation and reaction. The time taken by the simple reaction varies according to the nature of the stimulus. The sensorial reaction to light lasts about 270-thousandths of a second. A thousandth of a second is symbolised by the Greek letter σ. The muscular reaction to light lasts 180σ. The sensorial reaction to sound lasts 225σ, and the muscular 120σ. The sensorial reaction to pressure lasts 210σ and the muscular 110σ.

Accuracy of measurement is secured by special apparatus. An electric clock or chronoscope, as it is called, marks thousandths of a second. The production of the stimulus sets this clock going. The finger of the reactor all the time rests lightly on the button. The movement he makes by way of reaction consists in a slight pressure on this button, which immediately stops the clock.

* *Op. cit.*, p. 325. † *Ibid.*, p. 323.

In the compound reaction, various complications are introduced. The reactor may be called on to discriminate between two sensations, reacting only to one of them. Thus he may be told "that he will be shown either black or white, and that he is to react when he has cognised the black as black or the white as white; but he does not know which of the two brightness qualities to expect in each particular experiment."* In this case, he knows that either white or black is to be looked for. The conditions may be further varied, so that he has no definite knowledge of the alternatives which are to be submitted to him, although he is expected to react on one of them, and one only. "Thus he may be told that he will be shown a light stimulus, and that he is to react when he has cognised this stimulus as a particular brightness or a particular colour; but nothing more explicit is said."†

The measurement of the *intensity* of psychical states is attended by peculiar difficulties, due to the intrinsic nature of the quantity to be measured. The degree of loudness of a sound cannot be broken up into fractional parts which can be marked off from each other. We cannot say by direct comparison of two sounds that one is half, or a quarter, or a third, or twice as loud as the other. The two sounds cannot be superposed so as to make the fainter coincide with part of the louder, leaving a remainder which can be regarded as the quantitative difference between them. In this respect intensive differs from extensive quantity. The difference between two extensive quantities is itself an extensive quantity. The difference between two lines, one a foot long and the other ten inches long, is itself a line two inches long. But the difference between the loudness of two sounds is not itself

* *Op. cit.*, p. 328. † *Ibid.*, p. 329

a sound having a certain assignable loudness. "The difference between two intensive quantities, in fact, differs from each as much as the difference between two horses differs from a horse."*

Nevertheless, the attempt to measure intensive magnitude is not so desperate as it appears. Clearly we cannot take one intensive quantity as the unit of measurement of others; but we may take as unit of measurement the difference or interval between *two* intensities. Suppose that we are considering, instead of two sounds, two pairs of sounds. Symbolise the one pair by A and B, the other by α and β. We find that we are able to judge whether the difference in loudness between A and B is or is not equal to the difference in loudness between α and β. Thus, if we have a scale of increasing gradations of intensity, we may take as our point of departure any given intensity in the scale. We can then arrange other intensities in relation to this, proceeding by intervals which we judge to be equal. By counting these equal intervals we can assign a numerical value to any intensity in the scale. The unit which is of most use is the least perceptible difference, viz. that difference between two intensities which makes it just possible for us to be aware that there is a difference at all. All least perceptible differences in the same class of intensities are regarded as equal to each other, because they appear equal when compared.

Instead of measuring psychical process, we may measure its external manifestations or conditions, and we may also measure the objects which are presented by means of it. As an example of the first kind of procedure, we may refer to the measurement of variations in the circulation of the

*B. Russell: "On the Relations of Number and Quantity," *Mind*, N.S. vi., p. 334.

blood, and in the action of the lungs, under varying phases of emotion and pleasant or painful feeling. The measurement of the presented object is of value when it can be brought into definite relation with varying conditions of presentation. The best example is supplied by recent attempts to measure certain geometrical illusions of visual perception. The following is a good illustration. Two lines in reality parallel are each intersected by slanting cross-lines, the cross-lines of the one being opposed in direction to the cross-lines of the other. The parallel lines are then not perceived as parallel, but as diverging in the direction in which the cross-lines would meet if produced, and converging in the opposite direction.

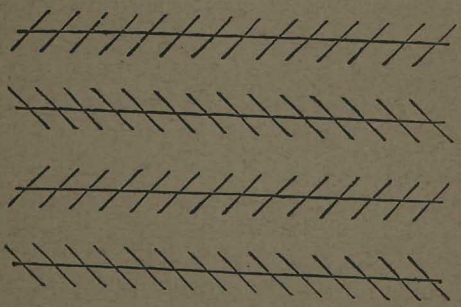

Fig. 1.

Now, to measure the amount of illusion, we have only to substitute for parallel lines lines really convergent in such a manner and degree that they appear parallel under the same conditions. The degree of convergence required for this purpose measures the amount of the illusion. By this means it is possible to trace the variations which take place in the amount of the illusion

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with variations in the conditions. It is found to vary according to the number and obliquity of the cross-lines. It exists in a fainter degree when the cross-lines merely meet the parallels without intersecting, or when they approach them without meeting. By establishing definite quantitative values for these varying cases valuable data are supplied for discovering the process on which the illusion depends. Actual experiments of this kind of course require a specially contrived apparatus. The lines may be represented by moveable threads, which can be readily adjusted at will so as to be parallel or to deviate from parallelism in varying degrees, the deviation being accurately measured by a scale. In this particular case, the solution of the problem has not been definitely reached, but there is no doubt that the quantitative method has far the best chance of success.

CHAPTER III.

BODY AND MIND.*

§ 1. *Physiological Antecedents and Consequents of Mental Process.*—It is an old saying that the body is the organ of the mind,—the instrument through which it works. This account of the matter is evidently true so far as regards the peripheral organs of sensation and motion. We cannot see without eyes, or hear without ears; we cannot move without muscles. But without sensation and motion the process of consciousness would be impossible. We can give no satisfactory account of the mental life without reference to the construction of the organs of sense and the impressions they receive from external agencies, or without reference to the mechanism of movement by which we act on the external world and change our spatial relations to surrounding objects. There is practically no difficulty in determining the nature of the relation between body and mind when we have in view on the bodily side only the peripheral instruments of sensation and motion. For all psychological purposes this must be regarded as a relation of interaction. Impressions on eye or ear produce modifications of consciousness, and conscious volitions produce muscular contractions. Serious difficulties arise only when

* This is not an easy subject. The student is recommended to do his best to understand this chapter on the first reading, but should certainly make a point of returning to it after having read the book through.

we push our inquiry further back, and examine the relation of nervous process to conscious process. Muscular contraction follows change in consciousness only when the muscle is excited by an impulse which has its origin in a disturbance of the grey matter of the nervous system. Similarly, impressions on the organs of sense produce sensations only when they set up an impulse which is transmitted to the brain. In this process some parts of the nervous system may be regarded as intermediate links. Consciousness is not immediately connected with the occurrences which take place in them. These occurrences are either antecedent conditions of the nervous changes which are directly connected with consciousness, or consequences ensuing from nervous change that is directly connected with consciousness. They thus constitute intermediate stages between change in consciousness and change in the peripheral organs, and inversely. The nervous mechanisms which fulfil this mediating function may be regarded, like the muscles or the senses, as organs in the service of mental process. The relation is one of interaction. Conscious volition produces change in the nervous mechanism, and change in the nervous mechanism, set up in the first instance by impressions on the organs of sense, produces changes experienced in consciousness as sensations. But the case is essentially different for those nervous processes which are connected with consciousness immediately, without the intervention of any other material occurrences. This unmediated connexion of neural and conscious occurrences is found mainly, if not exclusively, in the cerebral cortex, which is the highest part of the brain. "Viewed broadly, the brain is a mass of white matter, with nuclei of grey matter deeply imbedded in it, and with a sheet of grey matter, about one-fifth of a square meter in

area and between two and three mm. thick, covering the folds, fissures, and convolutions of its surface."* This overlying sheet of grey matter is the rind or cortex of the brain, and is in immediate connexion with conscious process. For our present purposes, we may without serious inaccuracy regard all processes taking place in other parts of the nervous system as connected with consciousness only so far as they are causes or effects of processes in the cortex. Before coming to the vital question of the relation between cortical process and conscious process, it will be convenient to give some account of those parts of the nervous structure which lie beneath the cortex.†

§ 2. *Function of the Sub-Cortical Nervous Mechanism.*— The portion of the nervous system which lies below the cortex is partly contained within the cranium. This portion consists of nuclei of grey matter imbedded in white matter. The nuclei of grey matter constitute what are called the sub-cortical centres. The white matter consists of nerve-fibres, serving to conduct impulses between the cortex and the sub-cortical centres, and between the sub-cortical centres themselves. Running through the trunk of the body, behind the viscera, there is another important portion of the nervous system—the spinal cord. At its upper end it enters the cranium, and this portion of it receives a separate name, and is called the *medulla oblongata*, or simply, the *bulb*. Nerve-fibres connect the muscles and the surface of the body with the spinal cord, and strands of nerve-fibre pass upwards along the cord itself to the sub-cortical centres.

* Dr. Waller, *Human Physiology*, p. 518.

† The student should make a point of reading the chapters on the nervous system in some good *Physiology*. Lessons I. and XI. in Huxley's *Elementary Physiology* (Macmillan & Co., price 4s. 6d.), and Ch. IX. in Davis's *Elementary Physiology* (Blackie's Science Text-Books, price 2s.),

These sub-cortical portions of the nervous system serve to convey and modify impulses passing between peripheral organs and the cortex; but they also discharge functions which are independent of their connexion with the cortex. They are organs of what is called reflex action. Reflex actions are such as take place in a fixed and uniform manner in response to an appropriate external stimulus. Without the actual presence of the external stimulus they do not occur, and whenever the external stimulus operates they occur inevitably and invariably, unless they are interfered with by the simultaneous operations of another external stimulus, or by processes going on in the cortex. Their typical characteristics are best seen when interference on the part of the cerebral cortex is excluded, which may be effected by simply removing the cerebral hemispheres from the brain of an animal. "We may perhaps broadly describe the behaviour of a frog, from which the cerebral hemispheres only have been removed, by saying that such an animal, though exhibiting no spontaneous movements, can, by the application of appropriate stimuli, be induced to perform all or nearly all the movements which an entire frog is capable of executing. It can be made to swim, to leap, and to crawl. Left to itself, it assumes what may be called the natural posture of a frog, with the fore limbs erect, and the hind limbs flexed, so that the line of the body makes an angle with the surface on which it is resting. When placed on its back, it immediately regains this natural posture. When placed

will put him in possession of the most essential facts. If he wishes to go more deeply into the matter, Dr. Waller's *Human Physiology* (Longmans, Green, & Co.), may be safely recommended. For the advanced student, Parts III. and IV. of Dr. M. Foster's *Text-Book of Physiology* (Macmillan & Co.) are necessary. What I have said in the text is the roughest possible sketch, and can only serve, at most, as a reminder.

on a board, it does not fall from the board when the latter is tilted up so as to displace the animal's centre of gravity; it crawls up the board until it gains a new position in which its centre of gravity is restored to its proper place. Its movements are exactly those of an entire frog, except that they need an external stimulus to call them forth. They differ, moreover, fundamentally from those of an entire frog in the following important feature: they inevitably follow when the stimulus is applied; they come to an end when the stimulus ceases to act. By continually varying the inclination of a board on which it is placed, the frog may be made to continue crawling almost indefinitely; but directly the board is made to assume such a position that the body of the frog is in equilibrium, the crawling ceases; and if the position be not disturbed the animal will remain impassive and quiet for an almost indefinite time. When thrown into water, the creature begins at once to swim about in the most regular manner, and will continue to swim until it is exhausted, if there be nothing present on which it can come to rest. If a small piece of wood be placed on the water the frog will, when it comes in contact with the wood, crawl upon it, and so come to rest. If disturbed from its natural posture, as by being placed on its back, it immediately struggles to regain that posture; only by the application of continued force can it be kept lying on its back. Such a frog, if its flanks be gently stroked, will croak; and the croaks follow so regularly and surely upon the strokes that the animal may almost be played upon like a musical, or at least an acoustic instrument. Moreover, provided that the optic nerves and their arrangements have not been injured by the operation, the movements of the animal appear to be influenced by light; if it be urged to move in any particular direction, it seems

in its progress to avoid obstacles, at least such as cast a strong shadow; it turns its course to the right or left or sometimes leaps over the obstacle. In fact, even to a careful observer, the differences between such a frog and an entire frog, which was simply very stupid or very inert, would appear slight and unimportant except in this, that the animal without its cerebral hemispheres is obedient to every stimulus, and that each stimulus evokes an appropriate movement, whereas with the entire animal, it is impossible to predict whether any result at all, and if so what result, will follow the application of this or that stimulus."*

The characteristic of reflex action which Professor Foster here emphasises is its lack of spontaneity—its thoroughgoing dependence on the actual present operation of a stimulus external to the nervous system. Experiments of the kind he describes have been performed on birds and rabbits as well as on frogs. The results are, broadly, similar, except that in the case of birds there is some appearance of spontaneity when the animal has had sufficient time to recover from the shock of the operation. But this spontaneity is too small in degree and too ambiguous in its nature, to invalidate the general conclusion that the function of the sub-cortical centres when working by themselves is almost wholly reflex. Closely connected with lack of spontaneity there is another and equally important characteristic of reflex action. It takes place invariably in the same way without being modified in accordance with the results of past actions. Whether it is accompanied by any sort of experience or not, we may at least affirm that it is characterised by the absence of the process of *learning* by experience.

* *Text-Book of Physiology.* By Dr. M. Foster. Sixth Edition. Part III., "The Central Nervous System," pp. 1000, 1001.

Lack of spontaneity, and lack of the power of learning by experience, do not necessarily imply the absence of all consciousness in the widest sense of the word. It would be very rash, therefore, to affirm dogmatically that the frog without its hemispheres is entirely devoid of any kind of feeling. Whether it is so or not is a question which has been much disputed, and we shall not here attempt to decide it. But there is one point which emerges clearly from the experiment: this is that the working of the sub-cortical mechanism, together with whatever consciousness may accompany it, is capable of taking place separately from, and independently of, processes in the cortex. If this happens when the hemispheres are removed, it may also happen when they are present. In so far as the sub-cortical centres operate independently of the cortex, any consciousness which may accompany their action will be disconnected from the consciousness which accompanies the action of the cortex. But the consciousness which accompanies intelligent action is associated with cortical process. Now intelligent consciousness, capable of learning by experience, constitutes, in all but the lowest grades of animal life, the main stream of consciousness. Thus, though the independent action of the sub-cortical centres may not be wholly unconscious, whatever consciousness it involves does not form part of the main current of mental life in man and the higher animals. Only when process in sub-cortical centres ceases to be separate and independent, and brings into play in a marked manner the action of the cortex, is it accompanied by conscious modifications which form part of the conscious life of the individual as a whole.

This is borne out by human experience. In cases of injury to the spinal cord, the functional connection between lower and higher parts of the cord may be destroyed.

If under these conditions the soles of the patient's feet are tickled, they will be jerked away; but the man himself is in no way aware of what takes place, except as he might be aware of the movement of a foreign body. Quite apart from pathological conditions of this sort, reflex actions are constantly going on, which do not involve in any appreciable way the consciousness of the individual as a whole. The pupil of the eye is constantly contracted and expanded in accordance with varying degrees of illumination. In eating, morsels of food are swallowed by reflex action. We are constantly breathing in the same reflex way. These and similar processes can and do go on while the consciousness of the individual is pre-occupied with other matters. On the other hand, there are certain reflex actions, such as sneezing, coughing, and withdrawal of the hand, when suddenly burned or scalded, which usually involve consciousness. A sneeze, for instance, produced by Cayenne pepper, can hardly take place unconsciously. But whenever such actions are unmistakably accompanied by consciousness, it is evident that the stimulus which produces them excites in a conspicuous way the cortex as well as the sub-cortical centres. Intelligent attention is either brought to bear on the situation, or it is disturbed and deranged by the violence of the shock. When a pin is suddenly plunged into a man's leg, he jumps, by reflex action. But at the same time, there is a marked disturbance of his intelligent consciousness. The train of thought, with which he may have been pre-occupied at the moment, is broken off and his whole mental attitude changed. The sensation which introduces a sneeze has not the same violent disturbing effect; but so far as it is conspicuously accompanied by consciousness, it tends to attract attention and to

produce intelligent adaptation to circumstances. The man pulls out his handkerchief, or the like. When the main stream of consciousness is very intently pre-occupied, external stimulants which would otherwise excite cortical process, fail to do so and merely produce reflex action of which the individual is unconscious. Thus, when we are much pre-occupied with some absorbing object, we may cough or yawn without being aware of it. From the facts we have stated, we may conclude that the cortex is pre-eminently, if not exclusively, the seat of those processes which are immediately correlated with individual consciousness.

Besides being a mechanism of reflex action, the sub-cortical centres constitute an apparatus by means of which the cortex produces movements of the organism. The mechanism for the relatively simple constituents of complex activities is contained in the sub-cortical centres. The complex activities are produced by the cortex playing upon the lower centres, so as to evoke the simple constituent movements in a certain order, simultaneous and successive. It is, above all, the successive co-ordination of movements which is due to the cortex. Simultaneous co-ordination of a complex kind is involved in many purely reflex actions.

From a biological point of view, the function of the cortex is adaptation to irregularly varying conditions. Reflex action will suffice to maintain the life of an animal which has merely to perform simple actions in a uniform way on the recurrence of uniform external conditions. But where fluctuating adaptation to fluctuating conditions is required, reflex action becomes inadequate, and often actually harmful. Action must be varied in correspondence with the results of previous action, so that it may not be

repeated in circumstances under which it has proved injurious. For this, intelligence, and the nervous organization correlated with intelligence are required. The burnt child shuns the fire, and so saves itself from future burns; but the moth will dash again and again into the candle-flame, though it is singed every time. The moth's action is reflex, that of the child is intelligent.

§ 3. *Immediate Correlation of Conscious and Nervous Process.*—In the cortex at least we have a direct relation between nervous process and conscious process, and are so brought face to face with the question of the ultimate nature of their connexion. To some extent this is a question of fact, and can be settled by special evidence. But there is also a wide field for speculation, in which we cannot be at all certain of our conclusions.

The facts show that there is not only a general correlation between conscious process as a whole and cortical process as a whole, but also that special parts of the cortex are connected with special constituents of the mental life. A generation ago the prevailing doctrine among physiologists was opposed to this "localisation of function," as it is called. It was held that the cortex discharged each of its separate functions as a whole, so that injury done to it, or removal of part of its substance, did not involve the loss or impairment of any special mental process rather than any other. The only result was a general impairment of mental power. Just as a man still breathes as before when he has only one lung, except that he does so less efficiently, so it was supposed that a part of the brain might in the same manner be substituted for the whole. On the other side, the phrenologists maintained a very definite theory of localisation. But their doctrine was a mass of psychological and physiological crudities. They

mapped out the brain into organs corresponding to complex faculties, such as acquisitiveness, combativeness, ideality, orderliness, constructiveness, and the like. Such a scheme is a psychological absurdity. Each of these faculties involves the coöperation of a vast number of fundamental processes, and the same processes enter in varying combination into the constitution of the different faculties. Thus the procedure of phrenology is like that of a man who should assume a different board and a different set of pieces for every game of chess, or a separate alphabet for every word. Besides this there is a very obvious anatomical objection against the supposed evidence adduced by the phrenologist. This consisted in the reading of character by the feeling of bumps; but as a matter of fact, the external conformation of the skull is far from accurately corresponding to the development of the brain.

But the most crushing refutation of phrenology is supplied by what has been ascertained in recent years about the modes in which cerebral functions actually are localised. So far as the cortex has been mapped out on good evidence, it is found that the division of function among different parts corresponds, not to complex faculties, but to the bodily organs of sensation and movement. One portion of the cortex, anatomically connected with the eye, is specially correlated with visual consciousness, in the way of sensation or mental imagery. Another, anatomically connected with the ear, has a similar relation to auditory experience. Another is specially connected with touch-sensations, and with movements of the limbs. The evidence on which these conclusions are based is partly gathered from experiments on animals, and partly from pathological data. The pathological evidence is most

important and unambiguous. Diseases affecting communication of ideas by means of language have been especially useful. Under the general name *aphasia* are embraced many defects of varying kinds. The patient may be simply unable to articulate words, although he can understand them when he hears them. This is motor aphasia, and it has been definitely connected with lesion of a special part of the brain called the third frontal convolution.* Again, a man may be able to articulate, and yet lack the power to distinguish words as such when he hears them. He hears them indeed as a confused stream of sound, but they are not for him words. This is sensory, or, more accurately, perceptual aphasia, and it is connected with lesion of a special portion of the auditory area of the cortex. Similarly, inability to recognise written words for what they are is connected with lesion of a special portion of the visual area. These indications may serve to show what is meant by localisation† of cerebral functions, and the methods by which it is determined. But it must be remembered that our ignorance is still incomparably greater than our knowledge. The student must also be warned against supposing that localisation is definite and precise in its nature. "The various activities making up the business of the brain do not take place all over its surface, as in a country without towns and villages, where all kinds of industry go on in every hut or tent; nor are the different activities absolutely restricted to certain spots, as if in walled towns. The brain cortex is

* Of the left hemisphere in right-handed persons, and of the right hemisphere in left-handed persons.

† In localisation what is locally marked off is a certain portion of the brain and the material processes which take place in it. The corresponding conscious process is not, strictly speaking, localised. The nature of its connexion with the localised brain-process remains to be discussed.

not comparable with either of these extreme cases; its territory must be recognised as possessing towns with special industries, but towns with straggling and overlapping suburbs, and industries that are, indeed, predominant each in a given centre, but not exclusive of all other industries in that centre, nor excluded from other centres in which other industries predominate."*

Data of the kind described afford us no efficient help when we come to consider precisely how cortical process is related to the corresponding conscious process. There are, in the main, three alternative possibilities,—interaction, one-sided action, and simple concomitance. On the interaction hypothesis, a cerebral process may produce a state of consciousness, just as a nervous process may produce a muscular contraction, or as change in one part of the cortex may produce change in another part; and, inversely, a conscious process, such as a volition, may act on the cortex, just as the cortex acts on sub-cortical centres, and these on the muscles.

The main objection to this view is that the kind of interaction pre-supposed is utterly incongruous with the conception of causation on which the whole system of our knowledge both of physical and psychical process is based. It is the function of science to explain how events take place, or, in other words, to make their occurrence intelligible; but this is only possible in so far as we can discover such a connexion between cause and effect as will enable us to understand how the effect follows from the cause; or, in other words, we must exhibit cause and effect as parts of one and the same continuous process. To explain is to exhibit a fact as the resultant of its factors. This is the ideal of science, and it is never completely

* Waller's *Physiology*, pp. 534-535.

attained. But in so far as it is unattained, our knowledge is felt to be incomplete.

Now when we come to the direct connexion between a nervous process and a correlated conscious process, we find a complete solution of continuity. The two processes have no common factor. Their connexion lies entirely outside of our total knowledge of physical nature on the one hand, and of conscious process on the other. The laws which govern the change of position of bodies and of their component atoms and molecules in space, evidently have nothing to do with the relation between a material occurrence and a conscious occurrence. No reason in the world can be assigned why the change produced in the grey pulpy substance of the cortex by light of a certain wave-length should be accompanied by the sensation *red*, and why that produced by light of a different wave-length should be accompanied by the sensation *green*. It is equally unintelligible that a state of volition should be followed by a change in the substance of the cortex and so mediately by the contraction of a muscle.

The same difficulty is felt from a practical as well as from a theoretical point of view. The physiologist, in his endeavour to make organic processes intelligible, by connecting them with the general order of physical nature, cannot but regard the presence of a factor which does not enter into this order as a most serious stumbling-block, which may upset all his calculations. A favourite way of putting the objection from this point of view, is to say that the intervention of conscious process in physiological process would contradict the law of conservation of energy. This is not strictly true, because the conservation of energy is a law framed expressly for a material system; when a factor is introduced which is not material, though the law

may not be applicable, it is not violated. Apart from interfering conditions stones will fall to the earth; this law is not violated when I lift a stone in my hand. Similarly no change in the material world, as such, produces loss or gain of power to do work; the power being merely transferred from one portion of matter to another. Nevertheless, it is quite conceivable that loss or gain of energy might ensue from the operation of a factor which does not belong to the material world at all. But, though no contradiction is involved in such a supposition, it is clear that the fresh creation of material energy by conscious process would introduce an incalculable and disturbing factor, seriously interfering with the work of scientific discovery and explanation. Nor is this objection limited to the law of conservation of energy; it applies to all the ultimate principles on which our knowledge of the physical world is based. So far as the conservation of energy is concerned, it might be supposed that there is a transfer of energy from material process to conscious process. Physical energy might be transformed into intensity and complexity of consciousness, and *vice versâ*. But there is no sufficient evidence of this, and all that we know points in the contrary direction. Intensive quantity is not measurable and calculable in such a way as to make it comparable with other forms of energy. The hypothesis of interaction, it is clear, labours under very serious difficulties, and though it cannot be pronounced impossible, yet it will be well to avoid it, if we can find some alternative which is on the whole more tolerable.

To the second alternative, one-sided action, either of matter on mind, or of mind on matter, the theoretical objections which have been brought against interaction apply with equal force. It also involves the additional

difficulty that all other action with which we are acquainted, is interaction. One-sided action would therefore be contrary to our general experience of the order of nature. Yet the hypothesis that matter causally determines consciousness, without being itself determined by consciousness, is one which has so much currency that it requires special criticism. This doctrine of *materialism*, as it is called, seems incapable of any precise statement; whatever plausibility it possesses, arises from the use, or rather from the misuse, of the word *function*. Digestion is a function of the alimentary canal; breathing is a function of the lungs; why cannot we simply affirm that consciousness is a function of the brain? The objection is, that we do not make two things the same by applying the same word to them, when in their own nature they are radically and essentially different. When we say that digestion is a function of the stomach, we mean that digestion is the stomach engaged in digesting. When we say that breathing is a function of the lungs, we mean that breathing is the lungs at work. In describing the process of digestion, we, *ipso facto*, describe the stomach itself as engaged in the process. In describing the process of breathing, we, *ipso facto*, describe the lungs as filling themselves with air by a certain movement, and expelling it by an alternate movement. But if we describe the brain at work, there is no need to mention consciousness at all; and in naming and describing conscious processes, there is no need to mention the brain. The function of the brain as a physiological organ is to move the body; the contraction of muscles is the result of neural impulses; and in describing it we have to mention the nervous system, including the cortex, as engaged in it. But the process of consciousness cannot be analysed or resolved

into such processes as chemical and physical changes in nerve-cells. If consciousness is supposed to be produced by the nervous process, the production is simply creation out of nothing. An objection of an equally serious kind is that the materialistic theory destroys all possibility of agency on the part of conscious beings. According to it, the appearance of causal connexion within the process of consciousness itself is an illusion; no judgment was ever due to a train of reasoning; no volition was ever due to motives. The sole cause in every case was a certain modification of the nervous system. Similarly conscious process can, on this view, never determine external action. No man ever lifted a finger because he willed to do so. No tears were ever the consequence of emotion. This question is sometimes confused by the supposition that materialism would only interfere with what is called free-will; in truth, it makes impossible any real operation of consciousness of any kind whatever. The logical consequence is not only that man as a conscious being never does anything freely, but that no man ever does anything at all.

We now come to the third hypothesis. This differs both from the theory of interaction and from materialism, inasmuch as it separates the statement of facts from theoretical explanation. Its first problem is to state the facts without implying direct interaction between nervous and conscious change, and without implying that the one creates the other. The formula which it uses for this purpose is that of psycho-physical parallelism, which simply states that modifications of consciousness emerge contemporaneously with corresponding modifications of nervous process. The nervous changes are supposed to be parts of the total continuous process of the physical universe, so that science will require none but material conditions to

explain them. On the other hand, there is causal connexion within the process of consciousness itself, as such. This psychical causation runs parallel with the material, but is not itself material. When a bodily action, such as moving a finger, follows upon volition, it is the cortical process concomitant with the volition which sets the muscles in contraction and so produces the movement. When an external impression is followed by a sensation, what the external impression produces is a cortical process, which is concomitant with but does not cause the sensation. The external impression may be regarded as if it were a cause of the sensation, inasmuch as it is a cause of the cortical process correlated with the sensation. Similarly, the volition may be regarded as if it were a cause of the movement, inasmuch as it is correlated with the cortical process which sets the appropriate muscles in contraction. This account of the matter covers the facts as they are known to us; but it is merely a way of formulating these facts; it is not an explanatory theory. On the contrary, if it is a true formulation of the facts it is evident that these facts do not contain their own explanation. If the concomitance of cortical and conscious process is regarded as an ultimate principle, it is simply a miracle. That the cortical process which sets in motion the muscles moving the finger should happen to be accompanied by the conscious volition to move the finger without causal connexion between them, is in itself utterly unintelligible. If we are to find an explanation, we must frame some hypothesis to account for psycho-physical parallelism, and in so doing we are compelled to plunge into ontology.

§ 4. *Metaphysical Explanation of Psycho-Physical Parallelism.*—If the doctrine of psycho-physical parallelism is true, the reason of the connexion between conscious process and

the correlated nervous process is not to be found in the nervous and conscious processes themselves. Both must be regarded as belonging to a more comprehensive system of conditions; and it is within this system as a whole that the reason of their connexion is to be sought. In particular, the individual consciousness, as we know it, must be regarded as a fragment of a wider whole, by which its origin and its changes are determined. As the brain forms only a fragmentary portion of the total system of material phenomena, so we must assume the stream of individual consciousness to be in like manner part of an immaterial system. We must further assume that this immaterial system in its totality is related to the material world in its totality as the individual consciousness is related to nervous processes taking place in the cortex of the brain. Within the immaterial system the individual consciousness is a determining factor: within this system it acts and is acted on. But this interaction is virtually interaction between conscious process and the material world: for the total immaterial system to which the individual consciousness belongs is correlated with material phenomena in general, as the individual consciousness is correlated with nervous occurrences in the cortex. When a volition sets the finger moving, the volition acts within *its* own sphere of influence, and the corresponding cortical process acts within *its* own sphere of influence.

We have yet to consider the relation of the immaterial system as a whole to the material system as a whole. If this relation be regarded as one of mere parallelism or concomitance, the fundamental difficulty, so far from being removed, is aggravated. To obtain light on this ultimate question, we must take an entirely new point of departure. We must consider the problem of the ultimate nature of

matter. To do so here at length is of course impossible; but we may say that the explanation of psycho-physical parallelism is ultimately based on an idealistic view of material phenomena. The sensible qualities of matter exist only for minds which have certain experiences in the way of sensation. The extension, configuration, and other qualities of material bodies all pre-suppose the existence of certain modes of conscious experience. In like manner, the ultimate constituents of matter as they are recognised by scientific theories are abstract constructions of the human mind, elaborating the content of sense perceptions. In general, all that makes matter material consists in predicates which include a content derived from affections of the individual mind which takes cognisance of it.

This idealistic view applies specially and peculiarly to material phenomena. It must not be confounded with the general doctrine of idealism. The essential purport of this doctrine is that whatever exists must be knowable. Whatever exists, even though it be actually unknown, must be of a piece with what is known. It must belong to the same continuous system, and it must therefore be capable of being known. A development of knowledge is conceivable which would include it. Evidently this doctrine determines nothing as to the special nature of the contents of the universe. It affirms that they are all capable of being known. But it does not determine what characters must be apprehended as belonging to them when they are known. But what we are here asserting concerning material phenomena as such is more than this. We assert that the attributes of matter as such depend for their distinctive nature on the specific constitution of the individuals who cognise them. Without visual sensations the sensible qualities which we call colours would not

exist. Apart from auditory sensation, bodies would not be sonorous. Apart from movement sensations and the extensity of visual and tactual sensations, the attributes of extension, shape, motion, position, would disappear. It is a common-place of modern physical science that the "secondary" qualities of colour, sound, temperature, odour, etc., are merely "subjective," *i.e.*, depend on the special constitution of human beings. These, it is said, are due to the action of external conditions on our peculiar organisation. But the physicist and physiologist generally stop at this point. They are content to regard the primary qualities of extension and motion as independent of the constitution of the individual mind. For their purposes it is not necessary to push the inquiry farther. But if we do push the inquiry farther, it becomes impossible to regard the primary qualities as differing in this respect from the secondary. Their nature also is constituted by special modes and combinations of sense-experience. The characteristic attributes of matter as such depends on interaction between individual minds, and something which is not in its own nature possessed of these attributes, but only assumes them in consequence of this interaction.

Matter, as perceived and conceived by common sense and science, is essentially a phenomenon; and *phenomenon* simply means *appearance* or *presentation*. There can be no appearance or presentation apart from a subject to which an object appears or is presented. Hence the nature of matter as known is constituted by its being known, or at least knowable. On the other hand, it is equally certain that the *existence* of what is known to us as matter does not depend on our knowledge of it. We do not make matter. Only its appearance as material phenomenon is dependent on our sensitive experiences and the elaboration of these by

thought. Hence it follows that, so far as it exists independently of its presentation to a cognitive subject, it cannot have material properties, such as extension, hardness, colour, weight, and the like. It is an agency which is an essential condition of material phenomena, but is not itself a material phenomenon. Thus we are led by a quite different line of investigation to the same conclusion which was suggested by the relation of conscious process to nervous process. The world of material phenomena pre-supposes a system of immaterial agency. In this immaterial system the individual consciousness originates. To it, in some way, the sensational experiences are due which form the basis of our knowledge of the material world. It is on it the individual consciousness acts when it produces changes in the material world. All this is possible because the system of immaterial agency is identical with what we know as matter, in so far as matter exists independently of its possible presentation to a perceiving subject. This theory has been purposely stated in a vague form. There are varying views as to the nature of the system of immaterial agency. Some say that it is will, others that it is absolute thought, others that it is unknowable; in any case, the student should guard against the assumption that the immaterial system is a sort of repetition of the material system, involving the same sort of interactions, and similar distinctions and relations of its parts.

§ 5. *Conclusion.*—We have discussed three theories of the immediate connexion between conscious and nervous process. Of these, what we have described as materialism must be rejected. The other two, interaction and parallelism, have each advocates among the best psychologists and metaphysicians of the present day. The student is recommended to avoid hastily deciding between them.

The hypothesis of parallelism is that to which we are ourselves inclined. It certainly covers the known facts, and forms the most convenient working hypothesis. It escapes the difficulties which attach to the theory of interaction. But it must be admitted that it does so only by somewhat bold speculation.

For psychological purposes the doctrine of psycho-physical parallelism is, as we have said, a sufficiently good working hypothesis, if we take it merely as a mode of formulating facts. We shall accordingly assume its validity in this work. In indicating the theoretical explanation of psycho-physical parallelism we have passed beyond the limits of psychology proper, and entered upon ontological speculation. It has been thought advisable to adopt this course for two reasons: first, because the intelligent student always feels a keen interest in the relation between body and mind, and cannot, as a rule, rest satisfied with the statement of the simple concomitance of nervous and mental processes. In the second place, theories on the subject are in the air and are put forward in a more or less dogmatic fashion by popular writers. Hence a mere attempt to give a formula for the facts is apt to be interpreted as a decision in favour of one or other of these theories. To avoid being misunderstood it is necessary to be explicit. But the reader should take note that we do not pretend to have given more than an adumbration of a main line of thought on this profoundly important topic.

BOOK I.

GENERAL ANALYSIS.

CHAPTER I.

ULTIMATE MODES OF BEING CONSCIOUS.

§ 1. *Introductory.*—Human consciousness is normally concerned with some object or other. In waking life, we are usually, and perhaps always, perceiving something or thinking about something. Now there are three ways in which our consciousness is related to its object. (1) We have some kind of cognisance of the object; (2) we feel pleased or displeased with it, or otherwise emotionally affected towards it; (3) we experience a tendency in some way to alter or transform it, either by bringing it more fully into consciousness, or the reverse. Thus, we may say that there are three ultimate modes of being conscious of an object: knowing, feeling, and striving; the cognitive attitude, the feeling attitude, and the conative attitude. These three are normally and in all probability always united in the same total state of consciousness. They are not distinct states which succeed each other in time; they are partial constituents of one concrete whole.

§ 2. *Cognition.*—The word *cognition* is here used in a very wide sense. It covers all modes and degrees of being aware of or cognisant of an object. The word *object* must

not be taken to mean merely material object, but whatever we can in any way be aware of or cognisant of. The book I see before me on the table is an object to me, inasmuch as I perceive it. The immortality of the soul is also an object to me whenever I think of it. *Nothing* is an object to me, whenever I use the word *nothing* and attach a meaning to it; so is a Centaur when I imagine one. To perceive or think at all is to perceive or think of something, and this something, just because it is perceived or thought of, is an object presented to consciousness.

By some writers the term presentation is used as a synonym of object. But it seems advisable to draw a distinction between them. When we are observing or thinking about an object, the object without ceasing to be recognisably the same appears under different aspects. Now this now that characteristic feature or relation is brought before consciousness. Indeed the processes of observing and thinking essentially consist in an endeavour to cognise relatively new phases of their object. So far as the object is already known there is nothing for them to do. Now, it will be convenient to apply the term "presentation" to these varying appearances assumed by an object recognised as the same during the process of attending to it. Professor Titchener gives an example which may serve to illustrate what is meant. He says to his reader :—"Close the book and look steadily at the table in front of you and try to think continuously of that. You will find that steadiness is impossible. There is a tendency to let the eyes wander, to let them follow the grain and pattern of the wood or to travel over the various objects lying on the table. If you withstand the temptation your mind becomes a blank very soon indeed; the table gets to be quite meaningless to you. Presently the

blank ends; you remember that you 'ought' to have thought of the table, and resolve to do so: the eyes try to wander again, and so the whole history is repeated." (*Primer of Psychology*, p. 8). The lesson of this illustration is that there is no such thing as complete mental immobility. As Titchener says:—"Mind goes on from moment to moment; it is never still." In attending to an object, though we are aware of the object as the same throughout, we apprehend it or endeavour to apprehend it in different aspects. I propose to mark the distinction between the identical object and its varying appearances by a distinction of terminology. I shall use the term "object" for the whole which we are attending and endeavouring to bring before consciousness more fully and distinctly. I shall reserve the term "presentation" for the special characters or relations of the object as they appear successively in different phases of the cognitive process. For instance, when I see an apple and pick it up, the apple as seen and the apple as touched are for me different presentations of the same thing. For a baby, on the contrary, who has not learned to connect sight and touch experiences in the perception of a single thing, the apple as seen and the apple as felt are two distinct objects.

We must carefully distinguish between cognitive process and its object. I can perceive the colour red again and again on different occasions, and identify it as the same. But on each separate occasion I have a separate perception. The perceptions are so many distinct events or occurrences in the history of my individual experience. The sensible quality is not an event in the history of my experience at all. It is an object which may be perceived and identified as the same in many different phases of my life-history widely separated

in time. The same distinction becomes still more obvious if we take other instances. If I perceive a triangle, my perception is not triangular,—it is not made up of lines and angles. On the other hand, the triangle as it appears to me when I see it is not an occurrence in the history of my individual consciousness; it is a geometrical figure, which is a very different thing. Again, in a moment of time I may think of eternity: it is obvious that the specific modifications of consciousness which exist while I am thinking of eternity, and disappear after I have ceased to think of it, are not themselves eternity or eternal. Similarly, I may think of non-existence; this is an actually existing thought; and the specific modes of consciousness which give it its specific nature must actually exist. They cannot therefore be identified with the object of the thought, which is non-existence. The object itself can never be identified with the present modifications of the individual consciousness by which it is cognised.*

§ 3. *The Feeling-Attitude.*—Besides having cognisance of an object, we are usually, if not always, pleased or displeased, satisfied or dissatisfied with it, and sometimes partially the one and partially the other. This feeling-attitude pre-supposes the existence of cognition. We cannot feel pleased or displeased with a thing when we have no cognisance of it. Even when we have no cognisance of it,

* The fact that the object is an object at this or that moment to this or that individual consciousness is indeed identical with the fact that it is cognised at this or that moment by this individual consciousness Similarly, the fact that it is capable of being an object is identical with the fact that some one is capable of cognising it. But its whole nature cannot merely consist in its being known or knowable; otherwise there would be nothing in it to know, and it could not therefore be known or knowable. (The beginner need not trouble himself if he does not understand this note. It is meant for certain possible students of a metaphysical bias who may feel a certain difficulty).

it may produce an agreeable or disagreeable feeling in us; but this causal relation is quite different from that between subject and object. We may feel displeased with a glaring light. Doubtless our displeasure is caused by vibrations in the luminiferous ether; but if we know nothing of these vibrations, we cannot say that they are the object of our displeasure*, in the psychological meaning of the word *object*. Therefore, from a psychological point of view, we cannot say that we feel displeased with them.

Can our total consciousness at any moment be entirely devoid of pleasure and displeasure? This is a question which we may be at first sight tempted to answer decidedly in the affirmative. I may, it would seem, perceive a stone, or a clod of earth, or a geometrical diagram, without feeling either agreeably or disagreeably affected towards these objects. But the apparent plausibility of this answer disappears when we look more closely into the case. Why do we notice these objects at all? Perhaps we do so merely with the view of settling by experiment the question we are now discussing. But if that be so, the issue of the experiment itself is more or less satisfactory or unsatisfactory. We are in some degree pleased that our own pre-conceived view is confirmed, or displeased because it is apparently upset. If we have no pre-conceived view, we are pleased or displeased because we do or do not succeed in obtaining an answer to the question proposed. Thus, the affirmative answer turns out under these special conditions to be due to an oversight. We have not taken into account our total consciousness in relation to the object,

* The term *displeasure* is ordinarily used to signify *resentment*. In this work we make it signify simply the opposite of being pleased. The term *pain*, as we shall see later, is ambiguous.

but only a small and unimportant part of it. Now, suppose that, instead of having a pre-existing motive for noticing the object, we simply take cognisance of it because it happens to pass before our eyes. Here it may be said that we are purely neutral in regard to it. But there are many things presented to our bodily vision of which we take no cognisance. The more pre-occupied we are, the more entirely they escape notice. If this or that object so obtrudes itself when our minds are pre-engaged on some other topic as to divert the current of our thoughts, it must have some interest of a pleasant or unpleasant character. If it does not divert the current of our thoughts, the cognisance we take of it will be slight and transient, and will form only a small and insignificant portion of our total consciousness. Thus our total consciousness may involve pleasant or painful interest, although this small portion of it does not contribute in any appreciable degree to its pleasantness or unpleasantness. Again, our minds may be comparatively disengaged, so that they are free to attend to surrounding things; but it is the characteristic of these idle moods that we are more or less amused or bored by the trivial objects which obtrude themselves on our senses. On the whole, the presumption appears to be that our total consciousness is never entirely neutral. The student must here be warned against a common fallacy: we are apt to suppose that we are only pleased or displeased, when we expressly notice, at the time, that we are, or remember afterwards that we have been, pleased or displeased. But in fact we only notice or remember when the pleasantness or or unpleasantness is specially conspicuous. There is a customary level of agreeable or disagreeable feeling which we are apt to treat as a neutral state. In like manner, we do not notice that we are hot or cold, unless we feel more hot or

cold than usual. Similarly, what we call silence is not absolute silence, but only a comparative absence of sound. This is shown when we pass from what we call silence to a still more complete absence of sound. The previous state then ceases to appear to us as one of silence. As a matter of fact, sound of some sort is rarely if ever wholly absent from our experience. The same is in all probability the case with pleasure or displeasure. One or the other or both, are always in some degree present, although we by no means always notice their presence.

When we wish to say that pleasure or displeasure belongs to this or that mental process, we say that the process is pleasantly or unpleasantly toned. *Hedonic-tone* is a generic term for pleasure and the reverse, considered as attributes of this or that mental process. It is less ambiguous than *feeling* alone, which not only has many other applications in ordinary language, but even in psychology is to some extent required for other purposes. Hence, as a technical expression, we shall henceforward speak of hedonic-tone when the reference is to pleasure-pain.

Are there other kinds of feeling-attitude besides pleasure and displeasure? It would seem that there are. It is difficult to bring emotions, such as anger and fear, and sentiments, such as love and hate, completely under any other head. Certainly, an emotion, like anger, involves some kind of cognition; but it cannot be said that the specific experience of being angry directly qualifies the nature of the presented object; in other words, this experience is not a presentation. So, too, anger has hedonic-tone, mostly of an unpleasant kind. But its specific quality cannot be resolved into pleasure or displeasure. Again, it involves certain characteristic active tendencies; but there seems to

be in it a peculiar and unanalysable mode of being conscious, which cannot be resolved into these. We must, therefore, conclude that in the complex emotion of anger there is included a specific feeling-attitude distinct from being pleased or the reverse. The same may be said of the other emotions.

§ 4. *The Conative Attitude.*—The process of consciousness is a process of incessant change; the changes are partly due to the play of external impressions, and to other conditions extraneous to consciousness itself. But this is rarely, if ever, entirely so. The process is in part self-determining. The successive phases have, by their very nature, a tendency to pass into other phases. The stream of consciousness has a current; and its course is determined not merely by external conditions, but by its own drift at any moment.

Such words as *interest*, *craving*, *longing*, *yearning*, *endeavour*, *desire*, *purpose*, *wish* and *will*, all mark this characteristic of the process of consciousness. All of them imply an inherent tendency of conscious states to pass beyond themselves and become something different, an inherent tendency which continues to operate, unless interrupted by interfering conditions, until a certain end-state is reached, which is called the *satisfaction* or *fulfilment* or *realisation* of the interest, craving, longing, yearning, endeavour, desire, purpose, wish or will.

We may compare this tendency of conscious process towards *satisfaction* with the tendency of water to find its own level. When water has once found its own level it becomes stationary. But before this it is in incessant movement, perpetually varying its course according to the varying configuration of the ground over which it flows.

But it is only by a metaphor that we speak of water *seeking* its own level or striving, endeavouring, longing after it, or desiring it, or willing it. For such words stand not merely for the direction of process towards an end-state, but also for modes of being conscious. The stream of consciousness unlike the stream of water feels its own current.* In its case the tendency towards an end is essentially connected with characteristic ways of being conscious. These ways of being conscious have a certain common nature pervading their specific varieties and they may all be brought under the general head Conation, or Striving, or Interest.

We do not exhaust all that is meant by Conation when we say (1) that it involves the direction of psychical process towards an end-state called its *satisfaction*, and (2) that it essentially includes a characteristic mode of being conscious. Conation also implies relation to an object. We cannot desire without desiring *something*; we cannot have longings or yearnings without longing or yearning after *something*; we cannot will without willing *something*. We must not confound the object of conative consciousness with its actual satisfaction. The conation exists before it is satisfied, and its object must therefore be present to consciousness before satisfaction takes place. But here we seem to be confronted with a paradox. On the one hand, the object of conation must be present to consciousness; for otherwise it could not be an object. On the other hand, it cannot be present to consciousness; otherwise the conation would be already satisfied. I desire to eat an apple. The actual experience of eating the apple is what is desired; it is the object of conation

* Personally I should add that the current only exists in being felt But this is a disputed question.

and must therefore be somehow present to consciousness. But I do not have this experience at the moment I am desiring it; it is therefore *not* present to consciousness. It is true that I have the idea of eating; but it is not the idea which I desire but the actuality. That which is present to consciousness is not the object of conation, and that which is the object of conation is not present to consciousness.

The solution of this difficulty is contained in what we have already said (p. 57, *seq.*) on the distinction between object and presentation. We there said: "When we are observing or thinking about an object, the object, without ceasing to be recognisably the same, appears under different aspects. Now this now that characteristic feature or relation is brought before consciousness." The point is that these varying appearances are not absolutely separate objects, but partial presentations of one and the same total object. Thus an identical object is presented in the idea of eating an apple, and in the actual experience of eating it. The idea is a relatively incomplete presentation, but it is capable of guiding the conative process towards its own satisfaction. This is the essential point. All that is necessary to constitute an object of conative consciousness is a cognisance of the conditions of satisfaction which gives a guiding clue, however vague and fragmentary, to the subsequent development of the psychical process. The clue may be very vague indeed; it may be so vague that we should not in ordinary language describe it as a cognition of the conditions of satisfaction. All that is required is the presence of some idea or perception which prevents the course of the conative process from being entirely indeterminate. It should also be noted that even when the initial presentation is relatively precise it may be misleading. I may desire to eat an apple which I assume

to be in my pocket; but on trial I may find that no apple is there. Or, I may find the apple, and then be disappointed when I come to eat it. I discover that what I really want—the actual satisfaction—is not what I supposed it to be. Strictly speaking, we only come to know what we want with complete determinateness in the actual process of attainment. In "learning by experience" the initial presentation of the conditions of satisfaction is continually being corrected, defined, and enlarged by trial and error. We are continually finding out what we do or do not really want. Suppose that I sit down to solve a chess problem. I start with a certain end in view (the object of conation). I endeavour to discover a certain series of moves, limited in number, bringing about inevitable mate. So far the end is defined as an object of consciousness at the outset. But it is not wholly defined. Its full determination comes only with its attainment. If I possess at the outset the knowledge of just that series of moves which is required, satisfaction is already attained: there is no problem, for the problem is already solved. Just in so far as the conative process has anything to achieve, its end is not already determined, but relatively indeterminate. Initially the end is only so far presented as to give a prompting clue, which starts the mental process in a certain general direction. This example is typical, and we need not add more here; for the whole course of mental development, as we shall have to expound it in other parts of this work, yields incessant illustration.

It will be evident from what has been said that there is some ambiguity in the use of the word *end* in reference to conative process. It may mean either (1) actual satisfaction of conation, or (2) the conditions of satisfaction as they appear to conative consciousness before the

satisfaction is actually and completely attained. In sense (1) the term *end*, whatever else it may imply, implies also its ordinary literal meaning of termination or cessation. When conation is completely satisfied it completely disappears. Appetite for food ceases after a full meal; intellectual curiosity ceases when a problem is solved, and so on. The end in which striving consciousness finds satisfaction, is, when completely achieved, the termination of the striving. This fact is apt to be obscured by two circumstances. The first is that in the process of satisfying one conation others frequently come into being. Thus in finding the answer to one question we may find other questions emerge of equal or greater interest. But it remains true that our initial curiosity concerning the first question ceases when that question is fully answered. In the second place, there are some ends so complex that they can only be realised by a long series of successive steps, and some such as the moral ideal which can never be realised completely. But even in these cases, *so far* as satisfaction is attained, conation ceases. We press on, forgetting the things that are behind. The end, in this sense, implying actual satisfaction, and with satisfaction the cessation of the conative process, may be called by way of distinction the *end-state* or *terminus*. We may then confine the word end to its second meaning as *object* of *conative* consciousness—the conditions of satisfaction as apprehended by the subject before actual attainment. In this connexion it is important to remember that the subject may be mistaken as to what he really wants, that his initial clue may be very vague and fragmentary, whereas the actual conditions which would satisfy him are definitely fixed by his own constitution and that of the world in which he lives. It should also be noted that while we

are actually pursuing an end, we do not usually represent it as the cessation of the mental process which is directed towards it. We attend rather to the positive nature of the conditions which are to satisfy us. Now these conditions when they are attained usually take some time to produce their full effect. Appetite for food is satisfied by eating: it does not however disappear as soon as we begin to eat; it only ceases when we have eaten to satiety. But the hungry man looking forward to a meal thinks of the whole process of eating, not of the moment in which his appetite will be completely appeased and therefore cease to exist. On the other hand, it is precisely this moment of satiety which constitutes the end in the sense of end-state, or terminus.

Conation constitutes the active side of our conscious being. It is the activity of the subject in relation to its object. It involves a tendency to do work upon the object, to alter it, to expel it from consciousness, or to bring it more vividly and completely before consciousness. By thus operating on its object the subject discovers the nature of the object; the way in which it behaves under various modes of treatment. Conation and cognition are thus essentially connected. What is called judgment or belief, all that can be brought under the head of affirmation or denial or doubt, presupposes this activity of the subject. Belief in the widest sense of the word, including that certainty which is distinctively called knowledge, essentially involves the determination of subjective activity by the nature of its object: I see a heap of stones and count them. The counting is a subjective activity. But the result is determined by the nature of the object. It is already determined before-hand by the actual number of stones. When I affirm that there are twelve stones, I mean that the heap is

so constituted that if I count each stone once and none twice over, I shall reach a point where there are no more to count, and that at this point I shall have reached the number twelve. Suppose that instead of counting a heap of stones or similar aggregation, I attend merely to the abstract number-series, 1, 2, 3, etc. In this case the object imposes no limit to the process of counting; on the contrary, so far as the nature of the number-series is concerned, the possibility of a limit is excluded. I shall stop counting some time, but this will be because I am tired, or for some other reason, which does not belong to the intrinsic nature of the number series. I therefore affirm that the number series is limitless. In general we may say that though it lies with us to be active in this or that special way, the result of our activity is objectively determined, and that this objective determination is essential to all affirmation or denial—which may be called the yes-no consciousness.*

Mental activity also produces or tends to produce changes in the body and in the external world. But we must carefully separate these changes from conation. They are merely means by which it may work. The end to which it is directed is always some change in consciousness itself. If I will to blow a candle out, the mental activity does not lie in the contraction of my muscles, nor yet in the effect produced on the candle as a physical occurrence. It is the resulting darkness, in so far as I am aware of it, which is the end attained by my volition. In other words, it is a change in the object, as *presented*, which I strive to attain in willing to blow out the candle. It is not necessary that I should have actual experience of the physical result. I may make a will, leaving property to a certain person.

* This point will be fully developed in the chapter on Belief, and elsewhere.

Here, what I am aiming at or endeavouring after is that this person shall enjoy my property after I am dead. By the nature of the case, I can have no direct experience of the result. What satisfies me and so terminates the volitional process is the *belief* that my property will actually come into the hands of the legatee. Before I made the will, this was only a floating possibility. In making the will, I transform it into a practical certainty.

It may happen that the end to which conation is directed is, from the nature of the case, unattainable. Thus, I may wish to recall or undo the past. This is a tendency which cannot realise itself. But none the less it is a tendency as much as if it could realise itself. Considered as a mode of consciousness, it is just as much a conation as the desire to blow out a candle standing before my eyes.

Conation may attain its end by merely mental process, without overt bodily action. In part or whole, it may be satisfied by fuller knowledge of its object; and this may be brought about merely by a train of thought or observation, without altering the nature of the object as it actually exists apart from its being presented to consciousness. From this point of view we can bring under conation all that is covered by the word *attention*. Attention is simply conation in so far as it finds satisfaction in the fuller presentation of its object, without actual change in the object. This may be possible only in part. Thus, we may have a practical end in view, and we may, for the sake of this end, attend to the conditions and means of its attainment. I may wish to climb a rock, and I first observe it carefully to determine the best mode of ascent. So far, all I have gained is more complete knowledge. This is a partial satisfaction of my original desire. It carries me a stage nearer to my end; but it does so only because

it makes further steps possible. On the other hand, my interest may be purely theoretical. I may simply desire to know the geological structure of the rock. In this case, mere observation will be sufficient. If it is necessary to climb the rock, the climbing will be merely a means of making observation possible, just as in the previous case observation is merely a means of making climbing possible. Sometimes it would appear as if attention were not directed to the fuller presentation of an object, but merely to the keeping of it unchanged before consciousness. "Perhaps the closest approximation to this mental attitude is found in the case of attention to a simple object of sense or imagination, on account of the immediate pleasure it yields."* Now we allow here that the end of attention is not cognitive; none the less, its end is in a sense the fuller presentation of the object. So long as the pleasure-giving capacity of the object is not exhausted, it makes a difference to consciousness whether it continues to be presented or not. It is only fully presented when consciousness is satiated.

As feeling-tone has two phases, pleasure and displeasure, the first positive and the second negative, so conation has a positive phase, *appetition*, and a negative phase, *aversion*. It is either directed to maintain and further develop a presented object, or the reverse. To use a phrase of Hobbes, it is either an endeavour *towards* or an endeavour *fromwards*. Appetition by no means coincides with pleasure, or aversion with displeasure. We may feel a very keen desire for an object, and yet feel nothing but displeasure if we are delayed or obstructed in its attainment. I may desire food, and this is a positive conation. But if no food is to be had, the feeling-tone of consciousness

* *Analytic Psychology*, vol. i., pp. 126-7.

will be disagreeable. So we may have an aversion to the presence of a person; and this is very unpleasant if we cannot get rid of him; but it may be very pleasant, if we can throw him out of the window, or kick him downstairs. It is worth while to note this point, because it disposes of certain attempts which have been made to identify conation with hedonic-tone.

We have finally to deal with the question whether conation in some form or degree is invariably a constituent of consciousness. The problem is beset with the same difficulties as in the case of feeling-tone, and similar remarks apply here also. We are apt to assume that consciousness is absolutely inactive, when it is only comparatively so. We only notice that we are endeavouring after an end, when our endeavour rises above a certain pitch of intensity. Thus we do not generally say that our consciousness is active when we happen to catch sight of an object and attend to it in a slight and transient way. None the less, conation may be, and probably is, present in this case, as well as in the most intense mental effort. The best mode of approaching the question introspectively is by comparing different degrees of conative tendency; a state of consciousness which, taken by itself, would appear to be purely passive and inert, ceases to appear so when it is compared with one which is still more passive and inert. "Take, for example, the following series: (1) In a state of delicious languor I enjoy the organic sensations produced by a warm bath. (2) In an indolent mood, I let my eye wander from object to object, and amuse myself with what I see, without any definite plan or purpose. (3) Without plan or purpose, I give the rein to my own ideas, following the train of more or less casual associations. (4) I repeat the multiplication table, or work out some simple arith-

metical question of a familiar kind. (5) I work out an arithmetical question which is more of a task because it is more complex, though it is of a familiar type, and presents nothing in the nature of a puzzle. (6) I attempt an arithmetical question which for a time baffles me, because it contains a difficulty which requires to be overcome by repeated trials. (7) In a critical point of my career I endeavour to decide between two courses of action,—the whole course of my future life being dependent on the decision. Of these, (7) is a mental state characterized by a far more intense feeling of activity than (1); and (2), (3), (4), (5), (6) constitute an ascending scale of transitions mediating between them."*

We must distinguish between activity and the feeling of activity. The only question which introspection can consider is whether we always have some immediate experience of striving, or tendency towards an end. Even if this question is answered in the negative, it may still remain true that conscious process, as a matter of fact, always involves tendency towards an end, though the tendency is not always correlated with a mode of being conscious.

§ 5. *Sub-Consciousness.*—Suppose that I am reading a book by the light of a candle standing immediately beside me on the table. The object with which my mind is occupied at the moment is the topic treated of in the book; my mind is occupied with this object under the special aspect in which it is presented by the sentence I am following with my eyes. I take no notice of the lines on the opposite page or of other lines on the same page or of the margin of the page, or of the candle flame as such, or of the surface of the table, or of the clothes in contact with my skin, or of the clock which

* *Analytical Psychology*, vol. i, pp. 160-1.

is ticking behind me. Yet all these things are producing impressions on my senses, so as to affect my consciousness in specific ways. My total experience would be altered by change or removal of these surrounding conditions. It would not be the same if I were reading by lamp-light or sunlight or twilight instead of by candle-light. It would not be the same if the book I am reading had no margin, or if the opposite page were a blank. It would not be the same if I were lying on my back holding the book in my hand instead of sitting on a chair with the book lying on the table before me. It would seem, then, that conditions of this kind produce effects in consciousness though neither these effects nor the things which produce them are attended to, noticed or distinguished. Such unnoted experiences are called sub-conscious. We have now to describe the mode of existence which belongs to them. This may be characterised negatively and positively. Negatively we can say that they form no part of the *current* of conscious experience. They do not enter into the serial succession of presentations in which an object is developed before consciousness so as to satisfy subjective interest. They do not call up other contents of consciousness and enter into combination with them. They do not form part of a stream of thought or train of ideas. Such change as takes place in them is due to change in the conditions affecting the organs of sense. Otherwise they remain motionless fragments. When we speak of the *stream* of consciousness we refer to attentive consciousness—to consciousness as occupied with objects. Sub-conscious affections seem rather comparable to the waves of a frozen sea. Another negative characteristic is that they lie outside the sphere of judgment or belief. We do not affirm or deny them of anything, nor do we affirm or

deny anything of them. We do not even mentally affirm their existence. We have no consciousness relating to them which could be expressed in such words as "this," "that," "there."

Positively we may characterise them as follows. Though they are not actual they are potential presentations. Though they do not enter into the stream of attentive consciousness, yet their nature is such that they are capable of doing so. Though they are not actual presentations, they, are, so to speak, made of the same stuff as actual presentations, and may at any moment become actual presentations. If my attention flags in reading my book, I may begin to notice the candle flame. The visual sensations which had previously been sub-conscious, cease to be sub-conscious, and assume the character of presentations—presentations of the candle flame. In the next place, we have to add that sub-conscious experiences are not only capable of entering the sphere of attentive consciousness, but that they constantly tend to do so. We have described them as stationary in contrast to the flow of presentations. But this state of immobility is a state of tension comparable to that of a bent spring. They wait in the ante-chamber of attentive consciousness and keep pressing for admittance with an urgency proportionate to their intensity and to the interest of the objects which they are capable of presenting. It is evident that the more intensely a thing affects my sense the more likely it is to attract my notice. The effect of interest may be illustrated by the way in which the sight of one's own name on a printed page or hearing of it in a conversation arrests our attention, though other words equally obtruding themselves on the eye or ear pass unnoted. Any change in our sub-conscious experience is especially apt to divert the current of consciousness. Thus

the clock may go on ticking unnoticed; but if it stops I become immediate aware of the fact.

Finally, we have to consider the question how it is possible to know of the existence of these sub-conscious experiences at all. If they are unnoted while they are occurring, by what means do we obtain knowledge of them. The answer is two-fold. In the first place, they collectively contribute to determine our sense of our general condition and situation at the moment. They form a sort of dim background for the object of consciousness. They "tell on conscious life as sunshine or mist tells on a landscape, or the underlying writing on a palimpsest."* In the second place we may become aware of the previous existence of sub-conscious contents at the moment in which they cease to be sub-conscious. When the clock stops I notice what has happened though I had not previously been aware of the ticking. But this is not all. I can also become aware at the same moment that the sound of the ticking has previously entered into my total experience without being attended to. Again, the margin of a page which I am reading, so far as it affects my experience at all, does so sub-consciously. But if I cease reading and attend to the margin, noting, for instance, that it is broad or narrow, I am aware that I am not bringing in to consciousness something absolutely new. I am aware that the presence of the margin before my eyes made a difference to my experience even before I attended to it.

* Ward, Article on "Psychology" in the *Encyc. Brit.*, p. 43.

CHAPTER II.

PRIMARY LAWS OF MENTAL PROCESS.

§ 1. *Relativity.*—"By the principle of relativity....it is denied that any psychic factor, or complex psychosis,* can exist without having its own definite quality, quantity, tone of feeling, value in combination, and influence upon simultaneous or successive factors and psychoses, determined by the *relation* in which it stands to other factors and psychoses in the entire mental life. Or—stated positively—*every individual element, or state, or form of mental life is what it is only as relative to other elements, states, and forms of the same mental life.*"† More briefly we may say: *Mental development depends on modes of consciousness being determined by their psychological relations and subject to modification accordingly.* This statement, though sufficiently comprehensive, is proportionately vague. *The vagueness lies mainly in the phrase* "psychological relations." What is the nature of the psychological relations through which modes of consciousness are enabled to interact? To understand this we must consider the unity and continuity of consciousness. This topic falls under two heads, (1) general unity and continuity, nd (2) the special unity and continuity constituted by conation.

* *Psychosis*= total state of consciousness as existing at any one moment.

† Ladd, *Psychology, Descriptive and Explanatory*, pp. 661-2.

§ 2. *General Unity and Continuity.*—The partial constituents of our conscious life are, as Dr. Ward puts it, not disjoined from one another by something which is disparate in nature from consciousness. They are not separated "as one island is separated from another by the intervening sea, or one note in a melody from the next by an interval of silence."* The unity and continuity of consciousness conceived in this most abstract and general form enables us to recognise what we may call relations of immediate contiguity. Whatever components of any given moment enter into the composition of a single state of consciousness are immediately contiguous. Similarly, successive states are in immediate contiguity if and so far as the termination of one coincides with the commencement of another. "At any given moment," says Dr. Ward, we have "a 'field of consciousness,' psychologically one and continuous; at the next, we have not an entirely new field but a partial change within this field."† Inasmuch as the emergence of the new is a modification of the old, they are continuous and so far psychologically contiguous. We have not merely A and then B, but also the passage of A into B; and this passage as such is a modification of consciousness. The transition is itself an experience. It is the more obviously so the more abrupt it is. The interruption, being a *felt* interruption, itself constitutes a relation between the two states, however unlike they may be. Take for instance an illustration given by Dr. Ward in another context—the "passing from the scent of a rose to the sound of a gong or a sting from a bee."‡ Professor Ladd well remarks, that in "the case of so abrupt a transition in the content and

* Article "Psychology," in the *Encyclopaedia Britannica*, 9th edition, part xx., p. 45.

† *Ibid.* ‡ *Op. cit.*, p. 50.

feeling-tone of two successive mental states, the law of relativity would not be violated, but the more amply illustrated. The amount of our absorption in the scent of the rose would influence the redistribution of attention to the sound of the gong, and even to the sting of the bee; the degree of pain which the succeeding sensations of sounds or smarting gave would be enhanced by the preceding pleasure; the control of the motor results of [movements prompted by] the new sensation would be determined by the perceptions, etc., into which the sensation abruptly broke; and so on, and so on."*

Thus there are relations arising out of the unity of a single state of consciousness as it exists at any moment, and there are also relations arising out of the transition from one state to another. These relations involve immediate contiguity in time; either in the way of simultaneous existence or of continuous succession. But there is another kind of psychical connexion independent of direct proximity in time, and arising out of a more special and intimate continuity than that which is characteristic of the flow of consciousness in general.

§ 3. *Conative Unity and Continuity.*—Suppose that, while playing chess or whist, I am suddenly called away at a critical stage of the game to meet a visitor on a matter of business. The interruption, as such, constitutes a relation between the state of consciousness which is interrupted and that which interrupts it. But this relation exists between otherwise disparate and disconnected processes, and depends on that immediate contiguity in time which has been discussed. If, on the contrary, we consider the successive phases of the process of making up the mind about the move at chess, or of settling the matter

* *Psychology, Descriptive and Explanatory*, p. 663.

of business, we find a different and more intimate kind of continuity, which may be called conative or appetitive continuity, or continuity of interest. From this point of view, my state of mind when I have finished my business with the visitor and returned to my game is continuous with my state of mind when I was interrupted, rather than with the intervening flow of consciousness. The very word interruption implies this. It is clear, then, that continuity of interest is more or less independent of direct proximity in time. This kind of continuity is essentially connected with mental activity in the strict sense, with the striving, conative, appetitive side of our nature. Its general condition is that the successive phases of a conscious process shall constitute a movement towards an end-state or terminus. As we have already explained (p. 64, *seq.*) an end-state or terminus is a state of consciousness in which the process finds its natural termination—the termination prescribed to it by its own nature, and not by extraneous conditions. Each phase of the process before the end is reached is incomplete, and tends by its own inherent constitution to pass beyond itself. If the activity is displaced by a disparate and disconnected process before it has attained its goal, it tends spontaneously to recur after the interruption and work itself out, starting from the stage at which it was cut short. If, while it continues to occupy consciousness, its progress is in any way checked or arrested, an experience of dissatisfaction or unpleasantness arises. So long and so far as its progress is unchecked, but not yet completed, consciousness is unsatisfied, but not dissatisfied, and *ceteris paribus* the experience is pleasant.

Conative unity depends upon conative continuity. If we take any momentary phase in the flow of conative process, we find a total state of consciousness in which some constituents are irrelevant to the main direction of thought,

and others are essentially concerned in its progress. Thus in playing a game of chess the modifications of consciousness due to impressions from surrounding objects are irrelevant to the main current of consciousness. Only the experiences connected with the position of the pieces on the board are relevant, and only these experiences are embraced in the conative unity of consciousness. This distinction corresponds broadly to that between attentive consciousness and sub-consciousness.*

The total process of consciousness is, in general, composed of a succession of processes, each of which has a certain appetitive continuity. Some of these may be very transient and involve only a slight and evanescent interest. But in so far as they involve interest or attention at all they are essentially conative. Even when the mind rambles from object to object in a desultory way, its slight and transient occupation with each in turn involves some degree of attention and interest. Thus the transitions which are without conative continuity are transitions from one conative process to another. But even these transitions are in a sense conative, if one process occurs as a marked interruption of another. In the moment of interruption, the interruption itself constitutes a sort of conative continuity between the old process and the new. Just in so far as the new process is experienced as an interruption of the old, it is a constituent part of it, an incident in its progress.

In the development of the mental life, conative unity and continuity is of altogether predominant importance. Such psychical relations as depend on mere proximity in time are subsidiary, and may, in a broad view of mental evolution, be neglected. Thus, in what follows, we shall almost entirely confine our attention to those mental

* Discussed in § 5 of last chapter.

connexions which arise from the combination of mental elements as constituent parts of the same conative process.

§ 4. *Gradations of Conative continuity.*—The continuity of interest connecting the successive phases of a psychical process may have various degrees. The possibility of this lies in the fact that the continuity may exist in certain respects and not in others. The succeeding phase may be only in part a development of the preceding phase and in part disconnected and relatively independent. Compare the process of learning a proposition in Euclid by heart with that of intelligently following the demonstration. For the boy who learns by rote the proposition is only a collection of sentences arranged in a certain external order on the page before him; these sentences have continuity of interest for him mainly because they have to be repeated by him in the same order when he is called on to do so by his teacher. If the order of the sentence were altered in any arbitrary manner interest and continuity of interest would be unaltered, if he still supposed that the given order was authoritative. It is quite different with the boy who follows the reasoning. In his case it is not only the external sequence of the sentences but the logical development of the meaning which is interesting. Each step has interest for him only through its connexion with what precedes and follows. If the order of the sentences were arbitrarily altered this logical continuity would be destroyed. So far as he is interested in the logical development, the separate sentences have no independent existence for him. They come before his mind *only* as transitions in the evolution of a continued interest towards its satisfaction.

The stream of consciousness consists of successive trains of mental activity each having its own internal continuity

of interest, but relatively disconnected with each other. It must be noted, however, that in the case of normal human beings the disconnection of the successive segments is only relative, not absolute. The successive segments of the conscious stream have also some degree of continuity with each. This does not hold good save in a very rudimentary way of animals. The mental life of the animal seems in the main to be composed of a series of detached and independent impulses. But in human beings the sequence of special conations is more or less unified in a comprehensive scheme. There is a thread of continuity running through their whole mental life. This more comprehensive unity is, in essence, of the same nature with the special unity of the successive portions of the stream of consciousness. It simply means that the ends of conscious life are connected in a system, so that the satisfaction of special interests is also the partial satisfaction of more general interests, and the attainment of this or that result forms a step towards the attainment of others in progressive order. In sitting down to read the morning paper I begin with a general interest in acquainting myself with current news. In passing from item to item I gratify special and relatively detached interests. But these interests are only relatively detached. They are connected in so far as they form special parts of my general interest in learning the news. This interest again is part of the still more comprehensive interest I have in keeping myself in touch with my fellow men so as to know what they are thinking or talking about. Again, my special interest in such a topic as the Transvaal war is a particular case of my general interest in politics and more especially in the position and prospects of my own country.

This interweaving of interests in a system constitutes

the unity of personal life as opposed to the impulsive life of animals.

Plainly, the unity of consciousness, as constituted by unity of interest, may exist in very varying degrees. The mental life of such men as Hegel, or Comte, or Bismarck, or Newton, forms a far more systematic unity than that of the man in the street. The mental life of the civilised man is, in general, far more completely unified than that of the savage; and the mental life of man has a unity which is not found in the animal. But some kind and degree of conative continuity must be present, wherever there is anything which can be called mental development or learning by experience. Where there is no conscious striving there can be no self-fulfilment and self-development of conscious striving. Hence we may say that unity of consciousness as constituted by continuity of interest is at once an indispensable starting-point, and a progressive achievement of mental evolution in the strict sense, of that kind of development which is peculiar to conscious beings as such.

§ 5. *Retentiveness.*—Retentiveness in some form is an indispensable condition of development or progress of any kind. Advance would be impossible unless the results of prior process persisted as the basis and starting-point of subsequent process. In marching, each step has its point of departure from the new position secured by the previous step. In marking time there is continual reversion to the same position and no advance. No house could be built if each brick vanished as it was laid and had to be replaced anew. A rope cannot be formed of dry sand, which crumbles away as it is put together. Similarly, mental development would be impossible unless previous experience left behind it persistent after-effects to determine the nature and course of subsequent experience. These after-

effects are called, in psychology, *traces* or *dispositions*, and the psychological law of retentiveness may be stated as follows: *when and so far as mental development takes place through mental conditions, it does so because specific modes of consciousness leave behind them specific traces or dispositions, which determine the nature and course of subsequent process, so that when they are modified it is modified.*

The persistence of dispositions is not absolute; they tend to decay, and may perhaps disappear altogether if they are not maintained by renewal of the corresponding mental processes, or of mental processes connected with these. In this respect there is a great difference between different individuals. Some are more retentive than others. But even in the most retentive minds, traces tend to fade away: "so that if they be not sometimes renewed by repeated exercise of the senses, or reflection on those kinds of objects which at first occasioned them, the print wears out, and at last there remains nothing to be seen." Thus the experiences, "as well as children, of our youth, often die before us; and our minds represent to us those tombs to which we are fast approaching, where, though the brass and marble remain, yet the inscriptions are effaced by time, and the imagery moulders away."* The differences in the retentive power of individuals are, in part at least, differences in original endowment, and cannot be explained on psychological grounds. As Locke remarks, some minds retain the characters drawn on them "like marble," others "like freestone," and others "little better than sand." The ultimate explanation of this difference in original endowment must take a physiological form.

§ 6. *Conative Continuity and Retentiveness.*—The kind of

* Locke, *Essay Concerning Human Understanding*, ii. x., 5.

continuity which we have called conative involves in a characteristic way the principle of retentiveness. All progress towards an end depends on the persistence of the results of previous process as the basis of succeeding change. So in this case, continuity of interest is only possible if and so far as each succeeding stage of the movement of consciousness towards an end is determined and qualified by the cumulative disposition left behind by preceding stages. At the same time this cumulative disposition is itself subject to modification by each new mode of consciousness as it emerges. Dr. Ward has given an example which partially illustrates this point.

"Suppose that in the course of a few minutes we take half a dozen glances at a strange and curious flower. We have not as many complex presentations which we might symbolise as F_1, F_2, F_3. But rather, at first, only the general outline is noted, next the disposition of petals, stamen, etc., then the attachment of the anthers, form of the ovary, and so on..... It is because the earlier apprehensions persist that the later are an advance upon them and an addition to them."*

This example excellently illustrates the working of retentiveness where there is continuity of interest. But it does so only partially and for a special case. The case adduced is one in which "earlier apprehensions" recur as part of the same simultaneous whole with the later. The process by which the "earlier apprehensions" were originally formed is not itself repeated, inasmuch as the preparatory dispositions left behind by previous experience render it unnecessary. Hence, there is room for further advance,—for growing distinction and definition within the total presentation. But with the new distinctions the old

* Article, "Psychology," p. 47.

also are combined in the same complex whole. This is one of the ways in which preformed dispositions may operate. But it is by no means the only way. The persistent traces of past experience may modify present experience and be modified by it, without reappearance of the content of the past experience in the actual moment of present consciousness.

The effect of rhythmic repetition of the same stimulus is peculiarly instructive, because the external occasion of each successive impression is throughout the same, so that modifications of consciousness arising in the course of the process must be due to the working of retentiveness,—to the cumulative disposition left behind by previous impressions. The sequence of physical stimuli is $a, a, a, \ldots$. the sequence of mental states is $a_1, a_2, a_3, \ldots$. The mere fact that the second *a* comes before consciousness as a *repetition*, as *another* of the same kind, constitutes ar important difference between it and the first *a*. But, besides this, there may be a gradual modification of consciousness as the series advances, until a point is reached in which each new impression produces an effect relatively so small, in comparison with the accumulated result of previous impressions, as to be inappreciable. This is well brought out in certain experiments on what is called the "span of consciousness." The purpose of these experiments is to ascertain how many objects of a certain kind can be apprehended at once. It is found that, after hearing as many as fifteen or sixteen successive sounds at regular intervals of from 0·2 to 0·3 seconds, the subject can identify or distinguish this series as a whole from another equal or unequal to it. Counting is not admitted, and the successive sounds are of course not all simultaneously discriminated at the close of the series. A "sensation-mass" alone

is distinctly perceived. This is evidently a cumulative effect. Apart from special experiments in the laboratory, anyone can easily verify the statement that successive series of a rhythmic character can at their close be apprehended as a whole without mentally reproducing and discriminating in the moment of apprehension the several sequent parts which compose them. Thus, in walking, we may mentally divide our successive steps into distinct groups, and be aware without counting when one series ends and another begins. We need not even know the number of steps which are mentally connected within a single series. We may simply begin by walking a certain number of paces without counting them, and then as we proceed mark the points at which the initial series has repeated itself.

We have so far considered only the regular sequence of physically identical impressions. But the most important cases of rhythm are those in which recurrent similarity in certain respects is combined with diversity in other respects. The rhythm of verse, which depends on a more or less uniform recurrence of long and short or of accented and unaccented syllables, may serve as an illustration. In hearing a line from Milton or Vergil we need not at any moment have more than one word actually present to consciousness. Yet this single word appears as part of the whole and is qualified in a quite specific way by its place in the whole. The sound of the word "unpremeditated" has a quite different value for consciousness in the present sentence or in a dictionary from that which it acquires in Shelley's lines:

> "That from heaven, or near it,
> Pourest thy full heart
> In profuse strains of unpremeditated art."

Substitute "unstudied" for "unpremeditated," and the result is not merely one word in place of another. On the contrary, the occurrence of the wrong word is for consciousness the ruin of the whole rhythmic structure. What is true of verse is still more obviously true in the case of music. The last note of a melody may be and often is the only note of which we are aware at the moment it strikes the ear. Yet in it the entire melody is in a sense present. It comes before consciousness as part of a quite specific whole and derives a specific character from its place in that whole. The cumulative disposition generated by the ordered sequence of previous notes cooperates with the new stimulus to the organ of hearing, and the ensuing state of consciousness is the joint product of both factors mutually modifying each other. If a wrong note be struck, the whole melody is at once marred. The same happens if a note is unduly prolonged. Throughout the process the part is determined by the whole, and the whole by the part. In reading a sentence or a paragraph, when we come to the final word, the meaning of the sentence or paragraph as a whole is present to our consciousness. But it is only as a cumulative effect of previous process. What is directly given as a special datum is the last word itself and its meaning. In a similar way, the cumulative effect of one paragraph or chapter of a book qualifies and determines the meaning of another. We may set by the side of this highly complex case a very simple one. Pronounce successively the words *fructify*, *mystify*, *identify*, *simplify*; all these words terminate in the same sound. When we are just finishing or have just finished the utterance of each word, the special item of sensation before consciousness is the final sound they have in common. The preceding sounds in which they differ have vanished from consciousness; nevertheless, in each

case we are aware that we have said one word and not another, that we have said *fructify* and not *mystify*, and so on. This can only be because in each instance our consciousness, when the final sound is being pronounced, is modified by the cumulative effect of the preceding sounds.

This cumulative effect of the preceding phases of a conative process on the succeeding, may be called *primary* retentiveness, in order to distinguish it from the retentiveness which is involved in reproduction and association,—processes to be discussed later on.

§ 7. *Primary meaning.*—Primary retentiveness is correlated with what we may call primary meaning. We may sum up the result of the last section as follows: (1) In all processes having appetitive or conative continuity, and consisting of a series of distinct steps, a cumulative disposition is gradually formed which is the product of antecedent mental change, and a cooperative factor in succeeding mental change. (2) The after-effect of preceding mental process is not reproduced, but simply persists or is retained. (3) Its persistence in no way involves the persistence or the resuscitation of the specific items of sensation or mental imagery which have contributed to form it. These do not persist, but only their effects. If we denote the sequences of specific items of sense-experience, or, it may be, of ideal imagery, by *a*, *b*, *c*, *d*, then *a*, *b*, *c*, *d*, by no means adequately symbolises the process as a whole. For when *b* occurs, the resulting state of consciousness is the joint product of *b* and the persistent disposition or after-effect left behind by *a*. Similarly, when *d* occurs, the resulting state of consciousness is due to *d* in cooperation with the persistent disposition left behind by *a*, *b*, and *c*. We may denote the after-effect of

a by m_1, the after-effect of a and b by m_2, and so on. The whole series may then be represented by a, bm_1, cm_2, dm_3.

Now what does m stand for? What change or modification of consciousness does it represent? Clearly, it represents the relation of the specific items b, c, d, to the whole of which they are part, a peculiar character which belongs to them in virtue of their being part of this whole. Now the only general word which is at all appropriate for expressing this kind of consciousness is the word *meaning* or *significance*; m, then, stands for meaning or significance. The meaning which is essentially involved in all conative continuity may be designated *primary* meaning, to distinguish it from that which depends on association and reproduction.

§ 8. *Association and Reproduction.*—On seeing a flower, I am told that it has a certain name. Afterwards, I hear this name again: it may then call up to my mind a mental picture of the flower, though no flower is actually present. It is clear that if I had never seen the flower, the mental picture of the flower would not have arisen. Now suppose the original perception of the flower had left no trace behind it after itself ceasing to exist,—that it had flitted over the surface of my mind like a shadow over the surface of a stream, without producing any permanent result. The case would then have been just the same as if I had never seen the flower. The mere hearing of the name would be inoperative unless there were something for it to act on,—an appropriate *trace* of past experience constituting a preparatory *disposition* for future experience. But primary retentiveness is not in this case sufficient. More is implied than the mere cumulative effect of the previous phases of a continuous process determining

succeeding phases. Retentiveness in this instance works by way of reproduction and association. The specific nature of the original experience which we call the perception of the flower, is partially reinstated in the mental image of the flower. The name, as we say, *reproduces* the mental image. It does this through association. The actual perception of the flower occurred as part of the same continuous conscious process as the hearing of the name. Hence, when the name occurs again, it may re-excite the mental disposition left behind by the perception, and re-excite it in such a way that the mental image of the flower rises before the mind although no actual flower is present to the senses. In so far as the mere fact that a certain modification of consciousness has already occurred constitutes the general possibility of its recurrence, retentiveness takes the form of reproduction. The general possibility of recurrence is for the most part actualised in each special case by association. The disposition left behind by the previous experience must be re-excited if the experience itself is to be reproduced. The re-excitement is mostly, though not always, effected by a presentation similar to some presentation which has formed part of the same total process with the experience which is to be reproduced. This is expressed by saying that the re-instatement takes place by the previous association of the reproduced and reproducing presentation. In the example given, the association is between the perception of the flower and its name. The repetition of the name revives the mental image of the absent flower.

§ 9. *Acquirement of Meaning.*—Reproduction has a great many modes and degrees, according as the original experience is more or less fully and independently reinstated. The least that can happen, in order to make the

word *reproduction* applicable at all, is found in a process of fundamental importance which we may call the *acquirement of meaning*. We must distinguish between meaning which is primary and meaning which is acquired. Primary meaning accompanies the first occurrence of any series having continuity of interest. Secondary meaning accompanies its recurrence, and depends on the fact that it has occurred before. In the series a, bm_1, cm_2, dm_3, on its first occurrence d has a meaning due to the cumulative disposition left behind by a, b, c. Now, suppose that on a future occasion the process as a whole is repeated. Its point of departure is in a, but a now excites the cumulative disposition produced by the previous occurrence of the whole series a, bm_1, cm_2, dm_3. The starting-point of the series is therefore no longer a, but am_3. In other words, a has *acquired meaning* through previous experience. Let us consider the example of a tune. On first hearing it, the successive notes have each a significance,—a value for consciousness derived from their connexion with the whole. Now suppose that the tune has been repeated often enough to become recognisable. In order to recognise it, it is not necessary to go through the whole again. You know what the tune is as soon as you have heard a certain portion of it. This stands for or *means* the rest; and if you are only interested in recognising the tune, it is quite unnecessary to go further, or even mentally to reproduce what follows. So, if I begin to say, "Twice one is two, twice two"—there is no need for me to go further. A hearer who knows the multiplication table knows what follows as a whole without detailed repetition. The beginning of the series is equivalent to the whole, and it is just because it *means* the whole that it is unnecessary to repeat the whole in detail.

Let us now take a case which belongs to quite a low level of conscious life. A chick on emerging from the shell, and without previous experience, tends to peck at, seize, and swallow all small objects*. This is a conative process, which has for its end the cessation of the appetite for food. Now the chicken does not, at first, distinguish between what is edible and what is not. This it has to learn by experience. It will at the outset peck at and seize all worms and caterpillars indiscriminately. There is a particular kind of caterpillar called the cinnabar caterpillar. When this is first presented to the chicken it is pecked at and seized like other similar objects. But as soon as it is fairly seized it is dropped in disgust. When next the chicken sees the caterpillar, it looks at it suspiciously and refrains from pecking. Now, what has happened in this case? The sight of the cinnabar caterpillar re-excites the total disposition left behind by the previous experience of pecking at it, seizing it, and ejecting it in disgust. Thus the effect of these experiences is revived. The sight of the cinnabar caterpillar has acquired a *meaning*. It means the experiences which in the first instance followed it; and just because it means them it may more or less dispense with the necessity of actually repeating them. It may so determine the course of action that repetition or re-instatement of the specific items of the previous experience is needless. To this extent, it is practically equivalent to them: it functions instead of them.

When one thing *means* another, it can, for certain purposes, or in reference to a certain end, be substituted for another. If *a* means *b*, this does not imply that *a* carries *b* along with it or about with it. We might as well

* This example is taken from Lloyd Morgan's *Habit and Instinct*, p. 41.

suppose that a five-pound note must always have five sovereigns literally wrapped up in it. The note will pass current instead of five sovereigns, and in like manner the peculiar visual appearance of the cinnabar caterpillar will, in some degree, pass current instead of the peculiar sensation of disgust which has previously followed it. It re-excites the whole disposition left behind by the previous process, and it re-excites this disposition as it has been modified in the course of previous process. Consequently, this process will not take place again as it took place before. But to understand the special kind of transformation which it undergoes, we must take into account the essential nature of appetitive process. This lies in its being directed to an end,—in the case of the chicken, the satisfaction of the appetite for food. This tendency towards an end is manifested in one general character of all appetitive process. Lines of action, if and so far as they are unsuccessful, tend to be discontinued or varied; and those which prove successful, to be maintained. In this way, for instance, accuracy in the act of pecking is attained by the chicken. When it misses, it tries again and again with slight variations until it succeeds, and it is the successful adjustments which tend to persist, and the unsuccessful which are eliminated. The endeavour towards an end, whether the end be consciously foreseen or not, is *ipso facto* an endeavour to avoid failure and obstruction. Everything in the way of check or impediment or want of success, causes dissatisfaction and altered behaviour. This holds good of appetitive activity in its primary occurrence; it is always characterised by persistence with varied effort. The same must also hold good for its repetition. Here, too, the lines of action which proved unsuccessful on its primary occurrence will be suppressed whenever the conditions under which they previously led to failure are recognisable.

Thus, the sight of the peculiar markings of the cinnabar caterpillar will, at the outset, by its acquired meaning, repress the tendency to peck and swallow. In other words, so far as the end of action is concerned, the sight of the caterpillar is superior to the actual taste of it, just as cheques and paper money generally are for certain purposes superior to coin.

The process which we have called the acquirement of meaning is the minimum in the way of reproduction required to explain intelligent learning by experience. All more specific modes of reproduction pre-suppose it, and owe their guiding efficacy to it. All revival of specific items of sensation and the like, in so far as it makes possible intelligent adaptation to the result of previous experience, must make more definite and explicit the peculiar consciousness which arises from the re-excitement of the total disposition left behind by previous process. The case we have analysed is sometimes explained in a different way. It is said that when the chick sees again the caterpillar, which it has previously ejected in disgust, the previous sensation of disgust is reproduced by the sight of the peculiar markings of the caterpillar. The primary experience of disgust prompted the ejection of the caterpillar; hence, it is argued, the revived sensation will lead the chicken to refuse the unsavoury morsel. Now, it is probable enough that something which may be called a revival of the disgusting sensation, actually takes place; but this is not sufficient, and possibly not necessary, to account for the result. According to the proposed explanation, the chick has (1) a primary sense experience, the sight of the caterpillar, and (2) a faintly revived sensation of disgust. What must follow? Each of the two sensations, the one primary, and the other secondary, independently prompt to

a certain kind of action, and the result can only be a sort of mechanical interference, not intelligent guidance. The visual experience prompts to picking and seizing. The revived distaste prompts to the act of ejecting or dropping from the beak. The tendency to ejection ought to interfere with the act of pecking only in so far as the two movements are mechanically incompatible. One would expect a nondescript blend of the two movements, or an alternation between them. Intelligent behaviour cannot be a product of such conditions. Two motor impulses of a quasi-reflex character are brought together in a mechanical way, and nothing can ensue except a sort of mechanical resultant. It is true that if it be granted that the sight of the cinnabar caterpillar has, from the first, a specific meaning, this meaning may be rendered more explicit by re-instatement of the sensation of disgust. But the mere re-instatement of the sensation of disgust taken by itself does not account for the result, whereas the acquirement of meaning might account for the result apart from the revival of the specific sensation. In the case we are discussing, there probably is a certain revival of sensation, though it takes place in a peculiar way, and not by direct association.*

Acquirement of meaning is that mode of reproduction which approaches most nearly in its nature to primary retentiveness. It might indeed be deduced *à priori* from the existence of primary retentiveness. If the successive phases of a process concur to form a total disposition as their cumulative effect, the renewal of a part of the process must tend to re-excite this disposition. Just as in primary retentiveness it is not the specific items of previous experience which persist in succeeding experience, but

* *Cf.* end of § 8.

only a modification of consciousness due to the cumulative disposition, so the re-excitement of the cumulative disposition does not necessarily involve revival of the specific items of previous experience, and it must involve something different from this. It must involve what primary retentiveness involves,—that peculiar modification of consciousness which we can only call *apprehension of meaning* or *significance*—of the peculiar character which the part derives from its relation to the whole.

We have now to consider modes of reproduction more specific in their nature than the general re-excitement of a total disposition. These more specific modes of reproduction assume manifold forms and gradations, which are to be regarded as stages in the evolution of meaning towards definiteness and explicitness. Meaning unfolds into them as the seed unfolds into the plant.

§ 10. *The various modes of Specific Reproduction.* (*a*) *Complication.*—Being reproduced is something different from being produced again. Repeated production involves a renewal of the producing conditions. But reproduction exists only in so far as the original conditions of production are inoperative (see § 8). Apart from the renewal of these, the previous occurrence of the reproduced experience of itself constitutes the possibility of recurrence. This necessarily implies that the previous occurrence has left behind a persistent trace or disposition. But previous occurrence constitutes only the general possibility of recurrence. The exciting cause, in so far as the revival depends on association,* is found in the occurrence of another presentation, *A*, which has previously existed in some kind of *psychological relation* to *B*, the presentation which is reproduced. In the main, the relations which operate as conditions

* This is by no means always the case.

of association consist in the union of the two modes of consciousness, as parts or phases of the same continuous conative process. The readiness with which associations are formed, and their strength, depend largely on the importance of the presentations in relation to the whole activity of which they form a part. The strength of the association is also, to a very great extent, dependent on the number of times the connexion between the associated presentations has been repeated.

Specific reproduction may assume a great variety of forms and degrees. Let us call the reproducing presentation, A, and that with which it has been associated, B: the reproduced presentation may be denoted by b. Now, the various forms of reproductive process depend (1) on the varying relation of b to A, (2) on the varying degrees of completeness in which b corresponds to B. These points of view are intimately connected. b may be either an integral part of A, or it may have a distinct individuality, so as to be capable of persisting when A has vanished. In the second case, the process is one of free reproduction: when b is an integral part of A and incapable of independent existence, the process is called *complication*, because the result is merely a change in the constitution of A, and for the most part an increase in its complexity. The facility and clearness with which b can be distinguished and separately attended to in the whole complex A admits of many gradations. It may be as intimately interfused with the whole as the red and blue which interpenetrate each other in purple. On the other hand it may be as easily disengaged as colour is from form. In general, the more intimate is the union of b with the other constituent characters of A, the more partial and the more profoundly modified is the reproduction of B, so that in some cases it

is hard to decide whether or not there is any reproduction.

We may take as a typical example of complication the peculiar differences of quality which attach to sounds according to the various modes in which they are produced. We distinguish clapping, crashing, clashing, hissing, bursting, splitting, rending, grinding, rushing, and whistling noises. Now these sounds doubtless have distinctive qualities, considered merely as auditory sensations. But it seems clear that they also have acquired modalities due to association. In producing them we have in each case certain distinctive experiences of movement and resistance, and in seeing them produced similar experiences are excited in a partial and inchoate way. When the sounds are merely heard their quality is partly constituted by a partial and modified reproduction of these sensations. The reproduced element is not usually distinguished without an express act of analytic attention. But it is none the less present as a peculiar modality of the auditory experience. Perhaps this will be most clearly brought out by considering the imitative words by which the nature of such sounds is commonly expressed. The word "clap" resembles the sound of clapping, the word "hiss" the sound of hissing, and the word "tear" the sound of tearing. But on examination it soon appears that the resemblance by no means lies wholly in the sounds considered merely as ear-sensations. It depends also on the movements of articulation. In saying "clap," the lips are clapped together; in saying "hiss," the breath is driven through a narrowed aperture; in saying "tear," the tongue is pulled away from the palate. In these and similar instances we do not ordinarily distinguish between the motor and the purely auditory imitation. So in the original experiences which are imitated the two factors are combined without

distinction, constituting a complex sensory quality which escapes analysis until the reflective scrutiny of the psychologist is brought to bear upon it. In this complex quality the sound as such is the dominant constituent, and the associated motor element appears as a modification of the sound.

For further illustration we may refer (1) to the qualification of sight by touch and resistance, and (2) to the qualification of touch and resistance by sight.

"The sight of a suit of polished armour," says Dr. Ward, "instantly reinstates and steadily maintains all that we retain of former sensations of its hardness and smoothness and coldness."* The armour *looks* hard, smooth, and cold. But this peculiar appearance to the eye does not necessarily involve any distinct representation or idea or separate sensation of hardness, smoothness, or coldness. The corresponding tactile and other experiences are not reproduced as separate and distinct modes of consciousness. They are not discriminated from the visual experience itself. The reproduction manifests itself rather as a modification of the visual experience—an addition to its unanalysed complexity. Similarly, ice looks cold because we have felt it to be cold. If it had been always warm to the touch, it would have looked warm. Yet its cold look is not a suggested idea; nor is it a distinct temperature-sensation. It is something which is presented as if included in the visual appearance as an integral part of it. Any attempt to separate it destroys both its own specific character and that of the visual experience.

If (2) we now turn to the converse case, the qualification of actual touch experience by revived visual experience, we

*Article "Psychology," *Encyclopaedia Britannica*, 9th edition, part xx., p 57.

find the union of the constituents of the complex much looser. This does not mean that they are more easily separable; for the association in normal human experience is almost, if not quite, indissoluble. But when the tactual experience is primary, the reinstated visual experience is much more prominent, more readily distinguishable and separately appreciable, than is the reproduced tactual element when the visual experience is primary. We have here a case of complication which approaches most closely to free reproduction. When we close our eyes and touch an object, we need not indeed have a distinct picture of the surface touched. But the slightest reflective scrutiny is enough to show that the total impression is complex, containing a visual as well as a tactual constituent, and also, in most cases, that the visual constituent is as prominent as the tactual or even more so.

(*b*) *Free Reproduction.*—In free reproduction, the reproduced mode of consciousness, *b*, is capable of existing apart from the *A* which reinstates it. *b* has an individuality of its own distinct from *A*, and it can therefore follow *A* in time, continuing to exist when *A* has disappeared. Trains of ideas supply by far the most familiar and important illustration. In complication, on the other hand, the existence of *b* is bound up with the existence of *A*. "To realise this difference," says Dr. Ward, "we need only to observe first how the sight of a suit of polished armour, for example, instantly reinstates and steadily maintains all that we retain of former sensations of its hardness and smoothness and coldness, and then to observe how this same sight gradually calls up ideas, now of tournaments, now of crusades, and so through all the changing imagery of romance."* The

* *Ibid*

characteristics of ideas and the nature of their distinction from actual perceptions are topics which will be fully discussed at a later stage. It is sufficient to notice here (1) that any reproduction which can be called an idea, must have sufficient independence to be capable of forming a distinct link in a train of thought; (2) that it must be the thought of an object, such as a thing, quality, relation, or event, and not a mere crude sensation, however faint; (3) that just because an idea differs from an actual perception, ideal reproduction* is always of a partial and modified character. The mental image of the flower, as called up by the name, is a typical illustration (*cf.*, § 8).

Is free revival in every case ideal revival, or does it also take other forms? In particular, are sensations, as such, ever re-instated? Can they be recalled in their original sensational character without recurrence of the appropriate external stimulus? This is an important question. Broadly speaking, we may affirm that the *direct* reproduction of sensations, as such,† is an exceptional and abnormal event. But there is an indirect process by which sensations of a certain class may be re-excited, although some of the conditions determining their first occurrence are by no means operative. Some sensations belong to the class called organic. It is characteristic of these that they are immediately excited, not by impressions upon the external organs of sense, but by the changing states of the internal organs, such as muscles, glands, and the like. Now, change in the state of these internal organs is, in a very important measure, determined from within the body by changing conditions of the nervous system. Any strong

* Reproduction which takes the form of an idea.

† By *sensation, as such*, is meant sensation with the peculiar intensity and liveliness which it possesses when produced by an external stimulus acting on a sense-organ

nervous disturbance tends to discharge itself over the whole organism, affecting respiration, heartbeat, tension of the muscles, circulation of the blood, secretion, etc. Such a nervous disturbance may, in the first instance, be set up by an external impression such as a wound or a blow. But it may be afterwards more or less reproduced by association without the external impression, and it may then internally generate organic sensations bearing a marked similarity to those which accompanied its original occurrence. These sensations may without impropriety be said to be *reproduced*, though in a circuitous manner. The physiological stimulus is indirectly re-instated, and it directly produces the sensation. Tickling is not merely a skin-sensation. The skin-sensation sets up changes in the central nervous system which determine diffused organic disturbance, including spasmodic movements, and the resulting organic sensation constitutes what is most specific in the experience of being tickled. But a similar effect may be induced without actual contact. By merely making believe to tickle a sensitive person it is possible to produce the nervous disturbance with the resulting organic sensations and convulsive movements. In like manner, the mere sight of nauseous food may produce nausea and even vomiting. The intense organic discomfort which may be occasioned by merely looking on at a surgical operation, or even by seeing surgical instruments, has the same origin.

A similarly circuitous mode of reinstatement probably occurs also to some extent in the case of the special organs of sense. There is good evidence of the existence of nerves capable of conducting excitation from the central nervous system to the sensitive surface of the eye, and thus giving rise to visual sensations. Probably the same holds good

for other organs of sense. Thus ideal revival may be more or less reinforced by actual sensation, and in certain cases this last element may be very prominent.

§ 11. *Facilitation and Arrest.*—In actual reproduction, one mental process reinstates another. But instead of actual re-instatement, we may have mere *facilitation*. The one mental process may favour the entrance of the other into consciousness, without actually introducing it into consciousness.

Facilitation may assume many forms and take place under many diverse conditions. It is an essential characteristic of attention. The nurse whose attention is concentrated on the sick child is pre-disposed to notice whatever sign or movement it makes, and to take action accordingly. Her mind is set in a general attitude of response to whatever impressions come to her from this source. This general attitude of response to a certain kind of stimulus may persist even when conscious attention has itself ceased. The nurse who goes to sleep with her attention concentrated on the child is likely to be awakened by the slightest cry from it, though more intense sounds fail to disturb her repose.

Under the head of facilitation due to attention we may bring a fact noticed by Mr. Verdon in a very interesting paper on "Forgetfulness."* "Individuals often remember clearly and well up to the time when they have to use their knowledge, and then, when it is no longer required, there follows a rapid and extensive decay of the traces. Many schoolboys forget their lessons after they have said them; many barristers forget details got up for a particular case. Thus, a boy learns thirty lines of Homer, says them perfectly, and then forgets them so that he could not say

* *Mind*, O.S. ii., 449.

five consecutive lines the next morning, and a barrister may be one week learned in the mysteries of making cog wheels, but in the next he may be well acquainted with the anatomy of the ribs instead." In other words, the general direction of interest facilitates the recall of certain experiences. It makes the corresponding dispositions more readily excitable. This seems only partially to depend on direct attention to the special subject-matter to be remembered. The barrister who keeps in mind for a week "the mysteries of making cog-wheels" does so through general interest in the case which he has in hand, and not by constantly thinking of cog-wheels. In other words, the corresponding mental dispositions are maintained in an excitable condition, not so much by attending directly to the subject matter, as by attending to something connected with it. So long as the need for remembering remains, there is a sense of having something on the mind. When the need no longer exists, a feeling of relief is experienced, and the power of remembering disappears.

If we learn something by heart, *e.g.*, a page of verse, we may afterwards so far forget it as to be unable to recall the words in their proper order. We may then set about learning it anew. But on the second occasion it may take very much less time to do so than on the first. The original learning by heart has *facilitated* the second.

The nature of facilitation is well illustrated in a series of experiments carried out by Professor Pillsbury.* Printed words variously mis-spelt were successively exposed on a screen for a period of about one-fifth of a second. The subject of the experiment was called on to read off these words. He did so for the most part incor-

* "A Study in Apperception," *American Journal of Psychology*, viii. 3.

rectly, and most often without noticing the wrong spelling. We have here nothing to do with the nature and frequency of the mistakes. What does interest us is the effect produced by calling out a word having some association with the word to be shown immediately before the exposure was made. The result of this was always a great increase in the number of mis-spellings overlooked. "In only a very few cases did the word called out suggest the word to be shown before the latter was seen, and then the misprints were observed quite as frequently as at other times. In most cases, the relation between the two words was noted after the printed word was seen. In such cases, the association helped the entrance of the word. It seemed to confirm the results of the visual impression, and to give a feeling of confidence that the word seen was the word intended." The words called, though they did not of themselves actually reproduce other words, yet facilitated the perception of one word rather than of another.

Arrest may be regarded as the negative side of facilitation. Whatever facilitates the occurrence of certain mental processes is a bar to the occurrence of others. The nurse, with attention concentrated on the child, is apt to overlook impressions which are not connected with the main direction of her interest. In general, any mental process tends to hinder the occurrence of others, if and so far as it does not facilitate their occurrence.

§ 12. *Habit and Automatism.*—Actions at first requiring attention come to be performed without attention when they are frequently repeated under sufficiently similar conditions. In such instances, the action is said to be *automatic*, to go on of itself. "The clearest examples of habitual action taking place apart from attention are those in which attention is otherwise occupied, as when a person

knits, or plays on a musical instrument, and at the same time engages in conversation, or threads his way through a crowded street while absorbed in thought. It should be noted that in such instances the diversion of attention is probably never absolutely complete. The musician, for instance, is more or less aware that he is playing a piece of music, and the absent-minded walker is not utterly oblivious of the fact that he is in a crowded street and in motion. What can be asserted confidently is that in such cases there is no persistent and discriminating attention to the details of the action. This distinction helps us to understand another group of habitual actions which do not appear to fall into the state of secondary automatism, however much they may be practised. Fencing supplies a good instance in point. The most expert fencer cannot afford to allow himself to be absorbed in an irrelevant train of thought while he is engaged in a duel. On the contrary, the keenest watchfulness is required. The reason is that only certain component parts of the action have become thoroughly habitual; these do not of themselves require to be attended to. The practised fencer has not to think about the proper modes of thrusting and parrying; what requires attention is the tactics of his opponent. As soon as he discerns by sight or feeling the direction in which his antagonist's rapier is moving, the proper reply is made automatically. Thus, attention is demanded for the proper combination of a series of movements which are severally automatic, a combination which has to be adjusted to constantly fluctuating conditions. The union of attentive adaptation to relatively novel circumstances with automatic adaptation to circumstances more uniformly repeated is found in all ordinary voluntary action. Thus, the decision to blow out a candle

may require attention, but the process of walking towards it and blowing is automatic."*

Habit is not confined to bodily actions. There are also habits of thought and of will. Of course, thought and volition are in their very nature processes that involve attention. When we speak of a "habit of thought" or a "habit of will," we do not mean that the special acts of volition or the special trains of thought can go on without attention. We have seen that in such bodily activities as fencing, "automatic processes may enter as component parts into a total process which as a whole is very far from being automatic. The inverse of this is seen in habits of thinking and willing. Here a comprehensive habitual tendency realises itself on special occasions by means of special processes which are not habitual."† We may take as an example the habit of answering letters on the day on which they are received. Here, what is habitual and automatic is not the actual process of writing the reply—this, of course, requires attention—but the writing of the reply on the same day on which the letter is received is a habitual and automatic procedure. It takes place as a matter of course. The alternative of postponing it to another day is not entertained without exceptional motives. A good instance of a habit of thought is that of the making of puns. There are some persons who continually make puns simply because they have fallen into the habit of doing so. Of course each single pun requires attention; but the general trend of attention in this direction rather than in other directions is a matter of habit.

The formation of habit involves the operation of two distinct conditions. The first is retentiveness; the second lies in the essential nature of conation, according to which

* *Analytic Psychology*, vol. i., pp. 260-261. † *Ibid*, p. 262.

conative processes cease, if and so far as their end is attained. Let us take as an example the child learning to walk. This at the outset involves full attention. "At the outset, performance falls far short of intention: only a certain series of contractions of certain muscles, in proper proportions and in a proper order, is capable of realising the end aimed at, with the maximum of rapidity and certainty, and the minimum of obstruction and failure, and corresponding effort. At the outset of the process of acquisition, muscles are contracted which are superfluous, and which therefore operate as disturbing conditions. Others are not contracted at the right moment, and in the right measure, so that action is deranged. Now the effort to attain the end is, *eo ipso*, an effort to avoid failure and obstruction; hence there will be a constant tendency to alter muscular adjustments in so far as they are unsuccessful. Hence arise gradual approximations to success, and it is these which are permanently retained, while all that belongs to the process of trial, as such, disappears. In this way a fixed and uniform series of movements is organised, which can go on of itself without conscious effort,—without trial and failure.*

It will be seen that the formation of habit is an example of facilitation. The dispositions left behind by previous conation facilitate subsequent conation in the attainment of its end. When this process of facilitation reaches a point at which conscious endeavour is no longer necessary, the action becomes automatic.

§ 13. *Physiological Dispositions.*—In using such words as *dispositions* and *traces*, we have hitherto maintained a strictly psychological point of view. But as conscious process in general is correlated with nervous process, so

* *Op. cit.*, pp. 267-268.

psychological traces and dispositions may be regarded from another point of view as physiological facts. They are persistent modifications of nervous structure. Their existence, inter-connexion, and mode of operation are in the first instance revealed to us by purely psychological evidence. But there are many advantages in also considering them from a physiological point of view. When we are considering a disposition merely as a trace of previous consciousness, and a pre-condition of further conscious process, we may call it a *psychical disposition.* "When, on the other hand, we desire to consider exclusively the physiological side, the term *physiological disposition* is in place. When both are simultaneously to be taken into account, it is appropriate to speak of a *psycho-physical disposition.*"*

* *Ibid*, p. 23.

CHAPTER III.

THE "FACULTY PSYCHOLOGY" AND ASSOCIATIONISM.

§ 1. *Introductory.*—There are two general theories of mental development of great historical importance. One of them—the "Faculty Psychology"—may be pronounced obsolete; and the other—Associationism—is at least obsolescent. But the ways of speaking and thinking which these theories pre-suppose have obtained such a hold on the popular mind, and, so far as they are false, they represent fallacies so natural, that it is worth while to give a critical account of them.

§ 2. *The "Faculty Psychology."*—"An individual fact is said to be explained by pointing out its cause, that is, by stating the law or laws of causation of which its production is an instance. Thus a conflagration is explained, when it is proved to have arisen from a spark falling into the midst of a heap of combustibles. And in a similar manner, a law or uniformity in nature is said to be explained when another law or laws are pointed out, of which that law itself is but a case, and from which it could be deduced."* Now a law of causation states a relation between two terms,—cause and effect, antecedent process and resulting product. Each of these must have a character of its own, by which it can be definitely conceived and described. Where this condition is not fulfilled there is no causal

* Mill, *Logic*, 9th edition, vol. i., p. 540.

law, and explanation is impossible. An effect cannot be its own cause, and cannot, therefore, afford its own explanation. But it is a fallacy of not infrequent occurrence to assign as a cause what turns out on examination to be only the effect itself, expressed in different language. This is a special case of the fallacy called "argument in a circle," and it usually consists in adducing as the cause of a special fact the general conception under which it is comprehended. The classical instance of this confusion is the reply of Molière's physician to the question, "Why does opium produce sleep?" "Opium," he answers, "produces sleep because it has a soporific tendency." It is to be noted that the fallacy does not lie in reducing the particular to the general, for this is the form assumed by all explanation. The generalised effect (soporific virtue) is adduced as the cause of the special effect (the production of sleep by opium). But in order to explain, we require a generalised *relation* between the fact to be explained and some *other* fact which determines it Thus, we may explain why a person goes to sleep by his having taken opium, but not by his possession of a power of somnolescence.

In psychology, the fallacy we have described needs to be guarded against with special care. The form which it is apt to assume is that of referring a mental state to a corresponding "faculty." To say that an individual mind possesses a certain faculty is merely to say that it is capable of certain states or processes. To assign the faculty as a cause, or as a real condition of the states or processes, is evidently to explain in a circle, or in other words it is a mere failure to explain at all. Thus, it is futile to say that a particular voluntary decision is due to Will as a faculty. It is equally futile to say that extraordinary

persistence in a voluntary decision is due to an extraordinary strength of Will, or of Will-power, or of the Faculty of Will. We explain nothing by asserting that certain mental processes in man have their source in the Faculty of Reason, or that certain other processes in lower animals have their source in the Faculty of Instinct. It may be true that conscience is a Compound Faculty including on the one hand the power of judgment, and on the other a certain susceptibility of feeling or sentiment. But such statements in no way account for the actual generation of a scruple or a twinge of conscience.*

The fallacy of what has been called "Faculty Psychology" may take either a positive or a merely negative form. A faculty may be explicitly regarded as an agency or real condition, producing its own special manifestation, and interacting with other faculties similarly conceived as agencies or real conditions. But such a position has rarely been maintained without disguise or equivocation. What we find is rather a tendency to rest satisfied with a reference of this or that state or process to a corresponding faculty without pushing the inquiry further so as to raise the question of causal explanation. Reference to a faculty, though it is futile from the point of view of causal explanation, may none the less have a good and useful meaning from another point of view,—that of classification. Now some kind of classification is a primary necessity for

* Locke, in criticising the phrase, "freedom of the will," has brought out very clearly the nature of this fallacy. "We may as properly say, that it is the singing faculty sings, and the dancing faculty dances, as that the will chooses, or that the understanding conceives; or, as is usual that the will directs the understanding, or the understanding obeys, or obeys not the will; it being altogether as proper and intelligible to say that the power of speaking directs the power of singing, or the power of singing obeys or disobeys the power of speaking." *Essay on Human Understanding*, bk. ii., ch. 21, § 17.

the psychologist. To divide and arrange the various and fluctuating modes of consciousness in a distinct and orderly manner, so that each may receive an appropriate name,—this is in itself no small achievement. Many of the earlier psychologists were so absorbed in inquiries of this nature that they ignored the need for discussing questions of origin and development. They tacitly assumed that the whole problem was one of classification. If they had held and expressed this view with full distinctness, there would have been no ground for charging them with a fallacy of confusion, and the Faculty Psychology could not be justly used as a term of reproach. But they were by no means completely clear as to their own position. They did not fully realize that they were only classifying and not explaining. They would probably have repudiated the charge that they treated faculties as real agencies if the charge had been distinctly formulated. But none the less, they frequently used language which implied causal relation both between faculty and special process and between different faculties.

Indulgence in such modes of expression had a disastrous effect. It created an appearance of explanation without the reality, and in this way seriously retarded the progress of knowledge. For this reason the word "faculty" has almost passed out of use in modern psychology. But the fallacy does not necessarily disappear with the word in which it has so often found expression. We are by no means secure against it even in the present day. It is, therefore, necessary to warn the student against this peculiar mode of explanation in a circle, and to insist on the necessity of real explanation by definite conditions, giving rise to definite results, according to a fixed order.

§ 3. *Associationism.*—Faculty Psychology is valuable,

if at all, only as a scheme of classification. But the ultimate aim of science is to explain and not merely to classify. Hence, when once explanatory principles came to be clearly conceived and expounded the Faculty Psychology tended to disappear. Its greatest enemy in modern times has been the theory of reproduction as determined by Association. This theory, when pushed to an extreme, so as to exclude all other modes of explanation, becomes what is called "Associationism." Such writers as James Mill in England, and in a very different way Herbart in Germany, may be taken as types of it. The assumption which lies at the basis of Associationism is that mental conditions can only give rise to a mental product, if and so far as they reappear in the product as its components. From this point of view, to explain the origin of a state of consciousness is to enumerate its constituent parts and show how they came to cohere with each other by association. As all words are put together out of the letters of the alphabet, so all derivative mental states and processes are put together out of primary and simple modes of consciousness, arising from the stimulation of sensitive surfaces either outside or inside the body. In ordinary human consciousness these elementary sensations rarely if ever occur in their purity. They have all acquired associations, so that they now appear embedded in a cluster of revived residua of previous experiences. Thus, when an orange is perceived, what is immediately given in the way of sensation may be only yellow colour. According to the theory we are considering, the perception of the orange wholly consists in the more or less complete re-instatement of past sensations by the present sensation. The present sensation forms the nucleus of a cluster of revivals. The immediate ocular

experience reproduces the visual appearance of the orange from other points of view. It reproduces the smell, and the taste, and the character of the pulpy contents as presented to sight and touch.

It is admitted that for the most part the simple components of such a psychical complex can only be ascertained by laborious investigation; that the ordinary states of consciousness which common sense regards as ultimate are really not ultimate, but have an origin and development due to psychological conditions. The essential point is that these conditions are held to operate only in one special manner; they combine, and their combination is the effect which they produce. On this theory, causation and composition coincide.

§ 4. *Associationism criticised.* "*Mental Chemistry.*"—In all psychical development some kind of association and reproduction is involved. So much may be conceded to associationism. Its defect lies in making the whole process merely reproductive, to the exclusion of other modes of psychical interaction, giving rise to new and not merely reproduced results. In the general course of nature causation and composition by no means always coincide. Conditions by no means always persist in their product as its component parts. Neither the sculptor's chisel nor its movements form part of the completed statue. The fire does not remain as an integral part of a burnt house, or a knife as an integral part of a wound. The theory which would reduce all mental production to reproduction, is, therefore, by no means a self-evident truth. Its claims to acceptance rest entirely on the verification which it may receive from experience. What kind of verification is necessary and attainable? It would seem at first sight that this question is easy to answer. If the producing conditions exist in the product itself we ought to be able to find them by analytic scrutiny of the

product. In material compounds this may not be possible, because the components may be so intermingled that they cease to be discernible by our senses. But it is the distinctive peculiarity of the combinations which are brought about by mental association and reproduction, that both the components and their union exist in consciousness. It would seem, therefore, that it ought to be as easy to detect the components of such a compound as to spell a word on phonetic principles.

But this conclusion is too hasty. To exist in consciousness is one thing. To be a discriminated and identified object of consciousness is quite another thing. Spoken language is composed of a limited number of elementary sounds. But language was spoken long before these elementary sounds were discovered and represented by an alphabet. So in articulating the sound of each letter combined movements of the throat, lips, tongue, and palate are involved. The corresponding sensations are experienced by everyone who utters the sounds. But they are only discernible by an express effort of analytic attention. Most of us never notice them at all. Again, the timbre of a musical note is due to its complexity. Overtones are united with a fundamental tone. These overtones are not as a rule separately discernible by an unpractised observer. But he may learn to discriminate them by adopting an appropriate method. If a simple tone is produced by itself and then compared with the complex note of which it is an overtone, and if this process is repeated with sufficient frequency, it becomes possible to distinguish the overtone as a separate component of the complex to which it belongs.

It is illegitimate to demand that the constituents of a complex mode of consciousness shall be immediately obvious

to simple inspection. But it is both legitimate and necessary to demand that they shall be ascertainable by a systematic process of reflective scrutiny conducted under favourable conditions. To affirm their presence where no scrutiny can detect them is simply to refuse to appear before the bar of experience, and judgment must go by default against those who assume such a position. If a certain mode of consciousness is alleged to consist of certain constituents, *a*, *b*, *c*, the only criterion of primary importance by which we can test their presence is systematic comparison. We must compare *a*, *b*, and *c*, severally, and, if possible, collectively, with what is alleged to be a product constituted by their combination.

It is necessary to bring the general plan of explanation which governs the procedure of the Association School to this test. Brought to this test it certainly collapses. One of the ablest members of the school, J. S. Mill, has virtually confessed its bankruptcy in his doctrine of "Mental Chemistry." "When many impressions or ideas are operating in the mind together, there sometimes takes place a process of a similar kind to chemical combination. When impressions have been so often experienced in conjunction, that each of them calls up readily and instantaneously the ideas of the whole group, those ideas sometimes melt and coalesce into one another, and appear not several ideas, but one; in the same manner as, when the seven prismatic colours are presented to the eye in rapid succession, the sensation produced is that of white. But as in this last case it is correct to say that the seven colours, when they rapidly follow one another, *generate* white, but not that they actually *are* white; so it appears to me that the Complex Idea, formed by the blending together of several simpler ones, should, when it really

appears simple (that is, when the separate elements are not consciously distinguishable in it), be said to *result from*, or be *generated by*, the simple ideas, not to *consist* of them. Our idea of an orange really *consists* of the simple ideas of a certain colour, a certain form, a certain taste and smell, etc., because we can, by interrogating our consciousness, perceive all these elements in the idea. But we cannot perceive, in so apparently simple a feeling as our perception of the shape of an object by the eye, all that multitude of ideas derived from other senses, without which it is well ascertained that no such visual perception could ever have had existence; nor, in our idea of Extension, can we discover those elementary ideas of resistance, derived from our muscular frame, in which it has been conclusively shown that the idea originates. These, therefore, are cases of mental chemistry; in which it is proper to say that the simple ideas generate, rather than that they compose, the complex ones."*

It is well worth while to examine this statement with some care. We must note that it contains a reluctant confession of the inadequacy of the Association theory, wrung by the stress of facts from one of its most devoted adherents. Mill shows his reluctance by the grudging nature of his admissions. He maintains the Association theory if and so far as he can find any plausible pretext for doing so. Thus he holds that our "idea of an orange really consists of the simple ideas of a certain colour, a certain form, a certain taste and smell, etc., because we can by interrogating our consciousness perceive all these elements in the idea." This is very plausible. For it is certainly true that when we ask ourselves what an orange is, we can only answer by enumerating such characteristics as those assigned. But the real

* *Logic*, 9th edition, vol. ii., pp. 441-442.

question at issue is quite different. The real question is whether in every moment in which we catch sight of an orange and know it for an orange, all these distinctive characteristics must be actually presented to consciousness. It will be seen at once that the necessity of such a collective resurrection of our previous experiences of oranges, whenever one happens to catch our eye, is by no means obvious. No doubt the visual appearance *means* all this to us in the moment in which we become aware of the object. But to say that *a* means *bcd* is one thing; to say that it drags *bcd* along with it is something altogether different. To suppose the contrary is, as we said before, like supposing that a five-pound note must always have five sovereigns literally wrapped up in it. The note will pass current instead of five sovereigns, and in like manner the visual appearance of the orange will in a manner pass current instead of the special experiences with which it has been conjoined. It will in certain ways and to a certain extent determine action, thought, and feeling, as these experiences will determine action, thought, and feeling, if they are actually present or actually reproduced in the form of ideas.

Though Mill clings to reproduction and association with all his might, he is in spite of himself compelled to confess their impotence to solve some of the most vital questions of genetic psychology. He is constrained to introduce a new principle of fundamental importance, which is, in a way, the contrary of that of association. In the products of associations, the producing factors persist in the result as its components. In the process of "generation" which Mill assumes the generating factors effect their own disappearance in giving birth to their product. Its life is their death. Yet Mill is by no means clearly aware that he is

deserting the association doctrine. He is rather of opinion that he is modifying and improving it. This is shown by his use of the term "Mental Chemistry." A chemical compound really is a compound. It really "consists" of its components and is not merely "generated" by them. Its weight is equal to their weight. By appropriate means the chemical combination can be dissolved so that the components again exist in a separate form. It is true that the compound has properties which do not belong to the components taken separately. But the components do not cease to exist in order to make way for the new properties as the generating factors in mental chemistry cease to exist in producing a new product. It may be said that though they do not cease to exist, they disappear just as the psychological factors disappear. But this is equivocation. The disappearance of the psychological factors is equivalent to their non-existence: the disappearance of chemical factors merely means that there are certain ways in which they cease to manifest their presence to us. The analogy between the chemical process and the mental, as the mental is conceived by Mill, appears more plausible from another point of view. In order that oxygen and hydrogen may combine to form water they must first be brought together. Similarly, according to Mill, the generating factors of a new mental product must first be brought together in a firmly associated group or cluster before they annul each other and give place to something radically new. For this reason, he appears to have imagined that he was still following the lines of the association theory. But in so thinking he evidently fell into a "fallacy of confusion." What he affirms is that a preliminary process of association and reproduction precedes the generation of a new and simple mode of consciousness. What he tacitly assumes is that

the process of generation itself is somehow reducible to association and reproduction. But this is mere confusion of thought. "Generation" remains an altogether distinct process from that which prepares the way for it. The fallacy had already been pointed out before Mill wrote in Thomas Brown's criticism of Condillac. "The great error of Condillac, as it appears to me, consists in supposing that when he has shown the circumstance from which any effect *results* he has shown this result to be essentially the *same* with the circumstance which produced it. Certain sensations have ceased to exist, certain other feelings have immediately arisen; these new feelings are, therefore, the others under another shape. Such is the secret, but very false logic, which seems to prevade his whole doctrine."* This applies *mutatis mutandis* to Mill. He held that because a certain grouping of mental elements precedes the emergence of a product distinct from each and all of them, this product must be the very elements themselves which have "melted and coalesced into one another." The metaphor of "melting and coalescence," if it is taken as more than a literary flourish, is quite unmeaning. Things which "melt and coalesce into one another" remain in existence after their union. The hydrogen and oxygen which unite to form water, persist, according to the principle of the indestructibility of matter, in the compound. It is only because of their persistence that they can properly be said to be compounded or to have coalesced. But there is no principle corresponding to the indestructibility of matter applying to modes of consciousness. They do not persist in their product, and therefore they do not "melt and coalesce" in it.

We have provisionally assumed Mill's theory that the

* *Philosophy of the Human Mind*, Lecture xxxiii.

"generation" of a new mode of consciousness by psychological conditions must be preceded by an associative grouping of the generating factors. But, in reality, this assumption is neither self-evident nor justified by experience. Mill, at this point, merely shows the strength of the bias which led him to affirm the Association theory, even in the act of denying it. From another point of view also, his account of "mental chemistry" is, in the main, fictitious. He holds that the co-operative condition entirely disappears in giving rise to something new. This may happen in certain cases: but it is certainly not the prevailing rule, and above all it does not apply to the special class of cases which he refers to. Spatial perception, tactual and visual, in its various forms and modifications, is undoubtedly due to a vast complexity of co-operative conditions which do not appear in the result. But it is untrue that *none* of the contributory factors are discernible. Magnitude, as perceived by the eye, is *colour* extended or spread out. Shape, as perceived by the eye, is constituted by the boundaries of colour. In such perception there is always present at least visual sensation, and generally experiences accompanying eye-movements. The spatial character which belongs to these visual and motor experiences is indeed derivative and not a datum of primary sensation. It belongs to them, at least in the case of human beings, only in virtue of their previous combination in specific ways with other specific experiences, tactile, motor, and visual. None the less, the ocular perception of extended form and magnitude does not float loose in detachment from *all* the factors which contributed to its origin. For among these factors an essential part is played by the visual and motor sensations, which become endowed with a spatial character as the result

of the process. What happens is not that *a*, *b*, *c*, *d*, *e*, the antecedent conditions, all disappear beyond recognition and leave behind them an *x* quite disparate from all or any of them. What happens is rather that one of these conditions has, through interaction with the others, acquired a peculiar modification, so that whenever it recurs, it recurs in a profoundly modified form.

What is true in the doctrine of mental chemistry is the denial, express or implied, that reproduction by association is the only principle of fundamental importance controlling the course of mental development.

BOOK II.

SENSATION.

CHAPTER I.

DEFINITION OF SENSATION.

§ 1. *Sensation and Stimulus.*—One characteristic mark of what we agree in calling sensation is its mode of production. It is caused by what we call a *stimulus*. A stimulus is always some condition, external to the nervous system itself and operating upon it. This stimulus may consist in physiological change originating in the organism itself, as in the case of organic sensations, or in physical conditions external to the organism, which act on the peripheral organs of sense, and by means of afferent nerves affect the central nervous system. The change in the internal state of the body which gives rise to organic sensation may be initiated, in the first instance, by an external stimulus acting on peripheral organs as in the case of tickling. We have also to count among the various modes of stimulation the irritant effect of certain variations in the nature and the distribution of the blood-supply within the brain, and various injuries or lesions of the nervous system due to diseases or wounds. Dependence on some kind of external condition or quasi-external condition is essential to the conception of sensation.

It is above all things important to distinguish the cause of sensation from the object of sense-perception. A man examining a material thing present to his senses may successively or simultaneously see it, feel it, weigh it in his hand, hear the sound it makes, smell it, and taste it. In so doing he perceives its sensible qualities, such as colour, hardness, weight, odour, and flavour. He does so by means of the sensations which are produced in him by the varying relations of his sensitive organism to the object. But the sensible qualities perceived are by no means identical with the cause of sensation. The colour-sensation, for instance, is due to a vibratory motion of the particles of the luminiferous ether, giving rise to certain chemical or physical changes in the organ of vision, and so to a certain modification of connected parts of the nervous system. But these conditions are not what a man sees when he perceives the colour red or blue. Similarly, the weight of the object as perceived is by no means to be identified with the changes produced by it in the skin, muscles, tendons, etc., which occasion the sensations necessary to the perception of the weight.

Sensations are essential to the perception of things and their qualities; but in the conception of what constitutes a sensation we abstract from the cognitive function which belongs to it as an element in the perception of an object. The vital point on which we fix attention is that a sensation is a mode of consciousness produced by a specific mode of stimulation, and having its own specific nature ultimately determined by the conditions which produce it. We have noted that the producing conditions may, in the first instance, be external to the organism. But they can only affect the nervous system by first operating on those parts of the organism which we call the organs of sense.

Thus the changes in the organ of sense, and the subsequent processes by which these changes affect the nervous system, constitute the essential antecedents of the sensation.

§ 2. *Sensory Elements.*—If I look at grass, I have the sensation of green. If I look at snow, I have the sensation of white. I can assign no psychological reason why in the one case the sensation is that of white and in the other that of green. The difference can only be accounted for by the different way in which my eye is affected by different kinds of light. So in all cases the qualities of sensation must be ultimately accounted for by reference to the nature of the stimulus.

If I do not actually *see* grass or snow, but summon up mental pictures of them in my mind's eye, the qualities of greenness and whiteness are present in my mental image as they are present in actual perception. Now these qualities would not be present in the mental image unless they had been previously produced by the operation of an external stimulus. For this reason, some writers would apply the term *sensation* to these qualities even when they appear in the mental image. Both in actual perception and in the mental image they defy psychological analysis, and can be ultimately accounted for only by reference to external stimulation. There is, however, an objection to applying the word *sensation* to both cases indifferently. Though greenness appears both in the perception and in the mental image of grass, it appears in a different manner in each instance. The present operation of the external stimulus gives it peculiar intensity, steadiness, and other distinctive characters, which do not belong to it in the mental image. It is better to restrict the term *sensation* to the special form of consciousness which accompanies the actual operation of the stimulus. The qualities of sensation

as they appear in mental imagery may be called *sensory elements*, but not *sensations*. The term *elements* indicates that their peculiar nature cannot be psychologically accounted for,—that ultimately it can only be explained by reference to an external stimulus. The word *sensory* indicates that their existence pre-supposes the previous existence of corresponding sensations.

§ 3. *Mere Sensation.*—In defining sensation we have disregarded the cognitive function which it may discharge as a constituent element in the perception of an object. It does not follow from this that sensation can actually exist without cognitive function. This is a question to be separately considered on its own merits. We may formulate it as follows: Is there such a thing as *mere* sensation? We owe to Professor Stumpf an argument which seems to settle this question in the affirmative. It is based on the fact that within limits we can vary a stimulus without producing any perceptible difference in the object cognised. If this variation in the stimulus is accompanied by variation in the sense-experience, then we have a variation in the sense-experience which makes no difference to cognition. There is a difference in mere sensation, but not in perception. That, as a matter of fact, this is so may be demonstrated as follows. We may vary the physical conditions on which the pitch of a musical note depends, so as to produce a graduated scale of notes increasing or decreasing in pitch. Symbolise the series by P_1, P_2, P_3, P_4, P_5, ... P_n. Now, if the variation of the physical conditions is sufficiently gradual, P_1 may be quite indistinguishable from P_2, and similarly P_2 may be quite indistinguishable from P_3, and P_3 from P_4. None the less, P_4 will be perceived as distinctly different from P_1. But this would be impossible unless the change in the physical

conditions were accompanied by a change in the sensation, even when the change is imperceptible. If the pitch-sensation P_1 is regarded as identical with the pitch-sensation P_2, merely because the one note is indistinguishable from the other, and if in like manner P_2 is regarded as identical with P_3, and P_3 with P_4, and so on, then P_1 must be identical with P_n, and it would be impossible that any perceptible difference should ever arise. The same argument may be applied to a gradual increase in heat or weight or pressure or brightness. The burden on a man's back may be increased by sufficiently gradual additions from an ounce to a stone without his noticing the successive increments. If these successive increments made no difference to his sensation, the sensation produced by a stone weight would be all the same to him as the sensation produced by an ounce.

The merit of Stumpf's argument lies in the exact and cogent form into which it is thrown. But the same point may be brought out by an appeal to common experience. It is easy to show that there is by no means a complete coincidence between the existence of sensations and their cognitive function. They may exist as possible material for perceptual consciousness, without being actually utilized. "At this moment I am thinking about psychological topics. I receive at the same time a multitude of diversified impressions from surrounding things which certainly enter into my total experience. But if I refer them to an object at all, I do so in a very indeterminate way. My perceptual discrimination is very far from keeping pace with the differentiation of the sensory data as immediately experienced."* The room is well-lighted, and the sun is shining in at the window. But, with my

* *Analytic Psychology*, vol. i., p. 48.

thoughts otherwise occupied, I do not notice this. My thoughts might be similarly occupied in the twilight without my noticing that it was twilight. But my total experience would be different in the two cases. The kind and degree of illumination modifies my consciousness, even though I do not take cognisance of it. In like manner, I often, in becoming aware of a sound, am at the same time aware that I have been hearing it for some time past without being aware of it. The corresponding sensation was present in my consciousness though I did not notice the sound.*

§ 4. *Sensation as Cognitive State distinguished from Sensation as Cognised Object.*—We must distinguish the knowledge, of which sensations are the vehicle, from the knowledge which has for its object sensations themselves. It is true that without the sensations we can have no knowledge of them: but it is not true that whatever we know by means of sensations is knowledge of these sensations. We must distinguish between what a sense-experience means and what it is in its own intrinsic nature. The image thrown by an object on the retina of the eye decreases in magnitude as the distance of the object increases. This involves a corresponding difference in the visual sensation. When we deliberately fix our attention on the sensation and its phases, we may, with practice and by using appropriate means, notice this difference. We may become aware that a man entering a room and approaching us apparently increases in stature. But for the most part we ignore these variations in our experience. None the less, they fulfil a cognitive function. They help to determine our perception of the distance of the object seen. It is the business of the artist to attend to these

* *Cf.* Bk. I., ch. I., § 5.

and other differences in visual sensation, and reproduce them in his pictures. Only in this way is he enabled to effect an artistic illusion. He must reproduce differences of colour and of shading, etc., and differences due to the varying way in which objects in varying positions affect the eye. But for all this he needs a special training. He has to learn to notice what nobody notices in ordinary life. In ordinary life, people attend only to what the sense-experience practically means. The artist must acquire the power of attending to the intrinsic nature of the sense-experience itself.

Similarly, in psychology, we have to attend to sensations, as such: we have to examine their attributes as psychical states, and not merely their meaning as vehicles of knowledge. The two points of view only partially coincide. If we compare the colour *red* as a quality of a material object with the colour *red* as a quality of the corresponding sensation, we find that redness as immediately perceived is an attribute common to both. The difference lies in the different relations into which it enters in the two cases. As a quality of the thing, it is considered in relation to other qualities of the thing,—its shape, texture, flavour, odour, etc. As a psychical state, it is considered as a peculiar modification of the consciousness of the percipient, in relation to the general flow of his mental life. But this is not the only difference. When we are attending to redness as a sensation, we take cognisance of many characteristics which are usually ignored when we are only interested in it as a quality of material objects. The manifold variations which the colour of an object undergoes under varying phases of illumination are, to a large extent, ignored in ordinary perception, because they make no practical difference in the nature of the object as a

physical thing. The colour is regarded as the same, and the illumination alone as varying. But for the psychologist, whose interest is in the sensation, and not in the physical object, these variations are of primary importance, and he, like the artist, must fix attention upon them.

Sensations, as such, therefore, are psychical states. These psychical states as such, become objects only when we attend to them in an introspective way. Otherwise they are not themselves objects, but only constituents of the process by which objects are cognised.

§ 5. *Essential attributes of Sensation.* When sensations are subjected to psychological examination they are found to possess certain general characters essential to their existence. Quality, intensity, and duration or protensity, belong to all sensations. The quality of a sensation is what marks it off from other kinds of sensation of the same or different senses. Thus the difference between blue and red, salt and sweet, warm and cold, is a qualitative difference. The term "intensity" denotes a certain manner in which there may be more or less of the same quality. Of two sweet tastes one may be sweeter than the other. Two notes having the same pitch may differ in loudness. The peculiarity of this kind of quantity is that it does not involve any distinction of parts. As we have remarked before*, the degree of loudness of a sound cannot be broken up into fractional portions which are separately distinguishable. Two sounds cannot be thought of as superposed so as to make the fainter coincide with part of the louder, leaving a remainder which can be regarded as the quantitative difference between them. Duration or protensity on the other hand is an extensive not an intensive quantity. Every sensation lasts for a longer or shorter period, and

* See p. 30.

consequently has as many parts as are distinguishable in the time which it occupies. There is yet another kind of extensive quantity which belongs to the sensations of sight and touch. Tactual and visual sensations not only endure in time, but also form quanta, which consist of parts capable of being spatially distinguished. I say *capable* of being so distinguished; for the actual distinction arises only with the development of special perception. "Suppose a postage-stamp pasted on the back of the hand: we have in consequence a certain sensation. If another be added beside it, the new experience would not be adequately described by merely saying that we have a greater quantity of sensation, for intensity involves quantity, and increased intensity is not what is meant." It is equally obvious that the quantitative difference is not one of protensity. We need a special name for this peculiar moreness and lessness of the same sensation, and, following Dr. Ward, we may call it extensity. Extensity is an essential factor in the development of spatial perception. It belongs undoubtedly to the spatial senses of touch and sight. Probably it belongs also to other senses in which the remaining conditions of spatial perception are wanting. This is a point which will be considered later on.

CHAPTER II.

THE SENSATION-REFLEX.

§ 1. *As distinguished from Physiological Reflex.*—"We may define a *reflex act*," says Dr. Waller, "as the *immediate* motor response to centripetal excitation."* The emphasis here is on the *immediacy* of the response. The reaction depends directly on the stimulus, so that it always occurs in an invariable and inevitable manner whenever the stimulus is repeated, and is discontinued when the stimulus ceases to operate. If we irritate with acetic acid the thigh of a frog whose cerebral hemispheres have been removed, the leg is jerked away. By using a suitable apparatus it may be arranged that whenever the leg is thus jerked away it comes in contact with a hot plate; when this happens, it is jerked back again. On being again irritated, it is once more jerked away and once more comes in contact with the hot plate, when it is again withdrawn; and so the process may go on until the limits of fatigue are reached.

A reflex act may be performed without being accompanied by change in consciousness, or at least by any conspicuous change. Coughing and sneezing are reflex acts, due to irritation of the mucous membrane. But a person may sneeze or cough either unconsciously or consciously.

Human Physiology, p. 294.

Perhaps the unconsciousness is in any case not complete; but it is often very nearly so. The consciousness on the other hand is sometimes very keen, as when the irritation of the mucous membrane is violent. Now those reflex actions which, roughly speaking, take place unconsciously, may be described as physiological; those which take place with consciousness may be described as sensational. There is no reason for believing that the physiological reflex is effected through nerve-fibres other than those which convey and effect the sensation-reflex.

The sensation-reflex is the most primitive form of mental life which is distinctly recognisable. If, then, we fix the conditions under which the physiological passes into the sensational reflex, we thereby fix the conditions under which mental life first appears in a definite form. These conditions appear to be two-fold. In the first place, the merely physiological reflex is found where the action takes place regularly and uniformly in response to stimulation which is uniformly and regularly recurrent. The sensation-reflex, on the other hand, takes place on a comparatively special emergency, which is only of occasional occurrence. In the second place, much depends on the degree in which the mind is pre-occupied by higher processes. A man may cough unconsciously when he is absorbed in some interesting topic, although in a less pre-occupied condition of mind the cough would have been a sensation-reflex. The more pre-occupied he is, the more intense must the irritation be in order to produce an appreciable sensation. Taking up the first point, it is plain that those reflex movements which belong to the ordinary and normal routine of the vegetative life of the organism are almost wholly physiological. The heart's beat and its modifications, the constriction and dilatation of the

blood-vessels, breathing, swallowing, the secretion of saliva, and the like, are not normally accompanied by distinctly appreciable sensations. I say *distinctly appreciable* sensations, because, in all probability, they do in their totality contribute to determine the state of consciousness as a whole, giving it a certain tone or modality. But the effects of the various organic processes blend into a vague total experience. Their several effects are not separately appreciable. The most we can say is that, as Dr. Michael Foster puts it, "if the whole of our abdominal viscera were removed, we should be aware of the loss as a change in our common or general sensibility."* On the other hand, when a stimulus is of comparatively occasional occurrence, and prompts a special combination of movements to meet a special emergency, the concomitant experience may disengage itself from the vague mass of general sentience and become salient in consciousness. The more special the occasion, and the more intense the stimulation, the more definitely does the sensation-reflex stand out in its own proper character as distinguished from the physiological reflex. Coughing is an act required only now and then, when irritating matter happens to be lodged in the throat. Hence in waking life it is usually a sensation-reflex, when the mind is not otherwise too much pre-occupied, or when the irritation is intense enough to counteract even a strong pre-occupation. The act of swallowing belongs to the fixed routine of vegetative life, and is not in the ordinary course of things accompanied by a separately appreciable experience. But if we touch the back of the tongue with a finger, or tickle it with a feather, this is an interruption of routine requiring a special adjustment adapted to the special emergency, which cannot be made without a well-marked modification

* *Text-Book of Physiology*, book iii., ch. vi., p. 1421.

of consciousness. So, breathing is normally unconscious ;* but if any difficulty or obstruction occurs in the respiratory process, it at once becomes accompanied and prompted by painful sensations.

On the second point we need not say much. Where the mind is much pre-occupied, we may have a physiological reflex where otherwise we should have had a sensational reflex. As an extreme example of the effect of mental pre-occupation we may refer to the soldier who in the heat of the battle is unaware of being wounded. What most concerns us is the fact that at the lower levels of organic life, where action is largely or mainly reflex, so that higher processes play a comparatively small part, there can be very little mental pre-occupation. Thus, the lower we descend in the scale, the stronger is the presumption that a reflex act adapted to meet an occasional emergency is of a sensational and not merely of a physiological character.

§ 2. *Distinguished from Perceptual Reaction and Ideational Reaction.*—In sensation-reflexes specially coordinated movements follow the mere existence of a sensation as an isolated and transient experience ; the movements are not prompted and guided by any meaning which the sensation may convey. Where movement is determined by what the recognised quality of the sensation points to, by what it gives warning of, the reaction is to that extent perceptual or ideational, not merely sensational. The distinction may be illustrated by the difference between sneezing and repressing a sneeze. The sneeze follows the irritation of the mucous membrane. This is a sensation-reflex. It arises from the mere existence of the feeling of irritation. On the other hand, the

* This means that the breathing-sensations are normally merged in the mass of general sentience ; they are not normally prominent in consciousness, as they are when breathing is obstructed.

repression of an inconvenient sneeze, or the turning of the head aside, or similar measures of precaution, are at least perceptual acts and may involve distinct ideas. The agent performs them because he recognises the irritation as of a certain kind pointing to certain consequences which are inconvenient at the moment. What determines his conduct is the cognitive function of the sensation, not its mere existence as a feeling,—a transient and isolated experience. The presence of ideal representations in the way of mental imagery is not necessary. We may not be able to spare time to call up a mental picture or a verbal description of the consequences of sneezing in a person's face. A recognised sensory quality comes before the mind as having a certain special significance: it presents itself as a fragment of a whole; it points beyond its own existence; in virtue of this cognitive value which it possesses, it prompts to a certain line of action, such as the repression of the sneeze.

In this case, a sensational impulse comes into conflict with a perceptual, and it is a matter of doubt which will prevail. Many sensational impulses, when they reach a certain intensity, become quite uncontrollable even in human beings; this may help us to understand the almost mechanical way in which they repeat themselves without modification by experience in some of the lower animals, whose perceptual consciousness is comparatively little developed. For the power of learning by experience first arises with perception, with meaning and the acquisition of meaning. The purely sensory reaction, unguided by higher modes of consciousness, follows inevitably its appropriate stimulus. Thus a moth or a "daddy-long-legs" flies again and again into the flame in spite of the obviously painful result. Here we have apparently a sensory reaction uncontrolled by

perceptual consciousness. The brightness of the flame produces an immediate sense-impulse to move in its direction. But the light-sensation is not correlated with other experiences; it does not acquire a warning significance.

From the biological point of view, the action required in response to a stimulus is one which serves to maintain the life and well-being of the organism. The appropriate response may be determined by the special nature of the agency acting on the organism; and it may be more or less delicately differentiated according to the varying nature of this agency. In so far as this is the case, the reaction is perceptual rather than sensational. On the other hand, many agents differing in their own nature may impress the organism in a similar manner, and so give rise to a similar response. In so far as this is the case, the reaction approximates to the purely sensational type. Thus, when a part of the body is cut or bruised or otherwise suffers direct injury, it matters not at the moment whether a stone, a piece of wood, or a piece of iron, does the mischief. In each case, the rapid withdrawal of the part of the body affected, or of the body as a whole, is the appropriate reaction, and follows directly on the unpleasant sensation. It depends on the mere existence of the sensation as a painful experience; it does not depend on the specific nature of the sensation being recognised or known for what it is; this is only necessary when the specific nature of the sensation points to something beyond itself—to some special kind of material agent; and when the organism has to adjust itself in reference not to the immediate operation of this agent, but to its other qualities and modes of behaviour, as when an animal perceives its prey in the distance. Such adjustment requires a prospective attitude of mind, a state of expectant attention

and of preparation for future action. It is the beginning of a systematic coordination of successive actions, determined by the whole nature of the object which thus reveals its presence. Where the appropriate reaction takes place, so to speak, on the spur of the moment, and is not the commencement of a systematic combination of successive acts, so directed as to secure some remoter good or avert some remoter evil, it need be determined by nothing but the sense-experience as an immediate feeling, independently of its cognitive function.

§ 3. *Hedonic and Quasi-Conative Aspect of the Sensation-Reflex.*—The movements arising from sense-impulses display in a simple and distinct manner an antithesis which pervades all manifestations of mind. They are directed either, on the one hand, to the removal, avoidance, or abatement of the stimulation which excites them, or, on the other, to its detention, maintenance, or increase. The first kind of reaction may be called negative, and the second positive. The psychical states which find expression in these anthithetic types of movement, show a corresponding contrast of a two-fold character. The reaction of avoidance or repulsion is the outward manifestation of disagreeable consciousness, and also of what, on a higher level, we should call aversion, or, as Hobbes would say, "endeavour fromward;" the positive reaction is the manifestation of agreeable consciousness, and also of what, in a higher level, we should call appetition, or "endeavour toward." Appetition and aversion are the fundamentally antithetic directions of psychical activity; their contrast is a contrast which belongs to the conative or striving aspect of consciousness. Pleasure and the reverse are the fundamental anthithetic modes of feeling-tone. Their contrast is a contrast which belongs to the hedonic aspect of

consciousness. Now conation in the proper sense involves an attitude of consciousness towards a object. In this strict sense there can be no conation at the level of the sensation-reflex, for at this level there is no object. But the two other characteristics of conation may be and are present. There is present the tendency towards an *end-state* or *terminus*, and also a characteristic mode of consciousness which assumes two forms corresponding to the contrast of appetition and aversion. Similarly pleasure may exist as psychical affection though there is no object in which the subject takes pleasure. In the purely sensory impulse the analogue of appetition always actually coincides with pleasure, and the analogue of aversion always actually coincides with pain. At higher levels of psychical life, the coincidence between positive conation and positive tone of feeling, and between negative conation and negative tone of feeling is by no means complete. After a fashion, the sensation-reflex may be described as an activity inasmuch as it has a quasi-conative aspect in the way of appetition or aversion. But the activity involved is of a rudimentary and primitive kind, just as the process itself is of a rudimentary and primitive kind. The sensation-reflex consists in a single simultaneous act; in this respect it is contrasted with perceptual process, which may, and usually does, combine a series of distinct and successive acts in the unity of a single action directed towards a single end. Thus, in the case of perceptual activity, we may speak of progress towards an end, which may or may not be interrupted or obstructed in its course. In the case of the sensation-reflex, on the contrary, the word "progress" has little or no meaning. It is for this reason that in it appetitive tendency and agreeable feeling completely coincide. This is not the case in perceptual process, because disagreeable feeling may arise

through obstruction of appetitive activity, which none the less remains appetitive although it has become disagreeably toned. We are endeavouring to hit the nail on the head even when we miss it.

We may briefly describe the physiological process involved in a sensation-reflex as follows. A stimulus disturbs the equilibrium of the nervous system. The subsequent process consists in the recovery of nervous equilibrium. When this is accomplished the end of the whole activity is attained, and it ceases. To put it simply, the excitement is allayed. The tendency to equilibrium is the physiological correlate of what on the psychical side we call conation,—the striving aspect of consciousness. But the nervous system may regain its balance in two opposite ways. It may be that it can only do so by removal of the stimulation which starts the whole process. On the other hand, it may happen that the continuance of the stimulation for a longer or shorter time is a positive condition of the reattainment of equilibrium. In the first case, we have pain and aversion; in the second, pleasure and appetition. As a rule, the more important is the perceptual function of a sensation, the less emphatic is its feeling-tone, and the more it approximates to a mere sensation concerned in merely sensory reaction, the more emphatic is its feeling-tone.

§ 4. *Relative Purity of Sensation-Reflex.*—The same sensation may, by its mere existence as a momentary experience, issue or tend to issue in a certain movement, and at the same time it may also determine action by its significance. Thus the perceptual may mingle with the sensational impulse, so that in practice it may sometimes be difficult to draw the line between them. The two modes of consciousness blend in intricate ways and in varying

degrees.* In general, they bear an inverse ratio to each other. The lower we descend in the scale of animal life, the more important is sensation; the higher we ascend, the more important is perception. It should, however, be clearly understood that in theory the distinction between them is sharp and clear. This is peculiarly evident when the perceptual impulse depending on the meaning of a sensation is contrary to the sensational impulse itself, as when we repress a coming sneeze.

* This applies almost, if not quite, universally to the developed human consciousness. The nearest approach to the pure sensation-reflex in adult human beings is the reaction which accompanies intense bodily pain, especially if it occurs suddenly without the subject being prepared for it beforehand.

CHAPTER III.

DIFFERENTIATION OF SENSE-EXPERIENCE, AND ITS PSYCHICAL SIGNIFICANCE.

§ 1. *Differentiation and Integration.*—The lower we descend in the scale of animal life, the more important is sensation; the higher we mount, the more important is perception, in other words, the intrinsic intensity and feeling-tone of sensation counts for less; its meaning counts for more. The reaction which it sets up is directed not so much to the maintenance or removal of the present stimulation as to the attainment of remoter ends.

This graduated difference in the relative prominence of sensation and perception is accompanied and manifested by a corresponding variation in the nature of sense-experience itself. The more developed is perceptual consciousness the more delicately differentiated is sense-experience. In other words, there is a finer correspondence between differences in the nature of the external stimulus, and differences in the sensation produced. With this finer differentiation is connected more definite restriction. The more delicately discriminated sensations are, the more capable they are of co-existing simultaneously in the same consciousness without mutual interference or amalgamation. "Colours," says Dr. Ward, "are with us so distinct from sounds that—except as regards the drain upon attention—there is

nothing in the intensest colour to affect the simultaneous presentation of a sound. But, at the beginning, whatever we regard as the earliest differentiation of sound might have been incopresentable with the earliest differentiation of colour, if sufficiently diffused, just as now a field of sight all blue is incopresentable with one all red. Or, if the stimuli appropriate to both were active together, the resulting sensation might have been what we should describe as a blending of the two, as purple is a blending of red and violet."* Thus "increased differentiation seems to be intimately connected with increased 'restriction.'"† With differentiation and restriction there is loss of the intensity and of the intrinsic pleasantness or painfulness of the sensation itself. The intensity and feeling-tone of sensation need to be strongly emphasised, where the reaction depends directly on the mere existence of the sensation, as such. In so far as the reaction depends on the meaning of the sensation, and not on its mere existence, the important point is that its special quality should correspond accurately to the special quality of the stimulus. Any direct effect produced by its own intrinsic intensity and feeling-tone would interfere with its value as a vehicle of meaning—as an indication of something beyond its own existence. Thus, as perceptual consciousness becomes relatively more prominent and important, sensation is more delicately differentiated, more definitely restricted, less intense, and less strongly toned in the way of pleasure or pain.

§ 2. *Differentiation of Sense-Organs.*—Degree of discriminative sensibility corresponds broadly to the complexity and differentiation of the organs of sense. If the nerve-

* Article "Psychology," *Encyclop. Brit.*, ninth ed., part xx., p. 46.
† *Ibid.*

fibres running to the skin in human beings are laid bare and directly stimulated, "then, however they be stimulated, be the stimulus weak or strong, if consciousness be affected at all, the affection takes on the form of pain; psychological examination of the subjective result discloses nothing that can be called a sensation of touch."* Touch- or pressure-sensations, delicately differentiated as they are, and almost neutral in tone, and capable of combining in one moment of consciousness a great variety of qualitative differences, can only be developed by the help of special terminal organs. But cutaneous pain-sensations, and all organic sensations which are vague, diffusive, and strongly-toned, arise without the help of highly differentiated end-organs. Now, in the ascending scale of animal life, we find a growing complexity and differentiation of the terminal organs of sense and of their nervous connexions, marking a correspondingly graduated displacement of sensational by perceptual consciousness.†

In following the ascending scale of animal life, we find a gradual evolution of specialised structures for the reception of special kinds of external stimulation; beginning with those which are scarcely distinguishable from the general surface of the body, and ending with such elaborate organs as the human eye or ear. The best illustration is drawn from sight, because most is known about it. It must be understood that the word "sight" is here used to mean merely "sensitiveness to light." It must not be assumed that the sensations produced by luminous vibrations are the same in the higher organisms as in the lower.

* Foster, *Text-Book of Physiology*, p. 1427.

† This is only meant as a broad and schematic statement. In this or that special direction an animal lower in the scale may have a more differentiated sensibility than an animal higher in the scale.

A very rudimentary beginning of a special structure for the reception of light-stimulation consists simply in groups of pigmented cells with a nervous connexion. The pigmented material occurring in a semi-transparent organism arrests and absorbs the light. The limpet has eye-spots of this simple kind "on the outer side of the tentacles where the eyes are situated in more highly organised species."* The skin is thrown into a pit within which the epithelial cells are elongated and pigmented.

The next step is the development of a lens for condensing the light in the manner of a burning-glass. Some species of worms have only pigmented cells, others have a concentrating apparatus. These simple eye-spots, consisting of pigmented cells and a vitreous body or condensing lens, may exist in great numbers over the general surface of the organism. Thus in a species of worm called "Polyophthalmians" there is a series of eye-spots "along the sides of the body, in pairs from the seventh to the eighteenth segments."† Such rudimentary organs can only serve to render the creature sensitive to degree of illumination, to the transition from light to darkness; they thus make possible a protective reaction when the shadow of an approaching object falls on the animal.

The next important step is the development of a rudimentary retina, essentially consisting in a layer of rod-like nerve-endings. The eye of the snail is situated on its hinder horn or tentacle. It consists of a cornea or transparent horny integument, a lens, and a retina composed of three layers, (1) the rods, which are the proper organ of vision, (2) a cellular layer, (3) a fibrous layer. "In all probability the eye does little more than enable the snail to

* Lubbock, *The Senses of Animals*, p. 139. † *Op. cit.*, p. 134.

distinguish between light and dark." "It does not seem to be aware of an object unless it is brought within a quarter-of-an-inch of its tentacle."* The rods of the retina in which the optic nerve terminates in all probability merely render the animal differentially sensitive to different directions of the light. In many animals which possess these retinal rods the formation of an image in any way comparable to that thrown on the retina of the human eye is impossible from the position and convexity of the lens. These eyes with rudimentary retinas, more or less sensitive to direction, may be spread in great numbers over the surface of the body. There are certain species of a genus of sea-shore slugs called *Onchidium* which have these scattered eye-spots in varying numbers, some a hundred, others as few as twelve. The number differs in different individuals of the same species, and the eyes "are continually growing and being reabsorbed."† The back of the *Onchidium* contains a number of glands, each opening by a minute pore; and it has been suggested that when warned by the shadow of certain flying-fish which come out of the sea to prey upon them, the little slugs emit a shower of spray and so drive off their enemy.

The next stage in the development of the eye is the formation of a retinal image by means of a lens; it is necessary for this that each diverging pencil of rays from a point in the object shall be brought again to a focus in one point, and in only one point, of the retina. The delicacy and perfection with which this is effected depends on the complexity of structure of the retina, on the nature of the lens, and on the power of adjusting it for different distances. Cuttle-fish and their allies have well-developed

* Lloyd Morgan, *Animal Life and Intelligence*, p. 293.

† Lubbock, *The Senses of Animals*, p. 143.

apparatus for the formation of images. So have vertebrate animals, but of course in varying degrees. Many fishes do not distinguish their food (worms) at a greater distance than three or four feet. On the other hand, some of them have very accurate vision for short distances. "I have often seen," says Mr. Bateson, "a large Wrasse search the sand for shrimps, turning sideways, and looking with either eye independently, like a chameleon. Its view is so good that it can see a shrimp with certainty when the whole body is buried in grey sand, excepting the antennae and antennae plates."* Some reptiles and amphibians have similar accuracy of vision at short distances.

Besides this main line of development of the visual organ which leads up to the eye of vertebrates, with its apparatus for forming a distinct image by means of a lens and delicately sensitive retina, there is a branch line which leads to the compound or facetted eye of insects and of crustacea such as crabs and lobsters. The surface of these compound eyes is divided up into a great number of hexagonal areas, each of which is called a facet, and in some insects forms a little lens. A kind of dragon-fly is stated to have twenty thousand of these hexagonal facets. Beneath each facet is a crystalline cone, with its base towards the facet and its apex turned inwards, where it ends in great elongated cells; in the midst of these there is a nerve-rod. Dark pigment is developed round each of the cones. "Starting from a simple form of eye consisting of a lens and a nerve-fibre, we should arrive at the compound eye by bringing together a number of such eye-spots, and increasing the number of lenses, while the separate cells beneath each lens coalesced to form a single crystalline cone and rod." As regards the way in which

* Quoted by Lloyd Morgan, *Animal Life and Intelligence*, p. 287.

these eyes perform their function, there has been much dispute. But it is now pretty clearly made out that the facetted organs taken collectively fulfil in a different way the same office as the lens in the eye of vertebrates. Only those rays of light which go straight through a crystalline cone affect the nerve-rod. All the rest which strike the cones obliquely are absorbed by pigment. Thus, each of the cones conveys to its own nerve-rod a single minute spot of light coming from a single point in the field of view, and from that point only. The result is what Lloyd Morgan calls a "stippled image."* The range of vision with such eyes is much smaller, and the image which they form must be far less accurate and distinct than in the higher vertebrates.

* *Op. cit.*, p. 290.

CHAPTER IV.

LIGHT-SENSATION.

§ 1. *Introductory.*—Having given a general account of the nature of sensation, and of the sense-reaction, we now pass to the special senses, beginning with those we know most about, sight and hearing. Sight is a vehicle of spatial perception, and it is so in part because of the peculiar nature of visual sensation. But we shall postpone treatment of this part of the subject, until we come to deal with perceptual as distinct from sensational consciousness. At present we are only concerned with the peculiar modifications of consciousness specifically corresponding to differences in the nature of the physical stimulus which we call light. In other words, we have to deal with colour-sensations, including the neutral tints, white, black, and intermediate greys.

§ 2. *Nature of the Stimulus.*—Physically considered, light is an undulating movement of the particles of a generally diffused medium called the luminiferous ether. For our purposes, we may represent this undulating movement by the waves which pass along a rope, when it is fixed at one end, and jerked up and down by the hand at the other. As the wave traverses the rope, what travels along it is not of course the material particles of the rope themselves, but only a form of movement which is transmitted from one

set of particles to another. The hand may move more or less quickly; the more quickly it moves, the shorter are the waves. In the undulating movement the particles of the rope first rise above and then fall beneath their position of equilibrium when the rope is at rest. They rise to a crest, and sink into a hollow. The length of the wave is measured by the distance between the point at which this movement begins and the point at which it terminates. Longer waves traverse the rope in the same time as shorter ones; hence the shorter wave must be more frequently repeated in the same time. Thus the shorter the wave the shorter time it takes to complete itself. The *amplitude* of the wave must be carefully distinguished from its *length*. The hand, while continuing to repeat its movements in the same time, and consequently producing waves of the same length, may take a more or less extended swing. The more extended the swing, the greater is the amplitude of the waves that traverse the rope. The particles of the rope rise higher and sink lower; their crests are higher and their hollows deeper. Suppose now that the hand, in making its excursion to and fro, also trembles. Two different kinds of impulse are then communicated to the rope, each of which separately would give rise to waves of different length. The result is waves of a more complex form which can be mathematically explained as due to a combination of the waves which the separate impulses would severally produce.

Thus we can distinguish three characteristics of an undulating movement: (1) wave-length, (2) amplitude, (3) simplicity or complexity. In the case of light, each of these characters of the physical undulation is specially connected with a corresponding characteristic of visual sensation. Differences of *wave-length* are specially connected

with differences of colour-quality other than those which are constituted by degrees of paleness or darkness, viz. by more or less resemblance to white or black. Colour-quality in this restricted sense is called *colour-tone*. For example, the difference between yellow and green, or between yellow-green and a still yellower green, is a difference of colour-tone. The difference between yellow and yellowish-brown is difference in saturation due to a darkening of the yellow. The *amplitude* of the wave is specially connected with the intensity of the sensation. Any specific colour-tone, such as green or red, produced by light of a certain wave-length, may be made brighter or less bright by increasing or diminishing the intensity of the light, viz. the amplitude of the vibration. It may become brighter without alteration of its colour-tone. If we have a series of greys including what we call white, arranged in a graduated scale of brightness, it is possible to fix the brightness of a given colour, such as green, by comparing it with the greys. It is judged to be equally bright with one of them, and more or less bright than the rest. The *complexity* of a wave determines what is called the *degree of saturation* or purity of the corresponding colour. We can, as we have seen, compare a green with a grey or white in respect of intensity or brightness: but we can also compare it in another respect: we can ask how far the green resembles the grey in quality. It may be a greenish grey or a greyish green, or apparently a pure green. The more it approximates to grey, the less saturated it is, and the more free it is from any apparent admixture of grey, the more saturated it is.

It must not be supposed that colour-tone is determined solely by wave-length, intensity solely by amplitude,

and degree of saturation solely by complexity. It is only within certain limits that the physical intensity of light can be varied without affecting colour-tone. Variation in the intensity of the light also affects saturation; increase makes the colour whiter, and decrease makes it darker. Wave-length not only determines colour-tone, but also helps to determine brightness. Some colour-tones are brighter than others, even though the physical stimulus is less intense. Complexity of vibration is a very important factor indeed in determining colour-tone. The same colours which are produced by simple waves can be produced by complex waves also, though in a less pure or saturated form. White or grey results from a combination of lights of all wave-lengths, and also from various other combinations. In ordinary daylight, all wave-lengths are combined.

§ 3. *Structure of the Eye.*—For anatomical detail we must refer to the text-books of physiology. The eye as a whole is analogous to a photographic apparatus. "In it a camera or dark chamber of notable size exists similar to that which a photographer uses, having a lens in the fore part, and a sensitive curtain at the back..... When the photographer looks in at the back of his camera, he sees on the ground glass plate the image depicted which he wishes to photograph, placed upside down, but faithfully delineated in all its colours; and such an inverted landscape is formed in like manner in the back part of each of our eyeballs. And as the photographer adjusts the focus of his instrument by altering the position of the lens, screwing it nearer or further from the screen, so we adjust the focus of our eye instinctively according to the distance of the object looked at, not indeed by changing the position

of the lens but by altering its form so as to make it stronger or weaker as required."*

The sensitive curtain is called the *retina;* when an object is looked at directly by a normal eye the optical image of that object is focussed upon a small oval area about the centre of the retina known from its colour as the "yellow spot." This area, in the centre of which is a minute depression or pit called the *fovea centralis*, is in ordinary light by far the most discriminative part of the retina, and it alone gives distinct vision of an object. Near it on the nasal side, the optic nerve enters the eye and pierces the retina to send its fibres radiating over the inner surface, and the spot at which the optic nerve comes through being insensitive to light is called the *blind spot.* The retina, although a very thin and delicate membrane, consists of several distinct layers. In the innermost layer the fibres of the optic nerve are spread out. The outermost layer consists wholly of minute rod-like structures packed closely side by side and perpendicular to the surface of the retina. These are the elements in which the light rays produce their immediate effect, probably chemical changes. They are of two kinds, called respectively the rods and the cones, and are connected with the nerve fibres of the innermost layer by highly complex systems of fibres which make up the middle layers of the retina. In the *fovea centralis* the cones alone are present of all the retinal constituents. The proportion of rods to cones increases from the *fovea* towards the periphery, and outside the area of the yellow spot the rods predominate largely. The retina differs from all the sense-organs except the olfactory in being an out-growth of the brain.

* Cleland, *Evolution, Expression, and Sensation*, pp. 77, 78.

§ 4. *Descriptive Analysis of Light-Sensations.*—We must distinguish between neutral tints and colours proper. Neutral tints consist of black and white and intermediate greys. Starting with pure black, we can arrange the greys in a series, so as to pass by gradual transitions to pure white. Each grey may be interposed between two others which it resembles so closely as to be barely distinguishable from them. It differs from the one which precedes it in being a little lighter, and from the one which follows it in being a little darker. Thus, though the greys differ, the general form of transition between them is throughout identical.

The eye is capable of distinguishing about 700 shades of grey, from the deepest black to the most brilliant white. It should be noted that though black is not due to a positive physical stimulus, as other visual sensations are, it is yet a positive experience. The eye which sees darkness is not at all comparable with the back of the hand, which sees nothing. There is reason for believing that the grey field which is present to consciousness in the absence of light is due directly to a brain-process, and does not involve excitation of retinal elements at all.

Differences of colour-tone, apart from differences of saturation and intensity, are best studied in the order in which they occur in the spectrum. The spectrum is formed by passing ordinary white light through a prism, and so breaking it up into its component simple lights, and projecting these on a screen. The simple components of the white light are then arranged in a series in the order of their wave-lengths. At one end are the longest wave-lengths, giving the sensation of red, at the other the shortest, giving the sensation of violet, viz. a blue tinged with red. Between the red end and the violet end are interposed all the

various colour-tones,* with the exception of the purples. The purples can be formed by intermixing red and violet lights in varying proportions. In what follows we shall suppose the spectrum completed by the addition of these purple tints, so as to form a closed figure.

We have said that colours are best studied in the *order* in which they occur in the spectrum. But unfortunately the spectrum is unsuitable in other respects for the analytic comparison of colour-tones. In comparing a series of colours merely with reference to their colour-tones, their brightness and saturation ought to be kept as uniform as possible. But the colours of the spectrum differ greatly in brightness. Hence in what follows we shall suppose a series of colours arranged in the order of the spectrum, but uniform in

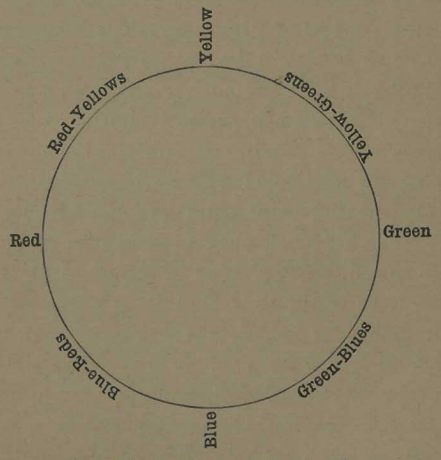

Fig. 2.—Circle illustrating serial order of colour-tones.

brightness and saturation. Such a series may be made

* Not of course all degrees of saturation and intensity.

by taking bits of transparent coloured paper, and adjusting their degree of brightness and saturation by placing bits of grey or white paper underneath them.

The whole series of colour-tones, beginning with red and returning to red, is continuously graduated, like the grey series of which we have just spoken. But there is an important difference. In the region of greatest wave-lengths, the transitions are from red to yellow; each member of the series is interposed between two others which it resembles so closely that the difference is barely perceptible, but it differs from the one in being redder, and from the other in being yellower. Thus the form of transition in the series is uniform throughout, and is quite analogous to that between black and white. But after passing yellow, there occurs what may be best described as a change of direction. The transition is still continuous; but it now takes place between yellow and green. We begin with greenish yellows, and pass by the smallest perceptible transitions to yellowish greens, and so to pure green. After passing green there is another change of direction; we now have a green-blue series. There is still another turning-point after passing blue; the series which follows is blue-red, passing from blue through violet and purple to red. The change of colour in the spectrum is throughout so continuous that it is not possible to fix the exact point at which these changes of direction begin. All that can be said is that they begin somewhere in the region of red, yellow, green, and blue, respectively. Since the change of direction occurs, it must occur somewhere. At the precise point of its occurrence, there must be a simple colour-tone, such as pure red, pure yellow, pure green, or pure blue. For instance, pure yellow is the point of transition between

the red-yellows and the green-yellows, and pure red is the point of transition between the purples and the red-yellows.

It may be well to note here a question of some psychological interest which has been much discussed. Is it right to say that a blue-green is a combination of blue and green, or a red-yellow a combination of red and yellow? It has become the fashion of late to say that such a colour as a blue-green merely resembles blue and green, but does not contain them as constituent elements. The colour itself, it is maintained, is perfectly simple. Now it is natural for common sense to distinguish one blue-green from another, by saying that there is more or less of blue in it, or more or less of green in it. It does not appear to the present writer that any cogent arguments have been brought forward to show that this point of view is untenable. A blue-green may approach so very near to pure green as to be barely distinguishable from it, so that the casual observer would regard it as a pure green. It seems strange to say that such a blue-green contains no green at all. What is probably in the mind of those who deny the combination is that a blue-green cannot be simply defined as blue+green. The components by entering into so intimate a combination are modified in a peculiar way. This modification is a new element which may be regarded as simple. The experience of the combination of blue and green is a simple experience, and seems to be identical in kind with the experience of the combination of yellow and red, and other such pairs. But the components abstractly regarded are not the less*

* Of course they are not *separable*, but they are under appropriate conditions *distinguishable*. The respect in which blue and blue-green are seen to resemble each other when compared is different from the respect in which green and blue-green resemble each other when compared. This

discernible as partaking of the nature of blue and green. Because there is something new and simple in the experience, we have no right to infer that there is no complexity in it. It must, however, be admitted that the question is not an easy one; and the balance of authority seems to be against the view which I am inclined to favour. But in any case it is most convenient to speak of such a colour as blue-green as a combination of blue and green. If the student is not inclined to believe that the colour actually is complex he may interpret the statement that blue-green is a combination of blue and green as merely meaning that on the one hand it resembles blue, and on the other resembles green.

So far we have only considered difference in colour-tone, apart from difference in intensity and saturation; but all the colours of the spectrum may vary in either of these respects so as to form a continuous series. Each of them may be made more or less pale by an admixture of white light. If the general intensity of the illumination be increased or diminished while the spectrum is being examined, and if the increase or diminution is not too great, the result is that all the colours in the spectrum vary in brightness while remaining the same in colour-tone. But the change in brightness is in general accompanied by a change in saturation. Increased brightness makes a colour paler, and decreased brightness makes it darker—causes it to be mixed with black. When the increase or decrease is made sufficiently great, the colour-tones tend to disappear in mere whiteness or blackness, respectively. They may be mixed with white light, and

appears to me a sufficient reason for inferring complexity in the blue-green. I would add that I do not assert the absolute simplicity of yellow, blue, red, and green. They also may have simpler constituents.

also lowered or increased in intensity, so that both changes are combined. All the colour-differences recognised in ordinary life may be accounted for in these various ways. They are constituted by differences in primary colour tone, in intensity, and in saturation. Pink and rose-colour are whitish reds; maroon is a dark red, *i.e.*, a red so diminished in intensity as to be strongly infused with black. Olive is a dark green. We usually call a pale green or blue a light green or blue. The series of colour-modifications obtained by making a colour-tone, such as blue, paler or darker is psychologically quite analogous to to such a series as that of the blue-greens. Here, too, the question of simplicity or complexity arises. Those who maintain that no two distinguishable parts of the blue-green series have, *qua* sensations, any common element, but that they are all simple and independent colour-qualities, must maintain the same for the blue-black series. They must maintain that a black in which only the artist's eye detects a tinge of blue has no element in common with pure black, or with black that has a barely appreciable tinge of green.

Intensity is by no means independent of colour. In the spectrum, the physical light is most intense in the region of red. But for our experience the yellow is distinctly the brightest colour. The blue is less bright than the red, but the difference is by no means in proportion to the difference in the intensity of the illumination.

It should be noted that the red of the spectrum is not pure red, but, as Hering pointed out, is tinged with yellow.

§ 5. *The Retina's own Light.*—In the total and continued absence of external light, there still exists a field of view which does not consist of mere darkness. Upon a back-

ground of medium grey, there are seen specks and clouds of colour. This is due to the fact that retinal elements and the visual centres of the brain are continually being stimulated by such internal processes as the circulation of the blood and the re-distribution of heat. This internal stimulation is called the *retina's own light* (*Eigenlicht der Retina*). The sensation of black is not obtained in its purest form in the complete absence of external stimulation. It arises when the eye is closed or passes to some surface that stimulates it in a slight degree only after gazing steadily at any sharply bounded bright surface upon a dark background.

§ 6. *Total Colour-Blindness.*—The extreme margin of the retina is totally colour-blind. Let the eye be fixed upon an object immediately in front of it, and let someone gradually introduce an unknown coloured object into the field of view from one side. On its first entrance into the field of view, the object will appear white, grey, or black. Its colour will only become recognisable as it approaches the centre of the field.

Again, when the illumination is sufficiently faint, the whole of the retina, with the exception of the yellow spot, is totally colour-blind. All the colours of the spectrum pass into grey when the light is made dim enough. When we pass from ordinary daylight into a dark room, we are not at first able to discern objects: but after a time the eye adapts itself to the faint illumination. It then becomes able to discern objects but not their colour-tones. It sees everything in black, grey, and white only. It has been shown that the sensation of grey which persists when the illumination is so lowered that colour disappears is, in all probability, a function of the rods only. Accordingly the *fovea centralis*, in which rods are not present,

does not become adapted in the same way. If a small patch of coloured light is thrown upon it, decreasing illumination causes the colour to disappear altogether, but does not transform it into a patch of grey. Cases have been carefully examined and recorded of persons who showed an entire want of sensibility to colour-tones, not only under faint illumination, but under all conditions. They saw everything in black and white. In most of these pathological cases, though not in all, there is an alteration in the distribution of the intensity of light-sensation in the spectrum. For the normal eye the region of greatest brightness is that of yellow light; for the totally colour-blind, it lies in the green rather than in the yellow portion of the spectrum. It is a notable fact that the spectrum, as seen under sufficiently faint illumination, shows the same change in the distribution of the brightness of its parts. The totally colour-blind cannot for the most part bear illumination of ordinary strength. They can see well in a dim light, but are painfully dazzled by full light. This indicates that their ordinary condition is analogous to that of a normal person whose eyes have been adapted to twilight vision. Colour-blindness is common to both cases. Probably the special apparatus that is brought into play in twilight vision, and whose seat is in the rods, is the only apparatus that is functional in most cases of totally colour-blind eyes. Recent research seems to show that this special apparatus is constituted by the rods of the retina as distinguished from the cones.

§ 7. *Partial Colour-Blindness.*—Between the outer margin of the retina and the yellow spot, there is a zone which is partially colour-blind. It is sensitive to blue and yellow, but not to red and green. This may be tested by an

experiment similar to that described in the previous section. When the colours of the spectrum are seen sideways, so that they fall on the partially colour-blind zone of the retina, the blue-green region appears grey. This grey divides the whole spectrum into two parts. The part containing light of greater wave-length appears yellow, that containing light of smaller wave-length, appears blue. Red and green are not discernible.

It is well known that there are many persons whose whole retina is affected by a partial colour-blindness, consisting in an inability to distinguish between red and green. Now, abstractly considered, this inability to distinguish between red and green may arise in either of two ways. A person who was insensitive to both red and green could not of course distinguish them from each other. But the same might hold true of a person sensitive to red and not to green, or to green and not to red. If we suppose yellow to be due to a combination of the retinal processes which are produced by red light and green light respectively, persons insensitive to red would see all yellows as green, and those insensitive to green would see all yellows as red. Both modes of explaining partial colour-blindness have been, and still are, advocated. On the whole, it seems most probable that in the partially colour-blind the retina is equally incapable of giving rise to sensations either of red or green. But the question is full of difficulty. The evidence shows clearly that there are two distinct types of partial colour-blindness, and it has been maintained that in the one type the sensation *red* is absent and in the other type the sensation *green*. But instances have occurred in which only one eye has been colour-blind, the other eye being normal. These instances have belonged to the type

which would be classed as *red-blindness* by those who distinguish between red-blindness and green-blindness. Now in such cases the colour-blind themselves testify that the colours they see with the abnormal eye are yellow and blue, and those they fail to see, red and green. They see the spectrum as composed of yellow and blue, with a grey region in which normal persons see blue-green.

If we suppose that partial colour-blindness consists in the absence of the sensations both of red and green, we must find some explanation of the difference between the two types which are on the opposite view distinguished as red-blindness and green-blindness. In both types it is possible, by mixing in varying proportions light from the short-waved end of the spectrum with light from the long-waved end, to produce all the colour-tones which they are capable of seeing when their retina is affected by intermediate simple lights. In type i. (the so-called red-blind), the rays at the extreme end of the spectrum, which give distinct sensations of red to the normal eye, produce no appreciable effect of any kind, and other reddish rays produce only faint sensations. In type ii., the retina is sensitive in some way to rays at the red end of the spectrum; and in general, reddish rays produce more intense sensation of some kind than in type i. In comparing a certain reddish yellow with a yellow almost free from red, the intensity of the reddish yellow light must be made about four times as great for type i. as for type ii., in order that the resulting sensations may be indistinguishable in intensity and colour-tone. Clearly there is a great difference in sensitiveness to red light in the two types. But it by no means follows that the red light produces the sensation *red* in type ii. and not in type i. The most probable explanation is that the red light has a greater

power of producing the sensation *yellow* in type ii. than in type i.*

A corresponding difference is found in normal persons in regard to sensations of yellow. "If by means of a special arrangement we bring a certain amount of the red part of the spectrum and a certain amount of the green part of the spectrum on to the eye at the same time, the result is a sensation of yellow. . . . By the same arrangement we can bring on to the eye at the same time a certain amount of the actual yellow of the spectrum. In this way we can make a match between a mixture of spectral red and green, on the one hand, and spectral yellow on the other, comparing the mixed† sensation derived from two parts of the spectrum with the sensation derived from a single (yellow) part. We have to adjust the quantities of red light and green light until the mixture seems of the same hue and the same brightness as the yellow, not showing either a reddish or a greenish tone. When this is done it is found that different people differ very materially as to the proportion of red and green, the proportion of the intensities of the two lights, necessary to make the match with yellow."‡

§ 8. *Effects of the Mixture of Lights of Different Wave-Lengths.*—When lights of all wave-lengths are intermingled in due proportion, the result is grey or white. If in the mixture there is a relative predominance of some one light, such as green or blue, the result is a whitish green or a whitish blue.

* Professor G. E. Müller has given an elaborate explanation of how this takes place. See *Zeitschrift f. Psychologie und Physiologie der Sinnesorgane*, Band XIV. Heft 3 und 4, p. 182.

† The sensation as distinguished from the stimulus is not mixed. Physiologists are apt to confuse the two things.

‡ Foster, *Text-Book of Physiology*, part iv., pp. 1240-1241.

If we select any colour of the spectrum, it is possible to find some other colour which, mingled with it in due proportion, will yield a neutral tint. If one of the components of the mixture is present in greater quantity than is required to produce a grey, the predominant light gives its own colour to the mixture. The other light diminishes the degree of saturation. Thus, if golden yellow and blue be mixed in proper proportions, they yield the sensation of white. As the proportion of blue is increased, the white becomes more and more a bluish white; as the proportion of yellow is increased, the white becomes more and more a yellowish white. Colours which, intermixed with each other, yield white, are called complementary. Yellow is complementary to blue. The red of the spectrum is not complementary to green, but to a bluish green. It should be remembered, however, that the red of the spectrum is not pure red, but yellowish. As every discernible colour of the spectrum possesses its complement, either within the spectrum or in the purple series, the pairs of complementary colours are indefinitely numerous. If the simple lights corresponding to colours which are not too far removed from each other in the spectrum are mingled, the result is a colour corresponding to an intermediate light. If we include the series of purples so as to form a colour circle the wider the interval separating the mingled colours the whiter is the resulting colour. When the interval becomes sufficiently wide, mixture in proper proportion yields pure white. For instance, by mingling the simple lights which severally produce blue and green, we can obtain all the blue-greens. A larger proportion of the blue light yields a bluer green: a larger proportion of the green light yields a greener blue. If we mix blue with yellowish-green, we obtain a green mingled

with the white due to the combination of blue and yellow. This green may be relatively pure or it may be bluish or yellowish according to the proportion of blue or yellow light in the mixture. The combination of of pure blue with pure yellow yields white. If, proceeding further, we mix blue with red, we obtain a new colour not contained in the spectrum,—purple. By mixing the red light of the spectrum with the green in certain proportions we produce yellow: by increasing the quantity of red light, the yellow is made redder; by increasing the quantity of green light, the yellow is made greener. The laws of combination which hold good of simple lights apply also to those mixtures which produce the same colours as the simple lights.

If we select three colours so related that by combining any two of them we can obtain a colour which is complementary to the third, it is possible, by varying combinations of the three, to produce all the colours of the spectrum. But there is only one triplet of colours by which the rest can be produced in a high degree of saturation. This triplet is red, green, and a bluish violet. For this reason red, green, and violet, have been called primary colours.

The best method of mixing lights of different wavelengths, so as to ascertain the resulting sensation, is to allow two different parts of the spectrum to fall on the same part of the retina at the same time. Another way is by using the colour-wheel or colour-top. Sectors of the colours to be investigated are placed on a disk. The pigments used in colouring must be as pure as possible; in other words, they must as nearly as possible reflect simple and not compound lights.* The disk is set

* The mixture of the pigments themselves, in the way that artists mix them, is by no means equivalent to a mixture of the lights which they reflect.

rapidly spinning so that one kind of light is brought to bear on the retina before the effect of the other has ceased. Thus the different modes of stimulation are superposed. If one sector of the disk is blue, and another yellow, and if the colours are present in due proportion, the rapidly rotating disk will appear grey.

§ 9. *The Effects of Contrast.*—A man passing a street-lamp in moonlight casts two shadows. That which is cut off from the light of the lamp and only illuminated by the moon, appears blue. Now, moonlight is white or nearly so. The blue appearance of the shadow is due to contrast with the yellow illumination thrown by the lamp on the surrounding field of view. The excitement of the retina by the yellow light indirectly affects that portion of the retina or of the central nervous matter which is not directly excited by it. The influence thus exerted by the yellow light produces an effect similar to that which would be produced by a blue light acting directly. Now blue is complementary to yellow. The general law of contrast is that a colour in any part of the field of view tends to tinge adjoining parts with its complementary colour. The effect is greatest when a large field of uniform colour acts on a small one. A small spot of grey on a relatively extensive field of blue, appears distinctly yellowish. If a small spot of red be substituted for the grey, it will combine its own colour with the contrast colour. It will appear yellowish red or reddish yellow. The effect of contrast is most marked at the meeting-point of the two colours. It is interfered with by lines of demarcation separating them, such as a pencil-mark drawn round the red spot on the blue field. It is also interfered with by differences in the texture of the coloured surfaces. For these reasons, it comes out most clearly when contours are obliterated, and differences of

texture reduced to a minimum. The most favourable conditions are obtained in the case of coloured shadows, or by projecting the light from coloured glasses on a wall, or by means of coloured disks in rapid rotation with the colours in concentric zones. A simple method is to place a small piece of paper on a larger sheet, and to cover both with a sheet of tissue paper. The tissue paper obliterates contours and conceals difference of texture. The contrast effect is of course in general stronger in proportion as the direct excitation of the part of the retina affected by it is weaker; thus grey is better to experiment with than white. The influence of contrast is also operative between black and white. The same grey will appear darker on a white background, and lighter on a black background. If contrasted colours are complementary to each other, the contrast renders them more saturated.

§ 10. *The Negative After-Image, etc.*—"If, after looking steadfastly at a white patch on a black ground, the eye be turned to a white ground, a grey patch is seen for some little time. A black patch on a white ground similarly gives rise when the eye is subsequently turned towards a grey ground," to the image of a white patch. These after-images, which follow the removal of the primary stimulation, are called *negative images*. "When a red patch is looked at, and the eye subsequently turned to a white or to a grey ground, the negative image is a greenish blue; that is to say, the colour of the negative image is complementary to that of the object. Thus also orange produces a blue, green a pink, yellow an indigo-blue, negative image, and so on."* When the primary stimulation is very transient, it may give rise in the first instance to a positive image, as we shall see later. Negative images

* Foster, *Text-Book in Physiology*, part iv., book iii., chap. iii., p. 1266

arise also when the eye is simply closed after the primary stimulation as well as when it is turned to a different background.

It is not absolutely necessary for the occurrence of negative images that the primary stimulus should be removed. The same result may be brought about by diminishing its intensity. If we steadfastly gaze at a red spot on a yellow ground, and then diminish the intensity of the illumination by turning down the light or otherwise, a green spot upon a blue ground will appear instead of the red spot on a yellow ground.

The same process is manifested in a different way while the eye is actually subject to the primary stimulation in undiminished intensity. If we gaze long and steadfastly at any colour, it gradually becomes less saturated; the effect of steadfastly gazing at yellow is the same as that produced by gradually mingling the yellow light with more and more of its complementary blue. It becomes paler. We may gather these facts under one formula. The continuance of the same mode of stimulation tends to produce a contrast effect, not only on adjoining portions of the retina, but also on that portion which the stimulus directly excites. This contrast effect takes the form of a negative image when the primary stimulation is withdrawn or sufficiently weakened. When the stimulus is continued so as to maintain its positive effect, the contrast effect mingles with this, so as to produce loss of saturation. In this way, the yellow illumination of a gas-light or candle practically becomes equivalent to white light when it is long continued. It is noteworthy that negative images modify each other's colour-tone by contrast, and this even in cases in which it is difficult to obtain a contrast effect under ordinary conditions. The negative image of a red patch on a white

ground is blue-green; the negative image of the white ground which surrounds it is reddened by contrast. This is important, because it shows that contrast phenomena are not due to errors of judgment, as has been maintained by Helmholtz.

§ 11. *The Positive After-Image, etc.*—Light acting on the retina takes a certain time to produce its full effect, and the retinal excitement takes a certain time to disappear after the stimulus has been removed. If we take a black disk with a white sector, and set it in very rapid rotation, the whole disk appears to the eye as a uniform grey. As the white sector is whirled round, it affects successive portions of the retina, but by no means so intensely as if it continued to act on the same part. Owing to the rapidity of the rotation, it returns again to the same point before the effect of the previous stimulation has become appreciably diminished. The result is a uniform grey identical with that which would be produced if the white light from the sector were equally distributed over the whole surface of the rotating disk at rest. The persistence of the visual sensation after the stimulus has ceased gives rise, under certain conditions, to what is known as the *positive after-image*. To obtain this, the eye must briefly glance at an object, instead of steadfastly gazing at it. The conditions are most favourable when an eye which has for some time been withdrawn from the influence of light is momentarily exposed to a somewhat strong stimulus. "Thus if immediately on waking from sleep in the morning the eye be directed to a window for an instant and then closed, an image of the window with its bright panes and darker sashes, the various parts being of the same colour as the object, will remain for an appreciable time."*

* Foster, *op. cit.*, p. 1265.

§ 12. *Physiological Theories of Light-Sensation.*—Very little indeed is known by direct observation and experiment about the physiological processes either in the retina or in nervous matter corresponding to light-sensation. The theories on the subject are hypothetical constructions based on physical and psychological data. The two which are best known are those connected with the names of Helmholtz and of Hering respectively. Neither of these is satisfactory; but that of Hering is based on a more complete survey of facts; and if it is not right, it may safely be said to be on right lines. It has recently been greatly modified and improved by Prof. G. E. Müller, but his views are at once too complex and too recent for us to deal with them here. We shall therefore refer to Hering's theory mainly in its original form.

The theory of Helmholtz is primarily based on the facts of colour combination regarded from a physical point of view. The aim is to account in the simplest way for the production of the same colour by many different combinations of physical light. Helmholtz believed that this could be done by assuming three, and only three, ultimate physiological processes. Each of these processes takes place in the first instance in the retina and is conveyed by its own special nerves to the brain, where it produces a corresponding specific nervous excitation. The processes severally correspond to the sensations of red, green, and blue. Their combination in equal proportions yields the sensation of white or grey. Every kind and combination of light excites all three processes. Hence no colour under ordinary conditions of stimulation is ever quite saturated. It always contains a certain intermixture of white. By combining in various proportions the red and the green processes, the green and the blue, the red and

the blue, all the colours of the spectrum, together with the purple, may be obtained.

This theory seems a highly satisfactory account of the results of combining lights of different wave-lengths, so long as we do not test it by psychological analysis of the resulting sensations. But when we do this, a difficulty occurs in the case of white and yellow. By mixing green light with blue light, we obtain a blue-green. This, says Helmholtz, is due to a compounding of the physiological processes corresponding to blue and green respectively. His account of the matter is borne out by a scrutiny of the sensation itself. A blue-green partakes of the nature both of blue and green: it resembles both of them at once. It resembles each in varying degrees according as blue or green preponderates. But by mixing red and green lights we produce, not reddish green but yellow. The yellow does not partake of the nature both of red and green, as blue-green partakes of the nature both of green and blue. No analytic scrutiny of sensation can discover such a colour as a reddish green. The same is true of white. White, according to Helmholtz, is a compound of all three ultimate physiological processes. But, as a matter of fact, the sensation of white does not partake at once of the three colour-tones, red, green, and blue.

Objections of this kind will probably have different weight with different persons. But it so happens that they are confirmed by some very important facts connected with colour-blindness. If white arises through a combination of the three elementary processes, all the colour sensations ought to be possible when the sensation of white is possible. But, as we have seen, there are well-established cases of total colour-blindness. Here all three elementary processes are absent, and yet the sensation of white

remains unimpaired. On the theory of Helmholtz we must say that the three elementary processes are really present, but that they are on all occasions excited in equal proportions by all kinds of light. This is a rather improbable assumption, but the improbability becomes increased to the verge of impossibility, when we consider that the same hypothesis must be applied to a number of other cases in which colour-sensibility is absent, and sensibility to white and black is preserved. All lights of whatever wave-length, produce only neutral sensations, when they act on the retina for a very short time. All the colours of the spectrum pass into grey when the illumination is sufficiently diminished. They pass almost completely into white when the illumination is sufficiently intensified. The extreme outer margin of the retina is sensitive to white, but totally colour-blind. Under all these varying conditions we must, according to Helmholtz, suppose that the three elementary colour-processes are present, and that the only reason why the corresponding colours are not perceived is that the processes are always excited in equal proportions.

An equally serious objection arises from cases of partial colour-blindness. It is evident that, if Helmholtz is right, the absence of one or more of the elementary colour-processes must involve the absence of the sensation of white, which is due to their combination in equal proportions. "A person who is green-blind ought, upon this supposition, to see in white only its red and blue constituents, and hence white ought to look to him as purple looks to us. As long as his defect made him incapable of explaining to us what he felt, this might perfectly well, for aught we knew, have been the case. But we know now that a person who is green-blind in one eye only sees

white with his defective eye exactly the same as he sees it with his normal eye."* A similar argument applies also to yellow. The partially colour-blind usually retain the sensations of yellow and blue, although they are without the sensations of red or green or both. There is a marginal zone of the retina at which the sensibility to red and green ceases, and that to yellow and blue is retained. So, with great increase in the intensity of illumination, red and green are still discernible in the spectrum, though yellow and blue disappear. Such facts as these are incompatible with the supposition that yellow is due to a combination of the red process and the green process.

If the theory of Helmholtz is unsatisfactory in its account of colour-combination, its failure to explain other facts of light-sensation is still more conspicuous. It accounts for contrast effects between adjoining colours as errors of judgment. A fuller investigation of these phenomena has shown that such an hypothesis is quite untenable. The colour-produced by contrast appears and behaves in all respects like the colour produced by direct stimulation. Negative images are explained by Helmholtz as due to fatigue. By long continuance, one or more of the ultimate colour-processes become exhausted, so that the others are predominantly aroused either by stimulation from without, or from the retina's own light. One objection to this view is that, on the principles of Helmholtz, fatigue of all three processes must be constantly taking place, as all three are excited by every kind of light. Now the fatigue which is to explain negative images must take place in the course of a few seconds. Hence we should expect a very conspicuous effect of fatigue from the ordinary use of the eyes

* C. L. Franklin, "On Theories of Light-Sensation," *Mind*, N.S., vol. ii. (1893), p. 479.

in daylight. Hardly any capacity for light-sensations of any sort ought to be left at the end of an hour, especially after exposure to predominantly white light, which must exhaust all three processes equally.

In Hering's theory, a strenuous attempt is made to escape the difficulties which beset that of Helmholtz. Following the clue given by psychological analysis of light-sensations, he assumes six ultimate processes, corresponding to the sensations of white, black, red, green, yellow, and blue. These he arranges in antithetic pairs; white and black go together, and similarly red and green, blue and yellow. To each pair there corresponds a separate retinal substance, and a distinct modification of central nervous matter. The red-green substance is susceptible of two antagonistic processes, chemical in their nature. Red light excites the one, and green the other. When red and green light are combined in equal portions, neither process is produced because of their mutual incompatibility. Hence there is no such colour as a reddish green. But both the red and green act on the black-white substance, so as to produce the sensation of white. When red or green sensations occur, their intensity is mainly due to this excitement of the black-white substance. Hence, when red and green light act simultaneously in equal proportions, though the two stimulations neutralise each other as far as their colour effect is concerned, they continue to act on the black-white substance, and produce the sensation of white. The relations of the blue and yellow processes are analogous. The black and white processes are supposed by Hering to be antagonistic in much the same way; but as a matter of fact there must be an essential difference here, as black and white combine to form intermediate greys, so that the two processes are not incompatible any more than

the blue and green, or the yellow and red processes are.*

Hering is no doubt right in assuming that the processes corresponding to black, white, red, green, blue, and yellow, are separate and distinct in their nature, so that none of them can be resolved into combinations of the others. But he probably pushes this point too far in assuming that his pairs of antithetic processes always take place in separate substances. There is no doubt that there is a special apparatus connected exclusively with the white-black process. Total colour-blindness and allied facts seem to clench this conclusion. But it does not follow that the white-black processes cannot also take place in those retinal elements which subserve the colour processes. When blue and yellow lights act simultaneously so as to give rise to the sensation of white, Hering has good reason for denying that the blue process and the yellow process take place together. As such, they neutralize each other; but when he refers the conjoint effects of the two lights merely to their action on the white-black substance, his position is not without difficulty. Since the yellow and blue processes neutralise each other, the combined intensity of these processes must be deducted from the resulting sensation of white. This involves the assumption that the intensity of the yellow and blue processes, as such, is very small indeed, and that when they actually occur, the brightness of the corresponding sensations is mainly due

* "Really, black and white do cancel each other in the retina: there is no grey process there. But the cortical cells with which the optic nerve is connected are always in a state of commotion (owing to changes of temperature, etc.), whether there is a stimulus before the eye or not; and this commotion gives us the 'intrinsic' or 'subjective' sight-sensation, the sensation of grey." Professor Titchener, *Primer of Psychology*, p. 42. (This proposed explanation is due to G. E. Müller, who works it out with great care.)

to the intermixture of white. This is hard to believe. "Hopeless confusion is introduced into all our conceptions of colour when we are asked to believe that the entire brightness of every sensation of light is nothing but the brightness due to the white sensation which is mixed with it. . . . Can they be thinking beings who have allowed themselves to follow Hering into the intellectual vagary of supposing that a perfectly saturated red, for instance—that is a red wholly free from white admixture—no matter what the amount of chemical activity which called it forth, would have no brightness whatever, that there would be *nothing* in sensation corresponding to differences in amount of this photo-chemical process?"* Hering's view cannot be set aside in this sweeping way. But we can scarcely accept it without fuller evidence than has yet been adduced in its favour. If Hering is right in holding that brightness is almost entirely due to the effect which it produces on his white-black substance, colours, which are indistinguishable in intensity and tone when the lights which produce them fall on the yellow spot, ought also to be indistinguishable when the lights which produce them fall on the totally colour-blind margin of the retina, and are seen as greys. As a matter of fact, this appears to be approximately true. On the other hand, two colours apparently identical in brightness and tone, one produced by a mixture of spectral lights, and the other by homogeneous light, may differ very greatly when they are seen as greys in twilight vision. But this can hardly form a cogent argument against Hering, because the conditions of twilight vision differ essentially from those of ordinary daylight vision. (See § 6, *ad fin.*)

The red and green of the spectrum in combination pro-

* Franklin, *op. cit.*, p. 480.

duce yellow. Hering accounts for this by the composite nature of the spectral red. It contains an admixture of yellow: and when the red and green lights neutralise each other, the yellow alone is left. He may be right, but this is one of the points on which it is difficult to see that his theory is quite satisfactory. It would in some respects be preferable to suppose that the yellow process* can be produced by positive co-operation of red and green lights.

Hering's theory may easily be made to account for the phenomena of contrast and negative images. They are due to a disturbance of the chemical equilibrium of the retinal substances. For instance, we may suppose that the white process has for its product the accumulation of material for the black process, and *vice versâ*. Hence the white process will positively tend to give rise to the black process, both in the portion of the retina affected and in the adjoining part. Whatever may be the special details of the process, it seems clear that both contrast effects and after-images are due to a positive tendency on the part of each of the ultimate retinal processes to produce its complementary process.

In conclusion, we may say that the theory of light-sensation, although beset with difficulties, is in a hopeful condition. New facts are being constantly discovered, and more exact quantitative measurements being made. New theories are being propounded, and old theories modified in accordance with these fresh discoveries, and, on the whole, satisfactory progress is being made. It is, above all, interesting to note that those attempts are most successful which follow most accurately psychological data and psychological analysis. In this respect, the comparison

* *Viz.*, a distinct retinal process corresponding to yellow, not a combination of the processes separately produced by red and green lights respectively.

of the predominantly psychological method of Hering with the predominantly physical method of Helmholtz is instructive.*

* The general plan of exposition and much of the detail in this chapter is taken from Ebbinghaus, *Grundzüge der Psychologie*, Erster Halbband, Leipzig, 1897, p. 320 ff. The student who can read German should consult this work. In English the treatment of Light-Sensation in Foster's *Text-Book of Physiology*, fifth edition, book iii., chap. iii., pp. 1222-1247, is excellent. See also Mrs. C. L. Franklin's article "On Theories of Light-Sensation," *Mind*, N.S. vol. ii. (1893), pp. 473-489. The latest developments are mainly to be found in German and especially in the pages of the *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, where the contributions of König, von Kries, and G. E. Müller are most important.

CHAPTER V.

SOUND-SENSATION.

§ 1. *Nature of the Stimulus.*—The physical stimulus which occasions sensations of sound consists of vibrations of the particles of the air. As in the case of light, we can distinguish wave-length or rapidity of vibration, amplitude, and complexity. Wave-length determines pitch; amplitude loudness, and complexity timbre.

§ 2. *Organ of Hearing.*—For anatomical details we must again refer to physiological text-books. The drum of the ear is thrown into vibration by impact of sound-waves. This produces movements in certain small bones, and these movements in their turn give an impulse to a fluid, which by its impact throws into vibration a membrane called the basilar membrane. The vibrations of this membrane are the immediate stimulus exciting certain hair-cells, in which the fibres of the auditory nerve terminate.

§ 3. *Noises and Musical Sounds.*—Noises as immediate experiences are characterised by confusion and indefinite complexity, and for the most part by irregularity. A musical sound is marked by unity and uniformity of character. "The vibrations which constitute a musical sound are repeated at regular intervals, and thus possess a marked periodicity or rhythm."* Musical sounds are also

*Foster, *Text-Book of Physiology*, book iii., chap. iv., p. 1361.

produced when the periodicity, instead of being regular, varies continuously. Regular vibrations which would otherwise produce musical sounds, give rise to noises, when a large number of them, differing but little in wave-length, occur together, as when a number of adjoining keys of a piano are simultaneously touched. But in general, the stimulus which gives rise to noises is produced by a series of vibrations differing from one another in period. "There is, however, no abrupt line between" noises and musical sounds. "Between a pure and simple musical sound produced by a series of vibrations, each of which has exactly the same period, and a harsh noise in which no consecutive vibrations are alike, there are numerous intermediate stages. Much irregularity may present itself in a series of sounds called music, and in some of the roughest noises the regular repetition of one or more vibrations may be easily recognised."*

§ 4. *Pitch.*—"The greater the number of consecutive vibrations which fall upon the ear in a second, the shorter the time of each vibration, the higher is the pitch. Hence the pitch of a sound is determined by the *length* of the wave, a low note having long, a high note short wave-length. We are able to distinguish a whole series of musical sounds of different pitch, from the lowest to the highest audible note."† In this series each note has its fixed position between two others which are barely distinguishable from it; the one being somewhat higher, and the other somewhat lower. The arrangement is therefore linear, and comparable to the series of greys intervening between white and black. It has been maintained that, as in the greys we can distinguish varying degrees of affinity to white and black respectively, so in the scale of notes of

* *Ibid.* † *Op. cit.*, p. 1362.

different pitch, two ultimate modes of sensation are involved, corresponding to black and white.* But this view has not been generally accepted.

"Vibrations having a recurrence below about thirty a second are unable to produce a sensation of sound."† There is a similar limit for high notes. For most persons this is fixed at about 16,000 vibrations a second, though some persons can distinguish tones of 40,000. In music, only a comparatively small portion of these tones are used, beginning with about thirty and ending with about 3,600 vibrations a second.

The power of distinguishing difference of pitch is very highly developed within a certain range. In tones rising from 100 to 1000 vibrations in a second, practised observers under favourable conditions can discriminate differences of pitch corresponding to differences of one quarter or one fifth of a wave-length. Tones above 4000 or below forty are distinguished from each other with great difficulty. Towards the higher end of the scale, differences of hundreds or even of thousands of vibrations a second may not be recognisable.

§ 5. *Harmonic Intervals.*—When, of two notes simultaneously produced, the vibration period of one is exactly twice as rapid as that of the other, the two sensations show a strong tendency to blend into one. It is hard to distinguish them as two. The result of their union is a richer and fuller sensation, peculiarly agreeable to the ear. There is also a tendency to confuse the two sensations even when they do not occur simultaneously. When even a practised musician is called upon to imitate on the piano a tone whistled by the mouth, he frequently produces the tone which corresponds to

* See Mach, *Analysis of the Sensations* (English trans.), pp. 127, 128.
† Foster, *op. cit.*, p. 1363.

half or double the number of vibrations per second, or in other words, the upper or lower octave of the note which he has to imitate. What is peculiarly interesting is that the tendency to confuse a note with its octave in memory, and to hear them as a single musical sound when they are simultaneously produced, does not depend on similarity in pitch. Notes much nearer in pitch are easily and clearly distinguished. What has been said of the octave holds also of other musical intervals, the double octave, the fifth, and the twelfth.

§ 6. *Combination of Musical Sounds from different sources.*—When musical sounds occur together, it usually requires attention to discriminate them. It is, as we have seen, peculiarly difficult to do so when the one is the octave, the fifth, or the twelfth of the other. The greater the relative intensity of one of the notes as compared with the others, the more easy it is to discern it as a separate tone. It is harder to distinguish in proportion to its relative faintness. The combination of tones yields a specific experience, which cannot be regarded as merely the sum of the separate experiences of the separate notes. Even when the constituent tones are discriminated, they are still apprehended as integral parts of a whole. This whole has its own characteristic pitch and its own characteristic intensity. Its pitch is approximately that of the lowest of its constituent tones, even when this is not the most intense. The intensity of the total experience is not equal to the sum of the intensities of its constituents. It is approximately equal to the intensity of the loudest among them.

§ 7. *Beats and Dissonance.*—"If two tuning-forks" sounded together "are not of the same pitch, but so related that the period of vibration of the one is not an exact

multiple of that of the other, the sensation which we experience has certain marked features. We hear a sound which is the effect on our ear of the compound wave formed out of the two waves; but the sound is not uniform in intensity. As we listen the sound is heard now to grow louder and then to grow fainter or even to die away, but soon to revive again, and once more to fall away, thus rising and falling at regular intervals, the rhythmic change being either from sound to actual silence or from a louder sound to a fainter one. Such variations of intensity are due to the fact that, owing to the difference of pitch, the vibratory impulses of the two sounds do not exactly correspond in time. Since the vibration period, the time during which a particle is making an excursion, moving a certain distance in one direction and then returning, is shorter in one sound than in the other, it is obvious that the vibrations belonging to one sound will, so to speak, get ahead of those belonging to the other: hence a time will come when, while the impulse of one sound is tending to drive a particle in one direction, say forwards, the impulse of the other sound is tending to drive the same particle in the other direction, *i.e.* backwards. The result is that the particle will not move, or will not move so much as if it were subject to one impulse only, still less to both impulses acting in the same direction; the vibrations of the particle will be stopped or lessened, and the sensation of sound to which its vibrations are giving rise will be wanting or diminished: the one sound has more or less completely neutralised or 'interfered' with the other, the crest of the wave of one sound has more or less coincided with the trough of the wave of the other sound. Conversely, at another time, the two impulses will be acting in the same direction on the same particle, the movements of the particle will be intensified, and the sound

will be augmented. And the one condition will pass gradually into the other. The repetitions of increased intensity thus brought about are spoken of as *beats*."* Beats are separately discernible when the difference between the vibration frequency of the concurrent tones is very small. As the difference becomes greater, the beats occur more rapidly, and are not so clearly discernible. They then give rise to a rattling or whirring effect. This ceases somewhere between thirty and sixty beats in the second. But even then the beats still manifest their presence by imparting to the notes which produce them a certain roughness. This experience may persist even when there are hundreds of beats in the second. When the beats occur with sufficient rapidity, the roughness or harshness ceases. Before this point is reached, the notes, because of their harsh effect, are said to be *dissonant*. The number of beats produced by two notes which approach each other in vibration frequency, is equal to the mathematical difference between the number of vibrations per second of each. "Thus two...tuning-forks vibrating respectively at sixty-four or seventy-two a second, will give eight beats a second,"† because the shorter wave overtakes the longer eight times, so as to give to the vibrating particles opposite impulses, which neutralise each other. We have seen that as the interval between the combined tones becomes increased, the beats become so rapid that they are no longer appreciable; but they recur again when the interval is sufficiently increased. They recur when the interval is somewhat greater or less than the octave, and again, when it is somewhat greater or less than the twelfth, the double octave, etc. Two tones of 200 and 396 vibrations in a second give four beats; four beats are also produced by

* *Op. cit.*, pp. 1367, 1368. † *Ibid.*

tones of 200 and 404 vibrations in a second. The number of beats is equal to the difference between the vibration number of the higher tone and that multiple of the vibration number of the lower tone which comes nearest to the vibration number of the higher tone. Thus if the notes are 200 and 596 the number of beats is $3 \times 200 - 596 = 4$. This explains why a small deviation from the octave or other musical interval produces a dissonant effect.

§ 8. *Difference-Tones.*—When two tones are sounded together, certain other tones are heard, occasionally with great distinctness, for which there is no assignable physical stimulus. Within the compass of the same octave, there are mainly two of these. One corresponds to the difference between the vibration numbers of the primary tones, and is called the *first* difference-tone. The other corresponds to the difference between the vibration number of the higher tone and twice the vibration number of the lower tone, and is called the *second* difference-tone. The mode in which these tones are produced has not yet been satisfactorily determined. But it seems that they are due to the structure and function of the organ of hearing, and not to physical conditions. Their explanation forms an important test for any general physiological theory of sound-sensations.

§ 9. *Timbre.*—The same note sounded on a piano, a violin, a trumpet, etc., has a very varying character, though its pitch is identified as the same. Differences of this kind are called differences of *timbre*. *Timbre* is due to the complexity of the sensation. Ordinary musical sounds, even when they arise from a single source, are not simple. Attentive analysis can discern a number of distinct partial tones. The power of discrimination varies with musical aptitude and practice in analysis. The pitch of the whole

complex is approximately the pitch of the lowest tone. This is called the *fundamental tone* and is of course identified at the outset. The *overtones*, as they are called, are separated from the fundamental tone by harmonic intervals. The most intense of them are usually those which have most affinity with the fundamental tones, such as the octave. Thus, though their relative intensity makes it easier to discriminate them, their harmonic relation makes it more difficult. With sufficient practice, a person of natural musical aptitude acquires great power of discriminating overtones. The less skilled may use artificial helps. Thus the partial tone may be first sounded separately on the key of a piano, and then kept in mind in attending to the note which is to be analysed. Several tones in succession may be tried in this way; some of them may be discernible as constituent overtones and others not. Sometimes slight differences in pitch are noted between the overtone and the corresponding note as sounded on the piano. This is one of the reasons why the analysis must be regarded as real, and not illusory.

A moderate number of relatively low partial tones makes the whole richer and fuller and somewhat higher in pitch. A large number of high overtones of considerable intensity gives to the whole a sharp and penetrating and sometimes a somewhat harsh character. The harshness arises from beats between the high overtones.

The combination of partial tones in a complex note produced from a single source is analogous to the combination of notes from different sources, except as regards the great difference in intensity between the fundamental tones and the overtones. The whole experience due to the combination is specific in its character, and is not a mere summation of the experiences severally due to the partial

tones. This is true even when the partial tones are discriminated. They are still apprehended as constituents of a whole having an unique character. Analytic attention in discovering overtones does not appear to create them in the moment of discovery, but to find what is already pre-existing. Thus the composition of an ordinary musical note affords an excellent example of sensations which are merely felt without discrimination of their distinctive qualities. So long and so far as the experience is unanalysed, the constituent sensations are present, *qua* sensations, though their presence is not cognised. There is a sense-differentiation without perceptual distinction.

§ 10. *General Theory of Sound-Sensation.*—Anatomical research seems to show that the immediate stimulus to the terminations of the auditory nerve is constituted by the vibrations of the basilar membrane. The main clue to the way in which this membrane acts is found in physical and psychological data. On the physical side, we have the broad fact that impulses which would separately give rise to distinct waves of sound, blend their effects before they reach the ear into a single resultant effect. They produce a single wave, the form of which is mathematically accounted for by their combination. This is true whether the several impulses come from separate material objects or from the same object. Thus the vibrations which produce ordinary sounds are complex in their mode of origin. The forms which they consequently assume can be mathematically resolved into a combination of the forms of certain constituent simple waves. These simple waves are called *pendular*, because their form is like that described by the sweep of a pendulum. Though one, not many waves, is produced by the impulses which simultaneously set the air in vibration,

yet each of these impulses acts separately on the organ of hearing. This is known to be so because the several sensations corresponding to each are distinguishable in consciousness. We can analyse a single note into its partial tones, and we can distinguish a number of notes sounded simultaneously from different sources. This is the starting-point for the theory of sound-sensations. The organ of hearing must be so constructed as to respond separately to the several impulses which produce the complex wave.

The most simple and obvious, if not the only, way of accounting for this analytic power of the ear is that propounded by Helmholtz, and now commonly, though not universally, accepted. It proceeds on the analogy of certain physical phenomena. If a tuning-fork, which produces a simple tone without overtones, be laid on the top of a piano, and if the corresponding note is sounded by touching one of the keys, the tuning-fork vibrates in sympathy with it. If the lower octave of the note be sounded, the tuning-fork again vibrates in sympathy; for its own note, being an octave of the note sounded on the piano, is contained in this as one of its overtones. It can be similarly made to vibrate in sympathy with any of the notes which contain its own note as an overtone. It is unaffected by other notes. Conversely, if the tuning-fork is struck in the neighbourhood of the wires of a piano, those wires will vibrate in response to it, which are specially adjusted to the same tone, or to any of the notes which contain this as an overtone. In the second case they do not vibrate along their whole length, but in segments. The wire which corresponds to the lower octave of the tone sounded on the tuning-fork responds by a vibration of which the wave-length is half the length of

the wire. Now, the theory of Helmholtz is that the basilar membrane consists of a series of strands, each of which, like the wires of a piano or like a tuning-fork, is adapted to its own peculiar tone, and vibrates in response to this. Thus, however complex the physical sound-wave may be, it produces in the basilar membrane not a single complex vibration, but a number of distinct vibrations, and each of these constitutes a separate stimulus affecting the terminations of the auditory nerve.

Though the theory of Helmholtz is very simple and plausible, it is not without difficulty. In particular, it does not in its present form satisfactorily explain difference-tones (see § 8). Attempts have been made to find a substitute for it: but in all probability it only needs modification and development. Recently facts have come to light analogous to colour-blindness which appear strongly to support it. There are cases in which the mechanism for conducting sound-impulses is intact, and yet the sensibility for greater or smaller portions of the scale of tones is absent or much impaired. In some instances the tone-deafness extends to the greater part of the scale, leaving sensibility only to a fragmentary portion of it. One tone of moderate intensity may be clearly distinguished, while another neighbouring tone is indistinguishable, even when it is very loud. It is difficult to explain these phenomena unless we suppose in the ear a system of separate elements, each adjusted to its own peculiar tone, some of which may be absent or incapable of discharging their function while the rest behave in a normal manner.

In this chapter I have followed Ebbinghaus very closely. For further reading in English the student is referred to Foster's *Text-Book of Physiology*, part iv., book iii., pp. 1361-1378, and to *The Power of Sound*, by E. Gurney. In German there is the great work of Karl Stumpf in two vols., entitled *Tonpsychologie*.

CHAPTER VI.

OTHER SENSATIONS.

§ 1. *Taste and Smell.**—The greater number of the sensations which are usually ascribed to taste are in reality odours. "If the nose be held and the eyes shut, it is very difficult to distinguish, in eating, between an apple, an onion, and a potato; the three may be recognised by their texture, but not by their taste." Cinnamon applied to the tongue under the same conditions appears like flour; the taste may appreciate a slight sweetness, but that is all. There are four undoubted taste-sensations—sweet, salt, acid, and bitter. There are two others—the alkaline and the metallic—which are disputed. The alkaline is possibly a mixture of salt and sweet, together with peculiar touch-sensations.

All taste-sensations appear to be intermingled with and qualified by tactile sensations. An acid, too slight to be distinguished as such, produces a peculiar touch-sensation by its astringent character; and as the acidity is increased the touch-sensation becomes stinging, and finally passes into a pain-sensation which completely dominates the special experience of acidity. Salt is also accompanied by a stinging sensation: but this does not reach the same pitch of intensity as in the case of acids. The sensation of

*In regard to taste, I have mainly followed Kiesow, "Beiträge zur Physiologischen Psychologie des Geschmacksinnes," *Philosophische Studien*, X. (1894), pp. 329-368, 532-561.

softness and smoothness is associated with sweetness; this is appreciable when the sweet substance is present in quantities so small that it cannot be discerned as such. As the sensation of sweetness becomes intensified, the touch-sensation is dominated and obscured by it. But it emerges again as the sweetness is further increased. Very intense sensations of sweetness are sometimes accompanied by a biting sensation.

The tip of the tongue is especially sensitive to sweetness, the edges to acidity, and the base to bitterness. The tip and edges are equally sensitive to salts, the base less so. When the mouth has been washed out, and some neutral substance, such as distilled water, is applied to the tongue, the result differs according to the point of application, and varies in different persons. The base of the tongue appears in all cases to respond by a sensation of bitter. In some persons the same sensation is aroused to whatever part of the tongue the distilled water is applied. Others feel no sensation except at the base. Others feel a sensation of sweetness at the tips and of acidity at the edges. There appear to exist among taste-sensations relations somewhat analogous to the contrast of colours. Salt, by a sort of contrast, makes distilled water taste sweet. It has the same effect on solutions of sweet substances which in themselves would be too weak to be appreciable. It also has an intensifying effect on solutions which are strong enough to be appreciable. It operates in this way both when the same part of the tongue is successively stimulated, first by a salt, then by a neutral or sweet fluid, and also when the salt and the sweet are simultaneously applied to homologous parts of the tongue, *e.g.*, to corresponding points on the right and left edges of the tongue. Sweet has a much weaker contrast effect on salt, than salt on sweet. In both

forms of the experiment, sweet instead of making distilled water taste salt by contrast, makes it taste sweet. On the other hand, contrast with sweet makes distinctly appreciable a salt solution in itself too weak to be perceived. Similar relations have been observed between salt and acid, and between sweet and acid; but in the case of sweet and acid they are manifested only when the two stimuli are applied successively to the same part of the tongue, not when they are applied simultaneously to homologous parts. Bitter appears neither to produce contrast effects nor to be affected by them.

The sense of taste can be stimulated only by fluids. Solid substances must be dissolved in the mouth before they can affect it.

The appropriate stimulus for the sense of smell, on the other hand, consists of odoriferous particles conveyed to the membrane in a gaseous medium. The sensations of smell have not been adequately classified or analysed into their primary constituents: there appears to be a very great variety of them. They are often modified by mixture with touch and taste-sensations. The pungency of an odour is not strictly a sensation of smell at all, but a peculiar kind of tactual experience. Odours proper do not appear to produce sneezing: this is due to irritation affecting the sense of touch. Odorous sensations take "some time to develop after the contact of the stimulus with the olfactory membrane, and may last very long. When the stimulus is repeated the sensation very soon dies out: the sensory terminal organs speedily become exhausted. The larger, apparently, the surface of olfactory membrane employed, the more intense the sensation; animals with acute scent have a proportionately large area of olfactory membrane. The greater the

quantity of odoriferous material brought to the membrane, the more intense the sensation up to a certain limit; and an olfactometer for measuring olfactory sensations has been constructed, the measurements being given by the size of the superficial area, impregnated with an odoriferous substance, over which the air must pass in order to give rise to a distinct sensation. The limit of increase of sensation, however, is soon reached, a minute quantity producing the maximum of sensation, and further increase giving rise to exhaustion. The minimum quantity of material required to produce an olfactory sensation may be in some cases, as in that of musk, almost immeasurably small."*

The sense of smell plays an immensely important part in the life of animals. It is to them what sight and hearing are to us. The animal detects its prey and follows it by means of scent. On the other hand the scent of the pursuer warns the prey and guides its efforts to escape. Probably every individual and every species has its own characteristic and distinctive odour. There are some men who can distinguish human beings by smell; dogs and other animals possess this power in a very high degree. The ants of one nest attack those of another nest or of another species who may intrude among them; whereas they never under normal conditions attack ants belonging to their own nests. It has been clearly shown by experiment that this is due to the peculiar and distinctive odours belonging to different nests and their inhabitants. The unfamiliar odour of an ant coming from a strange nest has an exasperating effect. The intruder is attacked and usually killed. If before being introduced into a nest it is first bathed in juice produced by crushing the

* Foster, *op. cit.*, pp. 1389-1390.

tenants of the nest, no notice is taken of it however widely it may differ in appearance from these. It is incorrect to say that ants *recognise* other ants as belonging or not belonging to their own family: all depends on the irritating effect of the unfamiliar odour of strangers.* The comparatively small part played by smell in the mental life of human beings may be accounted for by the fact that trains of ideas constitute so large a part of human experience. Smells are not adapted to ideal revival in serial succession as sounds and sights are.

§ 2. *Cutaneous Sensations.*—These are principally of three kinds—pressure, temperature, and certain others allied in their nature to organic sensations, among which the most prominent are those which from their peculiarly disagreeable character are called *pains*. This last class will be best considered in connexion with organic sensations in general.

"The sensation caused by *pressure* is at its maximum soon after its beginning, and thenceforward diminishes. The more suddenly the pressure is increased, the greater the sensation; and if the increase be sufficiently gradual, even very great pressure may be applied without giving rise to any sensation. A sensation in any spot is increased when the surrounding areas of skin are not subject to pressure at the same time. Thus if the finger be dipped into mercury the pressure of the mercury will be felt more at the surface of the fluid adjoining the skin which is not in contact with the mercury, than in the parts of the skin wholly covered with the mercury; and if the finger be drawn up and down, the sensation caused will be that

* See Albrecht Bethe's *Dürfen wir den Ameisen und Bienen psychische Qualitäten zuschreiben* (*Archiv für die gesammte Physiologie.* Bd. 70). Bethe also shows that ants find their way to and from their nests by means of smell. In moving they leave an odorous track behind them.

of a ring moving along the finger."* It should be noted that this applies only to sensations of pressure sufficiently marked to attract attention. As a matter of fact, pressure-sensations are present over the general surface of the body in every moment of our lives, and their presence can be detected as soon as we turn attention to them. Such conditions as the circulation of the blood, etc., furnish a constantly present stimulus within the body itself, and such uniform contact as that with the clothes we wear produces sensations which ordinarily escape notice, but are quite discernible when we attend to them.

The different areas of the skin are sensitive to pressure in varying degrees. The tips of the fingers, the lips, and the surface of the forehead, discriminate the smallest differences. The sole of the foot, the arm, and the back, have comparatively little power of discrimination.

Bodies of the same shape, weight, size, and temperature, produce different pressure-sensations according to their various textures. Thus contact with a smooth surface and contact with a rough surface yield specifically different experiences. Similarly, we distinguish sharpness and bluntness, hardness and softness, wetness and dryness. All these peculiar qualities of sensation are due to varying combinations of pressure, to variations in the relative intensity of the constituent pressures, in the mode of their spatial distribution, and in their successive changes. A smooth surface produces a uniform pressure at every point; a rough surface produces a pressure which is discontinuous and irregular. The difference between hard and soft is connected with successive changes in the intensity of the pressure sensations. Sharpness and bluntness are differences in the extent of surface touched. These various qualities are

* Foster, *op. cit.*, p. 1413.

presented to consciousness, not merely as varying combinations of pressure, but as having a specific character of their own, which does not appear to be capable of further analysis. We are here confronted with the same fact which has met us in other departments of sensation. Just as the partial tones combined in a musical note produce by their union a specific experience distinct from the quality of any of them taken separately, or of all of them taken together, so the combination of pressures which we experience when velvet comes in contact with the skin, produces those peculiar modifications of consciousness which we call softness and smoothness.

Temperature-sensations are of two classes—the cold and the hot. The sensation of cold is as specifically distinct from that of warmth, as the sensation of black from that of white. A sensation of heat sufficiently marked to attract attention seems only to take place when the temperature of a region of the skin, which has previously been fairly constant, is raised; and it is also a necessary condition that the rise in temperature should not be too gradual. "Our skin has a certain temperature which varies from time to time, according to circumstances, and is not the same in all regions of the skin at the same time. A given spot of skin at a given time will have a certain temperature; that temperature does not give rise to a distinct sensation though its effects may enter into what we may call general sensibility; we may not be directly conscious, for instance, that the forehead has one temperature and the hand another, though the two temperatures may differ widely."* As the stimulus for sensations of heat is a more or less sudden rise in the temperature of the skin; so the stimulus for sensations of

* *Op. cit.*, p. 1416.

cold is a more or less sudden fall in the temperature of the skin. This applies only to sensations conspicuous enough to attract attention. A general experience of heat or cold is always present, and discernible whenever we are interested in taking note of it.

The sensations of heat and of cold and of pressure respectively are produced at different points of the skin. "If a blunt pointed but otherwise fine needle be used to exert pressure, a little exploration will ascertain that at some points the amount of pressure can readily be recognised—the sense of touch is acute—while at other points, and these may be quite near the others, the amount of pressure cannot be recognised, and indeed no sensation is experienced until the pressure is excessive and then the sensation felt is not one of touch proper but of pain. Similarly, if heat or cold be applied by means of a metal tube or rod narrowed to a point, it will be found that some points of the skin are very sensitive to changes of temperature, while other points are insensitive to temperature, the application of heat or cold giving rise to pain only and not to specific sensations of heat or cold. Further, the points of the skin which are sensitive to pressure are those which are not sensitive to heat or cold, and *vice versâ*."* It appears also that the points sensitive to heat are not identical with those sensitive to cold. The separation in this case does not seem to be so complete as that between temperature-spots and pressure-spots. Some points peculiarly sensitive to cold seem also in a less degree to be sensitive to heat, though this result of experiment may be illusory. It is possibly due to spreading of the stimulation over neighbouring parts of the skin. Further investigation is

* *Op. cit.*, p. 1428, 1429.

needed, but the general result, so far, is: the skin is the seat of three distinct senses,—the sense of heat, the sense of cold, and the sense of pressure.

§ 3. *Motor Sensations.*—If we close our eyes so that we cannot see our own body, we are none the less distinctly and accurately aware of the position of our limbs. If we move a limb, for example the arm or the finger, we are distinctly and accurately aware of the amount and direction of the change and of the new position which it produces. Similarly, if instead of merely moving a limb we push against a wall, or lift a weight, we are aware of the kind and degree of tension produced by the resistance opposed to our efforts. If, instead of actively initiating movements ourselves, we allow the position of our limbs to be shifted in various ways by another person while we remain passive, we are still almost equally capable of appreciating position and change of position. If our muscles are contracted by the application of an electric current, the experiences which mark position and change of position as well as amount and kind of resistance, continue to be present.

How do these experiences originate? In any movement a great many changes take place in a great many tissues. In moving the arm, the skin is in various ways crumpled and pressed at every stage of the process. There are varying degrees and kinds of tension in the tendons: the joints slide over one another; the muscles pass through various stages of contraction. All these tissues appear to be supplied with sensory nerves; it is therefore possible that each and all of them contribute to determine the experiences which mark position and change of position. As a matter of fact, it is probable that all of them contribute in some degree. The skin appears to be the least important. Our discrimination of position, movement, etc.,

is not "notably diminished by temporary anaesthesia of the skin; if, for instance, the skin of the arm be rendered for a while anaesthetic, we do not find any marked change in our power of judging weights or resistance, or in appreciating, with the eyes shut, the position of the limb."* Joints, on the other hand, constitute a very important factor, so far at least as concerns appreciation of position and change of position. This is shown in a series of experiments carried out by Goldscheider. "This patient observer caused his fingers, arms, and legs to be passively rotated upon their various joints in a mechanical apparatus which registered both the velocity of movement impressed and the amount of angular rotation. No active muscular contraction took place. The minimal felt amounts of rotation were in all cases surprisingly small, being much less than a single angular degree in all the joints except those of the fingers."† Anaesthesia of the skin made no difference in the result. Anaesthesia of the joints themselves greatly decreased the power of discrimination. In the perception of resistance, the tendons are probably the most important factor. They are organs especially adapted for the appreciation of strain or tension. "Let your arm hang down loosely by your side. Attach a fairly heavy weight by a string to the forefinger. The weight pulls the surfaces of the elbow and other joints apart; so that there is no pressure or friction of one surface against another. But you soon get the sensation of strain throughout the arm."‡ Sensations due to the states of the muscles themselves undoubtedly seem to exist; but it is very difficult to estimate their importance, as marks of varying position, movement, and tension.

* *Op. cit.*, p. 1436. † James, *Principles of Psychology*, vol. ii., pp. 192-193.
‡ Titchener, *An Outline of Psychology*, p. 61

The distinction between position-sensations and movement-sensations is important. The former are due to the particular form of the tension of the organs when quiescent, the latter to change in this form.

The sensations we have so far considered are peripheral in their origin. They are produced by impressions proceeding from outlying portions of the body to the nervous system. They are equally present when we move by our own volition, and when we allow our limbs to be moved by another person, or our muscles to be thrown into contraction by such artificial means as the electric current. But it has been maintained that besides these sensations due to the actual state and changes of state of muscles, joints, tendons, and skin, there is also a sensational experience, directly connected with the initiation of movement, with the discharge from the nervous centre independently of any effect produced by it on the muscles and the tissues connected with them. Thus, according to Bain, there is a direct sense of energy put forth which is independent of any results the putting forth of energy may produce. This peculiar modification of sensory consciousness has been called the *sense of effort*, or the *innervation-sense*. At the present time it is the fashion wholly to deny its existence. The denial is mainly founded on the fact that we can appreciate position, movement, and tension as well when the limbs are passively moved as when we move them by our own volition; and that, on the other hand, when in consequence of nervous diseases the sensibility of the joints, tendons, etc., is impaired or destroyed, there is a corresponding incapacity to appreciate position, movement, and tension. But this argument lacks logical cogency; for if there be an innervation-sense it cannot, from the nature of the case, inform us of the actual

effects of the motor impulse. It can only tell us what we are attempting to do, not what we are actually doing or have done. Thus a patient may will to move an anaesthetic limb with his eyes shut; and he may suppose that the movement has actually taken place, although the limb has all the time been held in its original position by another person. The patient does not know whether the limb has changed its position or not; but he none the less knows that he has made an attempt to change its position. Hence the argument does not positively disprove the existence of an innervation-sense. But it must be admitted that it throws the *onus probandi* on those who maintain this peculiar mode of sentience. We have said that the patient would in such a case be aware that he had made an attempt; but this only shows that he is conscious of his volitions. But volition is by no means the same as innervation-sense: it is not, in fact, a sensation at all, any more than a belief is a sensation; it is a peculiar mode of conation. It is true that in order to will a movement a person must in some way be able to think of this movement. But for this, ideal representation is enough: the ideal representation may involve ideal reproduction of motor sensations proper, or it may mainly consist of a visual image. In neither case can it be regarded as a peculiar sensation immediately accompanying the motor discharge.

There is certainly a vital difference between the experience of having a limb passively moved, and that of moving it by our own initiative. But it is very far from clear that the active movement involves a peculiar sensation which is absent in the passive movement, a sensation comparable with those which arise from joints and tendons. In passing from a state of doubt to a state of belief there is a

peculiar change in consciousness, but it is not a sensation. Similarly, in passing from a state of indecision to one of voluntary determination, there is also a change in consciousness; but it is in no way comparable to sensations such as those of redness or greenness, of heat or cold.

There are, however, certain facts which lend support to the assumption of an innervation-sense. The patient who attempts to move a paralysed limb not only knows that he is making the attempt, but is also aware of differences in the amount of effort which he puts forth. This may be explained, at least in part, by the fact that the motor impulse proceeds not only to the limb which is to be moved, but also to other parts of the body which preserve their sensibility, and especially to the organs of respiration. But, as Wundt insists, there are certain cases of paralysis of the muscles of the eye which are harder to deal with. If the muscle which moves the eye to the right is completely paralysed, so that an outward movement of the eye is no longer possible, the effort to move it produces an apparent movement of the object looked at. The muscle may be only partially disabled, so that it is still capable of a lateral rotation of twenty degrees and of no more. In this case, the patient, although he has moved his eye only through the angle of twenty degrees, refers the objects seen to the same position which they would occupy if they were seen by the normal eye turned as far as possible in an outward direction. This seems to show that the patient measures the amount of movement by the amount of his own effort, independently of any peripheral sensations which this effort may produce. But this argument is not conclusive, for it seems possible to explain the illusion as due to sympathetic movements in the other eye: against this it has been urged that when both eyes open, either

the illusion does not occur, or the two eyes see double, and the illusion is confined to the image presented to the diseased eye. But this is not inexplicable on the alternative hypothesis: for the two eyes normally work together, and it is not to be expected that the patient should distinguish the two sets of afferent sensations, and so form a separate and accurate judgment of position for either image. One would like to know whether the illusion would hold good in the case of a one-eyed man. The illusion is constantly present when the normal eye is closed.

It would seem that the positive evidence for innervation-sensations lacks cogency. But on the other hand it would be rash to assert that their existence has been disproved. It is probably best at present to suspend judgment and wait for further evidence. In conclusion, we must note one very important point. There are two forms of the theory, one advocated by Bain, and the other advocated by Wundt. According to Bain, the innervation-experience is primarily occasioned by the motor discharge itself: it is a unique kind of sensation correlated with the active initiation of movement. According to Wundt, on the contrary, its specific quality is ultimately derived from a peripheral source. The area of the cortex from which the motor impulses are discharged is also the area in which motor sensations in general are localised. Hence, the excitement of this area in the process of motor discharge involves a reproduction of experiences more or less similar to those which arise from peripheral sources in the actual execution of the movement; but the reproduction assumes the character rather of an actual sensation than of an idea.* There can be no doubt that, if we are to accept the theory of innervation-sensations at all, we must accept it

* On this point Wundt's own statements are somewhat vague.

in the form in which it is propounded by Wundt, and not in that which Bain has given it.

§ 4. *Organic Sensations.*—The sensations we have so far considered derive their main importance from the function they fulfil in the perception of external objects. Their specific qualities correspond not only to the specific modes in which the organism is affected, but also to the specific nature of the agencies which act upon it. It is true that motor sensations do not arise from external impressions: they originate within the organism itself. But they none the less play a most important part in the perception of external things. It is through them that we appreciate weight, resistance, and space-relations. But there is another class of sensations which mainly mark states of the organism itself, and not the nature of external objects. These are called *organic sensations.* Extreme heat and extreme cold no longer produce sensations distinctive of heat and cold at all; they both produce a peculiar painful experience, which is the same whether the external agency is heat or cold. In like manner, the sensations resulting from a bruise, a blow, or a cut, may be similar, though they are produced by very various external agencies. It is characteristic of such sensations that they persist often for a long time after the external agency has ceased to operate. The bodily change which it has produced continues to act as a persistent stimulus. A wound persists after the knife which has inflicted it is withdrawn, and along with the wound the sensation occasioned by it persists also. Organic experiences may arise either through the operation of an external agency, or merely through the changing states of the internal organs. Hunger and thirst and the like are familiar examples of sensations originating from within the organism itself. Motor experiences, as we have

seen, generally mark the qualities and relations of external things; but the sensations of fatigue or of cramp are truly organic, because they mark the state of the muscular apparatus itself, and do not contribute to our knowledge of the external world. In every moment of our lives organic sensations constitute a most important element in our experience. The general tone of our bodily feeling depends on them. On them depends the difference between feeling well and feeling ill, and the like. But this or that organic sensation does not attract attention and emerge clearly into consciousness, unless it attains a special pitch of intensity. In general, organic experiences from manifold sources are merged in a massive whole constituting what is called the *common sensibility* or *coenaesthesis*. When, from the general mass of common sensibility, a single organic sensation detaches itself and becomes salient in consciousness, it is usually intrusive and engrossing. Such sensations are specially characterised by their diffusiveness. They do not, like sensations of sight or pressure, depend merely on the localised affection of a circumscribed portion of the organism; they also involve a more or less widespread organic disturbance. For instance, the pain-sensation produced by a cut or a blow is a complex experience partly depending on the disturbance of respiration, circulation, and the whole motor apparatus of the body. The more intense the sensation, the more conspicuous and widespread is this general organic disturbance.

This brings us to another aspect of organic sensation. It may arise, and usually does arise in part, from a disturbance of the nervous system, which excites changes throughout the organism, these changes in their turn giving rise to sensations. In all the more intense

emotions, there is an accompaniment of organic sensation originating in this manner. This is so important an element in the total state that it has been held to constitute the essential part of the emotional experience.

We have seen* that the possibility of central initiation makes organic sensations reproducible as no other sensations are under normal conditions. Whatever reinstates a similar nervous disturbance, will indirectly produce similar organic sensations. Tickling, for instance, is a very diffusive experience; and the mere anticipation will produce the corresponding organic sensations, because it produces the general disturbance of nervous equilibrium on which they depend. The uncomfortable feelings which arise in paying a visit to a dentist, even before he begins operations, have the same source.

We shall have something to say about pain-sensations in general in a subsequent chapter. We need here only refer to two organic experiences of special importance, hunger and thirst. Thirst is usually produced "by the diminution of the water present in the body either through restriction of the intake, or through excess of the output in the secretions, such as that of sweat, or through both together. . . . . Thirst thus brought about may be temporarily assuaged by simple moistening of the soft palate. From this we may infer that the sensation of thirst is brought about by afferent sensory impulses started in the mucous membrane of the soft palate by a deficiency of water in that membrane."† Hunger is usually "produced by the products of digestion ceasing to be thrown into the blood." The sensation seems "to be in some way specially connected with the condition

* Book i., chap. ii., § 10, *ad fin.*
† Foster, *op. cit.*, p. 1423.

of the gastric walls, much in the same way that thirst is specially connected with the palate; the products of digestion have a much greater power in appeasing hunger when they act locally and directly on the gastric membrane than when they are simply brought to bear on the body at large, and a small quantity of food will immediately satisfy hunger when introduced into the stomach, though it will have no effect when introduced otherwise."*

Under the head of organic sensation we may bring certain experiences often of an acutely painful character, due to direct affections of the nervous tissue not arising from stimulation of sensory surfaces of the body, but from other conditions. The painful sensations arising from the cutting or other lesion of a nerve belongs here. So do neuralgic pains, and certain kinds of headache, and the peculiar sensations which attend the initial stages of epilepsy. It is also probable that certain drugs act directly on the nervous system, giving rise to sensations of an exhilarating or depressing character. The part played by conditions, thus directly affecting the nervous system, is probably far greater than is usually recognised.

* *Op. cit.*, p. 1424.

CHAPTER VII.

THE WEBER-FECHNER LAW.

§ 1. *The Experimental Facts.*—We can compare any two objects and pronounce them like or unlike. If the objects are disparate in kind, we are unable to say more than that they are unlike. This is the only result of comparing the brightness of the sun with the immortality of the soul. If we compare the brightness of a light with the loudness of a sound, we can say that both possess intensity; but we cannot fix any definite relation between them. For instance, we cannot affirm that the loudness of the sound is equal to the brightness of the light. On the other hand, if we compare the quantitative variations of the same kind of object in the same respect, we can pronounce more definite judgments. We can pronounce that one sound is less or more loud or equal in loudness to another. Besides this, we can compare degrees of unlikeness with definite results. We can say that one sound, C, is as much louder than B as B is louder than A. In this way we can select two sounds of different loudness, and then proceed to find a third exactly intermediate between them. We may then compare the intermediate sound, B, with each of the extremes, A and C, so as to interpose between A and B a D, unlike in loudness to A in the same degree in

which it is unlike in loudness to B; and to interpose between B and C an E unlike in loudness to B in the same degree in which it is unlike in loudness to C. It is thus possible to form a scale passing by equal gradations of unlikeness from a very faint sound to a very loud one. Similar scales can be formed for degrees of unlikeness in pitch, in the brightness of light, in weight as appreciated by pressure on the skin or by lifting, etc. Now the fundamental fact which underlies Weber's law is that equal degrees of unlikeness in sensation do not correspond to equal increase or decrease in the absolute intensity of the stimulus. If a series of increasing intensities of stimulation be denoted by R_1, R_2, R_3, R_4, and the corresponding sensations by r_1, r_2, r_3, r_4, the degree of unlikeness between r_1 and r_2 is equal to the degree of unlikeness between r_3 and r_4, when $\frac{R_1}{R_2} = \frac{R_3}{R_4}$, or to use an equivalent formula, in some respects more convenient, when $\frac{R_2 - R_1}{R_1} = \frac{R_4 - R_3}{R_3}$.

Long before quantitative methods in psychology were thought of, astronomers had occasion to classify the stars according to their relative brightness. The different classes are arranged in a scale. At the top of the scale comes the brightest; the unlikeness in average brightness between this and the second class is equal to the unlikeness in average brightness between the second and third class, and so on. The corresponding intensities of the physical lights have since been determined; and it is found that they approximately form the geometrical series, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, etc. Here each stimulus is the half of the preceding stimulus. Obviously $\frac{1}{2} : \frac{1}{4} :: \frac{1}{4} : \frac{1}{8}$, and $\frac{1}{4} : \frac{1}{8} :: \frac{1}{8} : \frac{1}{16}$; and $\frac{1}{2} : \frac{1}{4} :: \frac{1}{8} : \frac{1}{16}$.

In experimental investigations, attention has been chiefly given to degrees of unlikeness which are barely discernible.

Within limits, the stimulus may vary without any corresponding unlikeness in the sensation becoming perceptible.* The same law holds here also. The original stimulus, whatever its absolute intensity may be, must be increased by a certain constant fraction of its own amount, before any unlikeness in the sensation is discernible. The constant fraction is different for different kinds of sensation. In estimating weight merely by pressure on the skin, the ratio between original stimulus and increased stimulus must be 3 : 4 before an unlikeness is perceptible; or to use technical language, before the *difference-threshold* is passed. *Difference-threshold* is in some respects a misleading term: the facts do not warrant us in saying that there is no difference in the sensation before the threshold is passed, but that there is no discernible unlikeness in the sensation. It is better therefore to speak of the threshold of *discernment* than of the threshold of difference. For brightness of white light, unlikeness only becomes discernible when the ratio of the original stimulus to the increased stimulus is 100 : 101, or, in other words, when the increment is $\frac{1}{100}$th of the original stimulus. "If we place two candles so as throw two shadows of some object on a white surface, the shadow caused by each light will be illuminated by the other light, and the rest of the surface will be illuminated by both lights. If now we move one candle away we shall reach a point at which the shadow caused by it ceases to be visible, that is to say, we fail at this point to appreciate the difference between the surface illuminated by the near light alone and that illuminated by the near light and the far light together. If now, having noted the distance to which the candle had to be moved, we repeat the same experiment with two bright

* See book ii., chap. i., § 3.

lamps, moving one lamp away until the shadow it casts ceases to be visible, we shall find that the lamp has to be moved just as far as the candle; that is to say, the least difference between the illumination of the bright lamps which we can appreciate is the same as in the case of the dimmer candles. Many similar examples might be given showing a similar result, in fact, it is found by careful observation that, within tolerably wide limits, the smallest difference of light which we can appreciate by visual sensations is a constant fraction (about $\frac{1}{100}$th) of the total luminosity employed."*

It should be added that a stimulus must reach a certain degree of intensity before it can produce any discernible sensation at all. Physical light or physical sound may be too faint to be distinguishable. The point at which it is just indistinguishable, so that the least increase would make it distinguishable, is called the *stimulus-threshold.*

§ 2. *Interpretation.*—The explanation of the facts described has been much discussed. One hypothesis is that increase in the intensity of the stimulus fails to produce an increase in the intensity of the sensation until the increment is a certain fraction of the original stimulus. On this hypothesis the sensation ought to vary by leaps and bounds at certain fixed points. The reason why no unlikeness in the sensation is discernible before these points are reached is that no unlikeness in the sensation exists. This view may be definitely rejected. There are no such fixed points of transition. Whatever the intensity of the original sensation may be, the same relative increment is required to make unlikeness discernible. In gradually increasing the intensity of the stimulus, it is not found that there are certain points at which change in sensation becomes

* Foster, *op. cit.*, p. 1211

perceptible in such a way that any pair of stimuli gives rise to distinguishable sensations, if they lie at opposite sides of the point of transition, however closely they may approach it. As a matter of fact, a sensation A may be indistinguishable from B, and B from C, and yet A may be distinguishable from C. If discernible unlikeness in sensation were co-extensive with actual unlikeness, this would be impossible. Another objection is that the power of discriminating very small degrees of unlikeness is greatly improved by practice, and varies greatly with the concentration of attention. It seems improbable that these conditions should have so great an effect on the actual intensity of sensation produced by the stimulus.

Another explanation is that adopted by Fechner. He rightly holds that the sensation varies with the stimulus even when the variation is not perceptible. It becomes perceptible when the degree of variation has passed a certain limit. So far, we may follow him. But he also holds that the increase in intensity of sensation required to constitute a discernible unlikeness is not relative but absolute, so that the variations of stimulus form a geometrical series, while the corresponding variations of the sensation form an arithmetical series. In estimating weight by means of pressure, if we begin with an ounce, we must add a third of an ounce before any unlikeness is discernible; if we begin with a pound, we must add a third of a pound before any unlikeness is discernible. In both cases, according to Fechner the increase in the intensity of the pressure-sensations is not relatively the same but absolutely the same. There are very serious objections to this view. If we compare the weight of an ounce with no weight at all, according to Fechner, the degree of unlikeness between the two

experiences ought to be strictly proportional to the difference between the intensity of sensation produced by one ounce, and the complete absence of pressure sensation. In other words, it ought to be proportional to the absolute intensity of pressure produced by one ounce. But as a matter of fact, the unlikeness between the zero value of a sensation and any finite value is infinite. Hence, for this limiting case, Fechner's interpretation breaks down. There is a difficulty in testing it in other cases, because of the peculiar nature of intensive magnitude. Intensive magnitude is indivisible. We cannot subtract a fainter sound from a louder so as to be able to point to a certain degree of loudness as the mathematical remainder. Hence we cannot in such cases immediately test Fechner's contention that the degree of unlikeness between two sensations is simply proportional to their mathematical difference,—to the remainder which would be left if one could be subtracted from the other. But there are other cases of the application of Weber's law in which this difficulty does not present itself. Weber's law holds good of extensive as well as intensive magnitude, and it also holds good of number. If we compare a line two inches long with a line three inches long, and then compare a line six inches long with a line seven inches long, according to Fechner the degree of unlikeness between the two inch line and the three inch line ought to be identical with the degree of unlikeness between the six inch line and the seven inch line. In both cases the mathematical difference is the same—one inch. This is true from the psychological as well as from the physical point of view. For if we suppose the lines to be presented to the eye under similar conditions, the mode in which an inch affects the retina in the one case may be virtually identical with the mode in which it affects the

retina in the other case. The inches are not only equal as measured by a rule; they also appear equal as they are presented to consciousness. We are therefore dealing with psychical, and not merely with physical, magnitudes. But in spite of the fact that $3 - 2 = 1$, and that $7 - 6$ also $= 1$, there is a greater degree of unlikeness between the line of two inches taken as a whole, and that of three inches taken as a whole, than there is between the line of six and that of seven inches. The same holds for least perceptible degrees of unlikeness. If we have to increase the length of a line of six inches by a certain amount in order that the unlikeness may be just discernible, we must increase the length of a line of two inches, not by the same amount, but in the same proportion, in order that the unlikeness may be just discernible. Number as well as extension affords illustration. If we lay a group of three counters on the table beside a group of two, and if we then lay a group of eight beside a group of seven, it is clear that there is a greater resemblance between the group of eight and the group of seven than there is between the group of three and the group of two. Yet in both cases the mathematical difference is the same—one counter; and it may appear to be the same as presented to consciousness. The principle holds also for magnitudes which are not directly perceived, but thought of. Everybody recognises that a billion and one is more like a billion than eleven is like ten. So in the ordinary dealings of life, if we have to pay or receive sums amounting to hundreds of pounds, we feel that it does not matter about odd pence; but a penny more or less is by no means negligible if the sum to be paid or received is under a shilling.

We may then conclude that degree of unlikeness between

the visible quantities is neither identical with their mathematical difference nor proportioned to it.

In the case of intensive magnitudes, such as the loudness of a sound, or the brightness of a light, there is, properly speaking, no mathematical difference, because we cannot divide such magnitudes into parts, so as to find a numerical equivalent for each, and subtract the one from the other. None the less, there may be in intensive magnitude something analogous to the mathematical difference. The velocity of a moving body is an intensive magnitude; but it is a magnitude which can be represented by a number which is a function of the space traversed and the time which it takes to traverse it. It may thus be treated as if it were an extensive magnitude capable of addition and subtraction. There is no reason why the intensity of sensation should not be conceived in the same way. At any rate, the mere fact that we are dealing with intensive magnitude does not in itself constitute an insuperable objection to the abstract possibility of such a mode of treatment. Hence there is in principle no objection to Fechner's attempt to correlate increased intensity of sensation with increased intensity of stimulus. But he was over-hasty in supposing that equal degrees of unlikeness involved equal absolute differences of quantity in the sensation. On the contrary, the analogy of extensive magnitude seems to show that degree of unlikeness is correlated with relative, not absolute, differences in intensity of sensation. Fechner's problem is yet to be solved. We do not yet know the law which connects increase in the strength of the stimulus with corresponding increments of sensation. We cannot yet assign a number which shall represent degrees of loudness or brightness, as the number obtained

by dividing the sum of units of time into the sum of units of space represents velocity.

§ 3. *Further questions.*—It may cost more or less effort to discern an unlikeness. The difficulty is greatest when the unlikeness is very small. Now it has been maintained that what we really estimate when we suppose ourselves to be estimating degrees of unlikeness, is the degree of difficulty which we find in perceiving unlikeness at all; the greater the difficulty, the less the unlikeness. A simple consideration shows that this is untrue. The lower grades of unlikeness are specially difficult to distinguish; and, as the unlikeness is increased in degree, it becomes more easily discernible. But this holds only up to a certain point. When the unlikeness is sufficiently great it is discernible without appreciable difficulty, and after this further increase does not make it appreciably easier to perceive. We must therefore conclude that our judgment of unlikeness depends primarily on the actual unlikeness, and not on the ease or difficulty of detecting it. At the same time, the ease or difficulty of detecting an unlikeness may more or less affect our judgment of its amount. It may thus be a source of error, and may to some extent explain apparent deviations from Weber's law.

Here a question of some importance arises. It is often assumed without discussion that all least perceptible degrees of unlikeness between the same kinds of sensible qualities are equal. Now this is by no means self-evident. It is indeed not self-evident that degrees of unlikeness which are just discernible, are therefore equally discernible, that is to say, discernible with equal ease. Even if they are all discernible with equal ease, it does not follow that they are themselves equal. The appeal in

the last instance must be to actual comparison. A valid reason for assuming them to be equal is that they appear equal. Another reason is that they occur under the conditions of Weber's law, which holds in general for equal degrees of unlikeness.

A stimulus must reach a certain degree of intensity before it can produce any discernible sensation at all. The question arises whether it produces any sensation before it produces a discernible sensation. Proceeding on the general analogy of the results we have reached in discussing Weber's law we must assume that in all probability it does. We have here a special case of the general relation of stimulus to sensation. Within limits, the sensation varies as the stimulus is increased, without the variation becoming perceptible. It is most natural to bring the case of a stimulus, which is not yet intense enough to produce a discernible sensation at all, under the same principle. It is still more improbable that sensations which escape notice merely because our attention is otherwise occupied have no existence as psychical facts. Thus, from our present point of view, we can reinforce the argument of Bk. II., ch. i., § 2.

§ 4. *Limitations of Weber's Law.*—We have spoken of Weber's law as if it held good exactly and uniformly for all sensations; but as a matter of fact this is far from being the case. Many deviations and limitations have been discovered by experiment. Verification commonly fails for very high or very low intensities of sensation. In view of the complexity of the operative conditions this is not in the least surprising. Our power of discriminating may be influenced by many factors besides the actual nature of the sensations which we have to compare. The relation between intensity of stimulus and absolute intensity of

sensation may, and probably does, depend upon many other conditions than the mere intensity of the stimulus itself. We may suppose the law to be perfectly exact, inasmuch as it states that unlikeness between sensations depends upon their relative difference, without supposing that this relative difference is determined only by difference of external stimulation. The special structure of the different sense-organs is probably an important factor. To speak of nothing else, the eye and the ear have sensations of their own due to internal stimulation, which it is difficult to allow for.*

* The treatment of Weber's law in this chapter follows Meinong, *Ueber die Bedeutung des Weberschen Gesetzes*, etc.

CHAPTER VIII.

THE FEELING-TONE OF SENSATION.

§ 1. *Common Sensibility.*—The pleasure and pain connected with organic sensations are of fundamental and all-pervading importance in our mental life. Normally, these sensations are fused in a total mass of experience, which can only be very partially analysed into its components by attentive scrutiny. The membranes which line our internal organs are generally supplied by sensory nerves, which, from all parts of the body, are perpetually conducting a multitude of impressions to the central nervous system. On the resultant effect of these impulses, and on direct affection of the nervous system by organic conditions, it depends whether at any moment we feel well or ill, cross or complacent. By the nature of our organic sensations in the morning we can often predict whether the day's experiences are going to be agreeable or disagreeable. The feeling-tone of common sensibility determines in large measure the feeling-tone of more special experiences in the way of sensations, perceptions, and ideas. An incident which might be pleasant or but slightly disagreeable if we were feeling fresh and "fit," is apt to be intensely disagreeable if our organic functions are out of order. This is too well-known a fact to need extended illustration. Smells and tastes which are agreeable to the healthy person may be highly unpleasant to the invalid. After a full meal, food which

was previously delicious may become almost nauseous; even the idea of it may be unpleasant. The very thought of smoking a pipe in certain states of body may be repellent in the case of persons who usually enjoy the use of tobacco. The profound alteration of organic conditions which accompanies pregnancy produces curious "longings" and repugnances for articles of food. It thus appears that organic conditions directly or indirectly influence the whole state of the central nervous system.* The neural processes connected with special sensations are more definitely restricted and localised. The experiences due to common sensibility are diffusive in their character. They give to the nervous system a certain general predisposition, and on the psychical side produce a certain general mood or temper.

By reflective scrutiny it is possible, as we have said, to detect special components of the total complex of organic sensation, such as those due to the heart-beat, and respiration, and the shiverings of cold or glows of warmth arising from contraction or dilatation of the blood-vessels at the surface of the body. But there are occasions when no special effort of attention is required to detect an organic sensation. The experiences immediately due to a toothache, to a colic, to muscular cramp, to a burn, a bruise, or a blow, usually compel attention, whatever other interests may compete with them. When one organic sensation detaches itself from the mass of common sensibility, it is apt to be overwhelmingly obtrusive. Such intense experiences

* Besides receiving sensory impressions from the internal organs, the central nervous system is also directly affected by general organic conditions, and in particular by the character and amount of the blood-supply which flows to it. This factor must also contribute to determine the general nature of experience as pleasant or unpleasant. Its relative importance as compared with the more indirect effect of sensory impressions upon the internal organs is difficult to estimate.

are much more often painful than pleasant; but they also occur in agreeable phases. In general, the satisfaction of organic cravings, such as hunger and thirst, may be intensely agreeable. The peculiarly disagreeable character of most organic sensations which are intense enough to detach themselves from the general mass, is marked by the usage of popular language which applies to them in a restricted and distinctive sense the word *pains*. A bitter taste or a discord may be disagreeable, but it is not usually called a pain. On the other hand, we currently speak of the pains of hunger, of scalding or burning, or of toothache. The reason is that the main importance of such experiences lies in their intrinsic feeling-tone. They have comparatively little value for cognitive consciousness. They contribute comparatively little to the discrimination of the qualities of external bodies; and they yield only more or less vague information about the condition of our own bodies. When we have received a wound, we have to look at it to find out its precise character and the proper mode of treating it. The pain-sensation itself does not help us much.

It must be noted that those sensations which are in popular language called, by a distinctive application of the word, *pains*, have other characteristics besides their mere unpleasantness. The feeling-tone does not exist in abstract purity: it is always the feeling-tone of some sensation having a more or less determinate character of its own. It is through the character of the accompanying sensation that we are able to distinguish different kinds of organic pain or pleasure. Thus we discriminate from each other stinging, piercing, gnawing, crushing, beating, shooting, burning, and innumerable other kinds of pain. Hence it is possible to

compare pain-sensations in other respects than the intensity of their painfulness. The points of agreement and difference are to a large extent to be found in the temporal and local distribution of the constituents of a complex experience. Local distribution is marked by such terms as *pricking*, *shooting*. Temporal sequence and rhythmic alternation are marked by such terms as *throbbing*, *beating*, and the like. These differentiating qualities which we use in describing the varieties of pain-sensation have usually little cognitive value of any other kind. So far as cognitive consciousness is concerned, their main function is fulfilled in enabling us to detect and express the difference between one kind of pain and another. It is therefore natural that in naming them we should apply to all indifferently the common word *pain*. But it is better to speak of *pain-sensations* than of *pain*, in order to indicate that something besides mere unpleasantness is involved. Markedly analogous experiences may also occur without any intensely disagreeable feeling-tone. A slight burn may retain much of the peculiar prickly, pungent, quality of the original sensation when the painfulness has almost or quite disappeared. So it is possible occasionally to detect the peculiar throb characteristic of a toothache, and the tenderness of the gum, when the acutely disagreeable phase of the experience has passed away or has not yet arrived. Hunger is usually unpleasant, but sometimes the beginning of it does not appear to be so.

So far we have referred only to those distinctive features which serve us in *describing* the difference between one pain-sensation and another. But there are undoubtedly other differences which seem incapable of analysis and description. This follows from the diffusive nature of organic sensations. The particular sensation which we

regard as painful may have its origin in a burn or a wound in a particular part of the skin, or in a diseased condition of the membrane of the stomach or bowels. The specific nature of the experience will therefore be in part determined by the character of this primary sensation. But the disturbance set up by the localised impression tends to involve more or less the whole nervous system, and to overflow the whole organism. The diffused effect on the nervous system may be marked by some peculiarity in the experience. Certainly, the impressions which arise from the changed conditions of the organism as a whole must modify the total experience in an important degree. But these elements are not easily expressed in definite language. They can, as people say, be felt but not described.

Organic pains and pleasures in extreme degrees of intensity reduce to a minimum cognitive process in general. In having a tooth drawn, our consciousness seems to consist in a single thrill of mere sensation. Attention to definite objects ceases: we cannot be said to attend even to the sensation itself, except in the vaguest way. We do not take note of its peculiar qualities, we simply feel it. The distinction between subject and object seems for the moment almost lost. It remains true that the experience has a peculiar quality which might be analysed and described by a demon which had taken possession of us and was watching our mental processes. But no approach to such analysis and description is possible to us until the experience is over, and we can calmly regard it in retrospect.

Pain-sensations may arise through disintegration of tissue or excessive stimulation in almost any part of the surface of the body. The question arises, how far are they

due to the existence of nerves of common sensibility terminating in the skin and other sensitive surfaces, and how far they may be produced by stimulation of the nerves subserving the special senses. It appears probable that stimulation of the nerves of sight and hearing does not result of itself in pain-sensations, strictly so called. But the case of cutaneous impressions is more doubtful. Goldscheider has found that a continued series of taps on a point peculiarly sensitive to pressure may suddenly give rise to a new sensation distinctly different in kind from those of pressure which had previously accompanied the several taps. This new sensation, due to the cumulative effect of repeated impressions, is organic in its nature, and bears the general character of a pain-sensation although it may not be acutely painful. Now the question may be raised whether the same nerve-endings which were the medium of the sensation of pressure were also the medium of this other sensation. Again, let us suppose a needle-point thrust into the skin; at first only a sensation of pressure is felt, which may be more or less disagreeable. It is only after the lapse of an appreciable interval of time that the pain-sensation of pricking occurs. The time-interval points to the possibility that the pain-sensation and the pressure-sensation, respectively, are subserved by different nerves. This view appears to be reinforced by certain pathological phenomena. There are cases when sensitiveness to temperature and pressure remains intact while pain-sensations are no longer producible. This sometimes happens to patients under chloroform or other anaesthetics. It also occurs in lead-poisoning and in some cases of nervous disease. The inverse also may take place. Susceptibility to pain-sensation may be retained, though pressure- and temperature-sensations are no longer

producible. These facts seem to show that the nerves of common sensibility and those of special sensations are distinct and separate. But there is one weak point in the argument. The pathological phenomena only occur under conditions which produce abnormal states of the nervous system. We may explain the facts, not by supposing separate and distinct sets of nerve-fibres terminating in the skin, but by supposing that the effect of the same impression on the same nerve is altered by the altered state of the central nervous matter to which it is conveyed. It has been found that removal or disablement of the grey matter of the spinal cord produces insensibility to pain-sensations, while sensibility to pressure- and temperature-sensations is left unaffected so long as the white strands of the cord remain intact. Conversely, cutting through the white strands of the cord destroys sensitiveness to pressure- and temperature-, but not to pain-sensations. Now before a nervous impulse can be transmitted through grey matter, it must first excite the grey cells so that they discharge in an explosive manner. For this the impulse communicated to them must reach a certain pitch of intensity, and after their discharge the impulse is transmitted in an intensified form. They thus serve as accumulators of nervous energy. In this way we may explain the sudden emergence of a new sensation as the result of a series of successive taps on a pressure-point. Each tap gives rise to a relatively feeble nervous impulse, which by itself is insufficient to produce a discharge of the grey cells of the cord. But the series of taps by its cumulative effect ultimately succeeds in producing an explosion of the grey matter, and with it a new sensation of an organic character. When the grey matter of the spinal cord is removed, the nervous impulses from the

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skin, whatever their origin, may fail to produce pain-sensations because they cannot attain the requisite intensity in the absence of an apparatus for accumulation of nervous energy. But there is no reason why they should not still continue to produce pressure- and temperature-sensations. Similarly, in the inverse case, all nervous impulses from the skin, in order to produce any sensation at all, must discharge the grey matter of the cord, and in so doing reach a pitch of intensity that can only give rise to pain-sensations. It seems, therefore, very possible that the nerves which subserve temperature- and pressure-, may also subserve pain-sensations, the difference between the two kinds of experience depending upon more central conditions.

§ 2. *The Special Sensations.*—We now turn to consider the special sensations of sight, sound, smell, taste, touch, and temperature. The feeling-tone of these sensations varies, first, with their intensity, secondly, with their duration, and thirdly, with their quality.

(1) Many of them in a low grade of intensity appear to be virtually neutral. All of them acquire appreciable feeling-tone as their intensity is increased. Some of them are unpleasant even when they are weak. All of them become unpleasant when intensified beyond a certain point. Before reaching this point they nearly all have an agreeable phase; after reaching this point they continue to be more and more disagreeable as intensity increases. It is a matter of dispute whether there is any sensation which is constantly disagreeable in whatever phase of intensity it appears. It is always possible to urge that though a sensation is generally disagreeable, it might be agreeable if it could be made weak enough. As an example of a pleasant phase of an experience which everybody would

regard as absolutely disagreeable from its very quality, we may quote the following from Mr. H. R. Marshall: "I remember well once having been aroused from serious thought in a railway carriage by a delicious odour, and the words 'What a delightful perfume!' were actually formed in thought. Almost immediately the smell changed to disagreeableness with growing intensity, and there appeared evident the intensely disagreeable smell emitted by a polecat which had been killed by the train."* We may formulate the general rule for the relation of intensity and feeling-tone as follows. A sensation must reach a certain minimum of intensity in order to have an appreciable feeling-tone. Further rise in intensity of sensation is accompanied by a rise in intensity of feeling-tone. If the sensation is initially unpleasant, its unpleasantness continues to increase as the sensation is intensified. If it is initially pleasant, the pleasantness increases to a certain maximum, at which it remains roughly constant until the intensity of the sensation is increased beyond a certain limit. When this limit is passed, the pleasantness decreases, and finally passes into unpleasantness.†

The nature of the transition from pleasantness to unpleasantness requires further elucidation. An unpleasant element appears to enter into the experience even while the original sensation continues to be in itself agreeable. This is sometimes distinctly traceable to other definitely assignable sensations, which are superadded to the primary one. Thus, at a certain pitch of intensity, warmth may continue to be still agreeable in itself, although it is accompanied by a distinctly disagreeable sensation of a prickly or pungent character, probably due to stimulation

* *Pain, Pleasure, and Aesthetics*, p. 288.

† See A. Lehmann, *Die Hauptgesetze des menschlichen Gefühlslebens*, p. 181.

of pressure-points in the part of the skin affected. So a bright light may continue to give pleasure when it is so intense that the effort to accommodate the eye to it is unpleasant. But there are other cases in which it is much more difficult to assign definitely the source of the collateral unpleasantness. However intense sweetness may be, it scarcely seems to become in its own intrinsic nature disagreeable. At the same time, it may excite strong disgust, which seems to be connected with accompanying organic sensations not easy to analyse or describe.

(2) The dependence of feeling-tone on duration varies in nature according as the sensation is continuously maintained or repeated intermittently.

There appears to be no appreciable interval of time between the emergence of a sensation of given intensity and the corresponding feeling-tone. Apparent exceptions can be explained away. If we touch a disagreeably hot object, the heat is felt before the unpleasantness; but this is because the stimulus requires a certain time before it can take full effect. On its first application the sensation is not intense enough to be disagreeable.

The following is the general formula for variations of feeling-tone with the continuous persistence of the sensation in time. The feeling-tone increases in intensity to a maximum. If the sensation is pleasant, it continues for some time at this maximum, and then gradually becomes less agreeable, and in the end distinctly disagreeable. If the sensation is initially unpleasant, the maximum persists for a much longer period than in the case of agreeable sensations. After this, the unpleasantness may become fainter, but it never passes into pleasantness, and it is always liable to reappear at intervals in more intense phases.

The same remarks which we made about the transition from pleasantness to unpleasantness with rise in intensity, apply to the same transition as dependent on continuous persistence in time. Here also collateral elements of a disagreeable kind are introduced into the experience before the primary sensation becomes in itself unpleasant. The illustrations of the bright colour and of the sweet taste may be transferred, *mutatis mutandis*, to the case of duration. A boy eating sugar-plums, if he continues to indulge himself beyond a certain point, has disagreeable sensations distinctly traceable to the stomach and other internal organs, while the sweetness itself remains sufficiently agreeable to tempt him to go on eating. But even apart from such definitely assignable collateral accompaniments, there may be a surfeit of sweetness, though sweetness remains in itself an agreeable taste. Doubtless this is due to some general organic effect hard to define by introspective analysis. Sometimes the disagreeableness is simply due to tedium; if we gaze at a bright colour too long we feel bored because of the suspension of other activities, although the colour continues to be pleasing.

The case in which the sensation is repeated intermittently is in many ways analogous to that in which it persists continuously. If the repetition is too frequent, a pleasant sensation tends to become less pleasant, and often becomes unpleasant. Unpleasant sensations by frequent repetition often, but by no means always, become less unpleasant. They may even become virtually neutral or even actually pleasant. Perhaps the best instance of a disagreeable sensation becoming agreeable by repetition is the "acquired taste" for olives.

When a pleasant sensation by repetition does not lose

its pleasantness and become disgusting, and when an initially unpleasant sensation has become more or less pleasant by repetition, its absence from consciousness will at certain moments give rise to a craving for it. The craving of the smoker for tobacco, of the olive-eater for olives, or of the drinker for his bitter beer, are cases in point. Certainly, the effect is most marked when originally unpleasant sensations have become pleasant by repetition. The nervous system has adapted itself to certain modes of excitation returning at certain intervals, and their absence produces a disturbance of neural equilibrium. If a person is in the habit of using tobacco only at fixed times in the day, the craving is apt to arise exclusively at these times. The omission of a customary early morning pipe may trouble the smoker in the early morning, but the craving may pass away and not recur during the day.

(3) We have seen that there are probably some sensations which are disagreeable in all phases of intensity. Others become disagreeable at a very low intensity. In the case of others, such as sweetness, it is not quite certain that they ever become intrinsically disagreeable, even when they are most intense. It follows that quality of sensation is a most important factor in determining feeling-tone. We can do little to explain why one quality is predominantly agreeable and another predominantly disagreeable. The nearest approach to an explanation is found in the special case of complex sound-sensations. The disagreeableness of dissonance is due to the presence of beats which interrupt the uniform course of the periodic stimulation of the organ of hearing. The central nervous matter has adapted itself to a certain rhythm of excitation, and this rhythm is disturbed by the beats. We have no

similar reasons to assign why certain combinations of odours and tastes are agreeable, and others disagreeable.

§ 3. *Surplus Excitation.*—It is clear that the agreeable or disagreeable feeling arising in connexion with the occurrence of a sensation may not be wholly due to the quality or intensity of the sensation itself. "If one is listening to a series of sounds, or looking intently at some object, the feeling of 'distraction' caused by being spoken to in a whisper, or lightly touched," is comparable with sharp physical pain.* The whisper or the light touch may be in no way disagreeable in themselves; they may be virtually neutral; but they set up a general nervous and bodily disturbance, correlated with a general mental disturbance of an intensely unpleasant character. A similar shock is experienced when, in the process of going to sleep, we are startled by some sudden sound, which need not be especially loud. There is in such cases a diffused excitement of the nervous system, produced by the sensation, and superadded to that special excitement which is immediately correlated with the existence of the sensation. Following Professor Ladd, we may call this diffused effect the "surplus" excitation. Its occurrence is by no means confined to such exceptional experiences as that of being startled; on the contrary, all sensations which have a distinctly appreciable feeling-tone, appear to have a more or less diffusive character. In this respect, the difference between the organic sensation produced by a wound, and the special sensation produced by a bright light, is only one of degree.† To some extent this statement may be directly verified by introspection: wherever

* Ladd's *Descriptive Psychology*, p. 199.

† Hence there is no sharply marked line of demarcation between pain-sensation and the disagreeableness of special sensation. When unpleasant organic accompaniments become prominent, pain-sensation arises.

feeling-tone is sufficiently intense, we can detect a diffused bodily and mental excitement, and concomitant change in our organic sensations. An intensely bitter taste may give rise to a cold shiver; the piercing scream of a railway whistle disturbs thought and perception, and is felt over the whole organism. A delicious taste may not only tickle the palate, but "set the whole man a-gog"; the strong pleasure or displeasure sometimes produced by stroking, tickling, or rubbing, is not immediately due to the quality and intensity of the tactile sensations themselves, but to the surplus excitement they produce. We mentioned previously that sensations in themselves agreeable may in their general effect be unpleasing, and we found that the collateral unpleasantness can only in part be accounted for by the concomitance of definitely assignable and describable experiences. But surplus excitation, with consequent modification of common sensibility, adequately explains these subtle and evasive affections of consciousness. In the same way we are able to account for the qualitative diversity of the feeling-tone of different sensations which agree in being pleasant or unpleasant. The pleasure of a sweet taste differs in kind from that of a bright colour or of a musical note; and the difference cannot be wholly identified with the qualitative diversity of the sensations of sight, taste, and hearing themselves. Besides the variety of primary sensations, there is also a distinction between the kinds of pleasure which they afford. The several experiences contain elements which fulfil no other cognitive function than that of enabling reflective analysis to discriminate diverse modalities of feeling-tone. The existence of these diverse modalities has been strongly emphasized by Professor Ladd. "*The way we feel* is not by any means precisely the same for all equally pleasurable

or equally painful, tastes and smells. Some agreeable sweet odours are described as 'heavy,' and others as having an 'enlivening' or 'spicy' quality."* Compare, for instance, the heliotrope and the Japanese lily. The strong organic effect which may be produced by a powerful odour is shown by its sometimes causing highly susceptible persons to faint. "Pleasant coolness is 'refreshing': pleasant warmth is 'cherishing.'... Musicians have always attached different distinct kinds of feeling to different musical instruments," and "to different keys and chords... The 'grave' feeling belonging to the bass register is different otherwise than in mere quantity of pleasure-pain from the 'stirring' of the tenor."† These various experiences tend to induce certain moods having affinity with distinctive emotions. The same is true in a less degree of colours. "Bright light and mellow light produce differences in the character of the equally pleasurable feeling which may result."‡ Goethe contrasts the "cheerfulness" of a view as seen through yellow glass with its "mournfulness" as seen through blue glass. These differences in feeling-tone cannot be reduced to the mere difference between pleasantness and unpleasantness; and they cannot be identified with the qualitative differences between the sensible qualities which occupy attention, and which are said to be pleasant or unpleasant. We must refer them to a more or less diffused excitement of the nervous system with its organic consequences, and the resulting modifications of common sensibility.

We have asserted that "all sensations which have a distinctly appreciable feeling-tone, appear to have a more or less diffusive character."‖ But we have not so far adduced evidence sufficient to justify this position in its full extent.

* *Op. cit.*, p. 184. † *Op. cit.*, p. 185. ‡ *Ibid.* ‖ § 3, p. 222.

Fortunately the deficiency is supplied by experiments, which show that pleasant and unpleasant sensations in general produce organic effects differing in a characteristic way according as they are agreeable or disagreeable. By suitable apparatus it is possible to measure variations in the volume of the limbs, and in the respiratory movements, while the subject is undergoing pleasant or unpleasant experiences. The variations may be recorded by a curve traced upon a revolving cylinder. The curve for the volume of the limb indicates, besides larger and longer variations, also smaller and shorter variations due to the beat of the pulse.

These experiments justify the assumption that all sensations having a distinctly appreciable feeling-tone produce a diffused organic effect, which differs broadly in a characteristic way, acccording as they are pleasant or unpleasant. The difference, however, is not of a kind which would warrant us in regarding the organic changes as the only or main cause of the pleasantness or unpleasantness.

There thus appear to be three factors which may contribute to determine feeling-tone: (1) The sensation itself; (2) The diffused excitement of the nervous system which it may produce; (3) The effect of this diffused excitation on the organism by the consequent alterations of common sensibility which arise from the altered state of the internal organs. All three factors probably contribute to the result in varying degrees according to circumstances.

§ 4. *Hedonic-tone and Organic Welfare.*—Most psychologists support the general thesis that the processes corresponding to agreeable sensation promote organic welfare, and that those corresponding to disagreeable sensation are injurious. Stated more definitely, this means that agreeable process contributes to efficient discharge of function in the organs

which it affects, and that disagreeable process disables the organs it affects. There are two senses in which the general proposition can be understood. The meaning may be that on the whole and in the long run a pleasant experience contributes to the welfare of the organism. The proposition understood in this sense no doubt holds good as a general rule, but it is a rule which has many exceptions. Any race of animals which should as a rule be pleased by conditions injurious to them and pained by conditions beneficial to them, would certainly perish in the struggle for existence. But to preserve the species in the struggle for existence, it is not necessary that pleasure should infallibly and universally coincide with ultimate benefit, and that displeasure should infallibly and universally coincide with ultimate injury. Hence we find that many things may be agreeable which are injurious, and inversely many poisons are palatable. Intoxication is very bad for the health; but it may be very pleasant.

If we are to establish a universal law, we must consider only the immediate vital activity at the moment in which the pleasant or painful sensation occurs. Sugar of lead has a sweet taste, which is pleasing at the moment; this pleasing taste may in itself be favourable to vital activity, although the substance which occasions it, when introduced into the blood, acts as a deadly poison. Similarly, a bitter drug which is disagreeable to the taste may have a beneficial medicinal effect. The beneficial effect is not due to the disagreeable bitterness, but to subsequent effects entirely disconnected with the original experience. The case of intoxication by alcohol is different. Here the very process which is correlated with pleasure involves a disablement of the central nervous system. The efficiency of the intoxicated person, both for thinking and acting, is

impaired. But this kind of exception also may be explained away. The intoxicated person is disabled from accurate methodical thinking, and from precise and delicate co-ordination of movement with a view to an end. But in general he makes no serious or strenuous attempt to fulfil these functions. If he does make serious efforts of the kind, he finds them very disagreeable. On the other hand, the loose and varied flow of ideas which accompanies the pleasing phases of intoxication, is much more free and expansive than in a state of perfect sobriety. We all know that champagne promotes conversation having a certain kind of brilliancy; and we all know that the opinions expressed and the arguments used are not likely to bear examination in sober moments. Even when there is no varied flow of ideas, even when a man persists in reiterating the same thing over and over again, his pleasure is connected with the fact that the point he is urging presents itself to him with peculiar vividness and intensity. Thus it appears that in the pleasing stages of intoxication a man is disabled from certain higher forms of mental function; but he does not have disagreeable feelings, simply because conscious activity in these directions is suspended. On the other hand, the kind of conscious activity which continues to go on is not impaired, but intensified, and he consequently feels pleasure.

In this last example, we have referred especially to process in the central nervous system. It is in this only that, as psychologists, we have an essential interest. Pleasure and pain are states of consciousness, and consciousness is immediately correlated with neural process. Hence, the question which really concerns us is whether disagreeable processes are essentially connected with obstruction or disablement of conscious and correlated

nervous activity, and agreeable processes with the free and unobstructed flow of such activity. If we state the question in this form it seems that the answer must be distinctly affirmative. Disagreeable sensations, in proportion to their intensity, obstruct and disturb mental process and the motor activities which, for their effective discharge, require conscious guidance. Everybody knows how difficult it is to think or act efficiently with a toothache or a headache, even though the desire to do so is strong. It is not merely that the painful sensations divert attention; this is true of pleasant sensations also, of similar intensity; the point is that the disagreeable sensations positively disorder and enfeeble thought and action, when the endeavour is made to think or act. Of course, if the disagreeableness arising from this or that special sensation is faint, and if the total state of consciousness is, on the whole, agreeably toned, in spite of the presence of this or that disagreeable item, the obstruction to mental activity may not be appreciable. But in principle it seems a safe generalisation that agreeable experience is favourable, and disagreeable experience is unfavourable, to the effective discharge of mental functions.

§ 5. *Feeling-Tone and Conative Tendency.*—Some pleasures of sense are dependent on pre-existing conations. There are sense-cravings connected with the primary organic needs, such as the need for food and drink; and the gratification of these cravings is a source of sense-pleasure. Similarly, the induced cravings for tobacco and alcohol, which recur of themselves at intervals, give a pleasure when they are appeased which is quite distinguishable from the pleasure immediately due to the stimulus apart from the craving for it.

Every pleasing and every painful experience at the time

at which it is actually taking place has a conative, or at least a quasi-conative, aspect. In so far as the experience is pleasing, there is a tendency to maintain and develop it by whatever means may be found effective, until its pleasure-giving capacity is exhausted, or is overpowered by the intermixture of unpleasing elements. In so far as the experience is unpleasant, there is a tendency to discontinue it by whatever means may be found effective. Thus, on the level of mere sensation, agreeable feeling-tone corresponds to the positive phase of conation, and disagreeable with the negative. The pleasant experience is coincident with a conative tendency which requires for its satisfaction the continuance of the experience. The unpleasant experience is coincident with a conative tendency which requires for its satisfaction the discontinuance of the experience. While pleasure lasts, conation is being satisfied; it is working itself out. When satiety is reached, it has been satisfied: it *has* worked itself out and reached its termination. Until satiety is reached, there is always a tendency for the process to go on. If the pleasing sensory process is discontinued or obstructed before satiety is reached, the conation continues and is intensified; there is added to the tendency to continue the pleasing sensation the tendency to get rid of the unpleasing state due to its interruption. The original conative tendency, which was in process of being gratified, is transformed into a thwarted craving. Suddenly snatch away the bottle from the baby who is complacently sucking it, and you will have a picture of the situation referred to. The reverse of all this holds good of disagreeable experiences. To discontinue them, however abruptly, is to give satisfaction and not dissatisfaction. Their continuance always thwarts and never appeases the conative tendency, which is essentially connected with their existence.

It should be carefully noted that we distinguish between ultimate satisfaction and the process of becoming satisfied. Ultimate satisfaction is attained only when satiety is reached,—only when the subject has had enough of the pleasant experience, so that, if it were still maintained, it would cease to please him. Pleasure is found in the process of becoming satisfied, not in its completion. Its completion is its termination, and therefore the termination of its feeling-tone.

We said that every agreeable or disagreeable sensation has a conative or quasi-conative aspect. The words "or quasi-conative" were added to meet a possible difficulty. Some psychologists hold that certain pleasing sensations appear purely passive, so far as introspection can analyse them. They do not appear to involve any experience of endeavour, or striving. I do not agree with these psychologists; but the question is a subtle one. It seems therefore best to evade the difficulty by pointing out that for our purpose it is not essential whether the tendency is experienced or not, so long as it exists. It will not be denied that there is at least an unconscious tendency to continue a pleasing experience until we have had enough of it.

Any pleasing sense-experience, when it has once taken place, will, on subsequent occasions, give rise to a conation, when its conditions are only partially repeated, as when the object with which it is connected is perceived, or the corresponding idea is reproduced. The impulses and desires thus occasioned have both agreeable and disagreeable phases. They are for the most part agreeable when gratification comes quickly, or is anticipated with confidence. They are disagreeable when gratification is long witheld, especially if it be withheld in

a tantalising way, so as to produce disappointment, or a series of disappointments. The experience is also apt to be more or less disagreeable when anticipation is not confident, but doubtful and hesitating.

§ 6. *General Theory.*—Whatever conditions further and favour conation in the attainment of its end, yield pleasure. Whatever conditions obstruct conation in the attainment of its end, are sources of displeasure. This is the widest generalisation which we can frame, from a purely psychological point of view, as regards the conditions of pleasure and displeasure respectively. Its application to the feeling-tone of sensation is already contained in the last section. A pleasing sense-experience operates as a positive factor satisfying the conative tendency or quasi-conative tendency which is essentially connected with it. On the contrary, an unpleasing sense-experience operates as a positive factor thwarting the conative tendency or quasi-conative tendency essentially connected with it. This is at the best only a vague explanation of sense pleasure-pain. It can only be regarded as being an explanation at all on one assumption. If it is supposed that, first, pleasure exists, and that, subsequently to its occurrence, the conative tendency arises as a consequence, it is a logical circle to explain the pleasure by reference to the conation. But, as a matter of fact, there seems to be no reason whatever for supposing that feeling-tone and conation are separated in time. From the very beginning they appear to coincide. From the very beginning a pleasing process is a process which tends to maintain itself.

We may hope to attain a more definite insight into the ultimate conditions which determine the feeling-tone of sensation from the physiological side. But from that side we have not at present any direct knowledge of the nervous

processes involved. We can only frame hypotheses to cover the psychological data.

If we attempt to translate into physiological language the general relations of pleasure and displeasure respectively to conative tendencies, perhaps the best result we can obtain is the following. Conation in general appears to correspond to a disturbance of nervous equilibrium, and its completed satisfaction to a restoration of equilibrium. The conditions of displeasure not only disturb nervous equilibrium, but also, so long as they continue, obstruct the processes by which it tends to be restored. On the other hand, the continuance of the conditions of pleasure is a factor positively operative in the restoration of equilibrium. It is evident that even if this view of the case be granted, there is still abundant room for further speculation as to the precise nature of the physiological processes corresponding to pleasure and displeasure respectively. The most favoured theories of the kind connect these opposite feeling-tones with the relations of wear and repair in the nervous system. Explanations based on this general principle assume many different forms; our ignorance of the exact nature of the complex chemical processes involved in assimilation and dissimilation of tissue, and of their connexion with functional activity and repose, leaves much room for speculation. The simplest form of statement is that when wear outruns repair the experience is displeasing, and that when repair outruns wear the experience is pleasing. On this view it is difficult to account for the fact that pleasures may be exhausting, and that when they are long-continued, they diminish, and pass into displeasure.

Mr. H. R. Marshall has propounded a theory which lays great stress on the building up of tissue during periods of functional repose. Pleasure, according to him, depends

upon the building up of a surplus of stored energy acquired during the inaction of the organ. Where this surplus does not exist or has been consumed, the corresponding experience will be virtually neutral, so long as repair keeps pace with wear in the course of functional activity. If wear outruns repair, the corresponding experience is unpleasant. There is much to be said in favour of this view, and Mr. Marshall has said it with great clearness and force. Fatigue is in general a source of disagreeable, and freshness of agreeable, experience. Of course, the fatigue or the freshness must be that of the special tissues engaged in the functional activity. "After the quiet of the night-hours the bird-song, as we awake, is more than usually pleasurable; the rested eye sees beauty in all colours. The rubbing, at our morning bath, of the skin, which has not during the night felt the normal friction of our clothing; the flavour of some special food to which we have been accustomed, but which has not lately been tasted,—all are pleasurable."* A pleasant sensation, when too long continued, will become unpleasant, because the stored surplus is used up. What is a surplus relatively to one intensity of stimulation, will not be a surplus relatively to a higher intensity; hence by gradually increasing the intensity of a stimulus, we pass from pleasant to unpleasant phases of an experience. But along with these advantages the theory presents grave difficulties, if we attempt to base on it the whole explanation of the feeling-tone of sensation; and in my opinion it presents insuperable difficulties if we attempt to cover by its means all the pleasures and pains of perceptual and ideational activity. At present we are only concerned with sensation.

* *Pain, Pleasure, and Aesthetics*, p. 200.

One obvious objection arises from the dependence of feeling-tone on quality as well as quantity of sensation. Why should some sensations be unpleasant at a very low intensity, and others be pleasing even at a very high intensity? Why should a comparatively small degree of bitterness or acidity be disagreeable, while a comparatively high degree of sweetness is agreeable? Mr. Marshall replies that there is a great variation in storage capacity, in the case of different sensation-processes. This explanation is probable enough in some cases. Where a function recurs with great frequency and regularity, and without much variation of intensity, as respiration does, we should not expect any large storage of energy. On the other hand, where stimuli occur irregularly, and with great variations of intensity, the organism can only provide against them by storing up a surplus in advance. But there are a large number of instances in which no such explanation appears applicable. Why should the same person dislike the smallest trace of vanilla, and keenly enjoy cloves or cinnamon? Why should the same person enjoy beef and hate mutton? To account for such differences by variation in storage capacity seems forced.

A more important difficulty is connected with the conception of a surplus. How are we to fix what is, and what is not, surplus energy? Mr. Marshall says that there is a pleasure-giving surplus "whenever the energy involved in the reaction to a stimulus is greater than the energy which the stimulus habitually calls forth," and that pain is experienced "whenever the physical action which determines the content is so related to the supply of nutriment to its organ that the energy involved in the reaction to the stimulus is less in amount than the energy which the stimulus habitually calls forth."* There is ambiguity in

* *Op. cit.*, pp. 204-205.

this statement. The effect produced by a stimulus varies with its intensity; when Mr. Marshall speaks of "the stimulus," does he mean the same kind of stimulus in the same degree of intensity, or the same kind of stimulus in varying degrees of intensity? If he means to include varying degrees of intensity, his case obviously breaks down altogether; for when a stimulus is unusually intense, it is often unpleasant, although the effect which it produces is greater, and not less, than that which we are accustomed to. On the other hand, if he means the same stimulus in the same degree of intensity, only a comparatively small group of facts is available for verifying his hypothesis. The instances in which the same kind and intensity of stimulus yields alternately pleasure and pain to the same person are relatively infrequent. The best example, perhaps, is the gradual decrease of pleasure when a pleasing stimulus is prolonged. Here not merely the feeling-tone, but the experience itself, appears to become fainter; but it is by no means so clear that it continues to remain fainter when it becomes positively disagreeable. Unpleasant experiences may be continued for a very long time indeed before they show any appreciable diminution of unpleasantness; and while they continue, it cannot be said that the effect of the stimulus is smaller than its habitual effect. When abatement of pain begins, the effect of the stimulus is smaller, the total experience becoming fainter. On Mr. Marshall's view we should expect, as an accompaniment of the diminishing effect of the stimulus, an increase and not an abatement of painfulness. This leads up to another objection; the intensity of unpleasantness appears to be in general proportioned to the intensity of the unpleasant experience. If Mr. Marshall were right in affirming that unpleasant stimulation produces a smaller

effect than pleasant stimulation, we should expect unpleasantness of all kinds to be very much fainter than we actually find it to be.

We have discussed Mr. Marshall's views because they form a very favourable example of the theory which traces pleasure-pain to wear and repair of nervous tissue. In general, we may conclude that a large part of the explanation, at least for sense pleasure and pain, may be found on these lines. But no theory framed on these lines has been so formulated as to cover the whole ground successfully even for sensation, and they are all beset by special difficulties. After all, it is not, *à priori*, likely that merely quantitative conditions will be found adequate to account for the facts. Considering the great complexity of the chemical processes in organic tissues in interaction with the blood-supply, there may be all kinds of qualitative as well as quantitative variations. For instance, the accumulation of waste-products in the blood may be a very important factor. It is possible that what takes place in repose and restores the freshness of organs is rather the removal of these waste products than the actual building up of tissues. There are considerations which tend to show that the building up of tissue takes place mainly during functional activity rather than during functional repose. We know that tissues suffer atrophy or degeneration if they are long disused. We merely refer to this point in order to show how speculative and insecure, in the present state of our knowledge, hypotheses of this kind are.

BOOK III. PERCEPTION.

Division I. Perceptual Process in General.

CHAPTER I.

DISTINCTIVE CHARACTERISTICS OF THE PERCEPTUAL CONSCIOUSNESS.

§ 1. *Definition.* — Perception is essentially Cognition. We cannot perceive without perceiving something. Thus perception essentially involves that reference to an object which we disregarded in treating of sensation. But perceiving is a special mode of cognition; it is that special mode which immediately depends on the actual presence of an object to the senses. It may in fact be defined as the cognitive function of sensation. It is contrasted with that mode of cognition which takes place through ideal images. Such images are not dependent on the actual presence of an object to the senses. They are representations of absent objects which have already been perceived. Thus the existence of perception is a pre-condition of the existence of ideal images. Direct cognisance of present objects must precede ideal representation of absent objects.

Even in the direct cognition of present objects, association and reproduction play a very important part. But in perception, taken in the strictest sense of the word, only those forms of association and reproduction enter which we have called *complication* and *acquirement of meaning*, together with that peculiar mode of free reproduction by which general states of nervous and mental excitement and their concomitant organic sensations are revived.*

Though association and reproduction are essential to the development of perceptual consciousness, they do not seem to be necessary to its existence in the most rudimentary form. This seems rather to depend on inherited constitution of the nervous system.

Perception is never merely cognition. It has also a conative character and a feeling-tone. When we speak of perceptual process, we include these factors.

§ 2. *Unity and Continuity of Perceptual Process.*— Many perceptions are very brief and evanescent. They satisfy a slight and momentary interest, after which the mind passes to other occupations. Other perceptions do not occur in this isolated manner: but enter into more prolonged trains of mental activity as constituent moments or phases. These more prolonged trains may be mainly trains of ideas: but they may also be mainly composed of a sequence of perceptions. A man climbing a precipitous cliff may have his attention fully occupied in gaining and retaining foothold and handhold. His activities mainly consist in muscular movement guided by sense-perception. Such an act as threading a needle

* See bk. i., ch. ii., §§ 9,10. The student should keep the whole of this chapter in mind at the present point.

does not necessarily involve ideal images; attention is fully occupied in the guidance of the hand, and the delicate co-ordination of its movements by the aid of the eye. The same holds broadly true of such performances as walking on a tight-rope, keeping one's balance on a bicycle so far as it may require attention, and, in general, of games of bodily skill. In these instances, perceptions are not isolated facts; they form series having a certain unity and continuity similar to that of trains of ideas or trains of thought. Any such series constitutes a single complex perceptual process. It differs from a train of ideas inasmuch as the sequence of its parts does not depend on direct mental reproduction. The sequence of its parts depends upon the sequence of external impressions; but as the sequence of external impressions depends to a very large extent upon the bodily movements of the precipient subject, it is to a very large extent under subjective control.

It is in these complex forms that the distinctive characteristics of perceptual process can best be studied. In many ways the best field for their study is animal life. They are found in definite forms in the instinctive activities of animals, *viz.* in those activities for which the animals are pre-disposed and pre-adapted by the inherited constitution of their nervous systems. They frequently arise at a period in the life of the animal at which it has had no opportunity for the acquisition of corresponding ideas; so that there can be no doubt concerning the predominantly or purely perceptual character of the process. For instance, the train of actions involved in hunting a living prey is shown in the play of

the kitten before it has actually hunted, and often without its having had opportunity for learning them by imitation.* The kitten will first assume the attitude of watching or lying in wait; it will then steal up to the ball of thread or other object which forms its plaything, in a noiseless snake-like manner; in the next place it gathers itself for a spring, and pounces on the *quasi*-prey, seizes it with teeth and claws, and worries it; finally it lets the object go again, and re-commences the process. The several acts of lying in wait, stealthy approach, crouching for a spring, pouncing on the prey, are phases in the development of the same activity. The same is true of the hunting of an actual prey.

All such processes are guided by external impressions; but each impression, as it occurs, only supplies the occasion for the further development of an activity which is already in existence. If the series were one of purely reflex actions, each separate stimulus would independently produce an isolated reaction, so that the process would have no internal continuity But it is just the internal continuity which is distinctive of perceptual activity. The successive phases of perceptual process are directed to one end, and this end is not merely nature's end; it is what the animal itself is in some sense striving after, or, if we may use such an expression, what

* We have no data which would enable us to characterise precisely the cognitive attitude of an animal towards the object which for the first time calls into play a train of instinctive movements having the internal continuity which marks perceptual process. We cannot say the animal recognises the object, for recognition pre-supposes previous experience. But the mental attitude is probably more analogous to what we call recognition than to anything else. There is no preparation by previous experience, but there is preparation by congenital endowment, which seems to fulfil an analogous function

it is "driving at." This does not necessarily mean that the animal presents to itself a mental image of the result to be effected. It means that the felt tendency, conation, or endeavour, with which the train of movements starts, is not satisfied until the end is reached. Like the baby in the advertisement of Pears' soap, the animal "won't be happy till he gets it." With the final attainment of the result, the conation ceases, because it has worked itself out. Interruption, delay, or failure at any stage of the process is a thwarting of the one continuous conation; it is felt as displeasure and aversion, and is accompanied by a tendency to vary the mode of procedure. The successful progress of the action is in every stage felt as a pleasure and as a tendency to continue in the same course. Stated from the physiological point of view, what happens is as follows. Given a neural arrangement for the co-ordination of successive acts, the equilibrium of this arrangement is disturbed by stimulation either from without the organism or from within. It can only recover its own balance and so become quiescent by a series of successive processes leading to a certain result. By these its initial excitement is allayed. The psychical activity whereby a conation develops itself, and so brings about its own end or termination, is the counterpart of the activity whereby the neural system regains equilibrium.

This unity and continuity of perceptual process is its most general feature. The following special characteristics may be regarded as bringing out in detail from various points of view what is involved in this general account.

§ 3. *Attention.*—Perceptual activity can only fulfil itself by the co-operation of a series of external conditions which supply in turn occasions for its further development. Now, if these external occasions are to be utilised in an effective manner, the animal cannot remain purely passive in regard to them. On the contrary, it must meet them half-way by watching for them, and by keeping itself in readiness to act in an appropriate way when they occur. Thus perceptual activity is essentially characterised by attention.* Attention is constantly directed towards the external conditions which are relevant to the progress of the action so as to utilise them. The activity is a train of distinct movements guided by a corresponding train of distinct percepts. Just as the successive movements express the development of one continuous conation, so the distinct percepts are parts of a continuous train in which each sets the mind in an attitude of preparation for the next. Such a train is the analogue on the perceptual level of what, on the ideational,† we call a train of thought. Consider even such a simple act as the chicken pecking, it may be for the first time. The pecking is not an indeterminate pecking in any direction; it is a pecking at a certain object in a given direction and at a given distance. The act of pecking receives its determinateness from the previous act of seeing, of attentively fixing the eye on the object. Conversely, the tendency to peck guides and controls the act of seeing. It is because the animal is about to peck, or is engaged in pecking, that it keeps its eye on the object; and it is because it keeps its eye on the object that it is enabled to peck in a

* See bk. i., ch. i., p. 71-72.

† See note, p. 259.

purposeful manner. This mutual guidance lasts till the moment of seizure, determining this act also, and bringing it within the same total co-ordination.

Attention is always in some manner expectant or prospective. So far as we already know a thing sufficiently for our purpose, the work of attention is already accomplished. The direction of thought, whether perceptual or ideational, coincides with the direction of conation, — of appetency or aversion; conation is always pressing forward towards its end; hence attention, which is nothing but conation defining itself in cognition, and so guiding itself by means of cognition, must also constantly be directed forward beyond the "ignorant present," to meet what is to come. To attend is always to *watch*, to *await*, to be on the *alert*. When we take a light to lighten our path through a dark place, we use it to make out whither we are going, not where we have already arrived. It is to guide our future steps, not the steps we have already taken. Now if we care to use a bold metaphor, we may say that attention is the light used by conation to make out its path. Only we must remember that attention is no external illumination, but is simply identical with conation considered in its cognitive aspect. Trains of perceptual activity are marked throughout their course by this mental prospectiveness. Its external sign is the pre-adaptation of the sense-organs to receive impressions, and the pre-adjustment of the body in readiness to act when the opportunity presents itself. The cat lying in wait for the mouse or bird is a sufficient example. The sight and smell of the mouse-hole, we may suppose, set it in action. Eye and ear are ad-

justed so as to catch coming impressions, the appearance of the mouse or any sound it makes; the muscles of the body are in a state of tension in preparation for a spring, or other appropriate action. But the action is suppressed and postponed until the occasion for it emerges. Perhaps a doubt may be raised whether such behaviour can be purely perceptual. Does it not of necessity involve acquired ideas and association of ideas? We may take another instance, in which this objection can hardly be urged. A crab or flat-fish at the bottom of the sea covers itself with sand, protruding only its stalked eye. With this it keeps restlessly spying in all directions. On the approach of an enemy, the eye is rapidly withdrawn and hidden in the sand. On the appearance of prey, the eye follows its motions. When the prey is near enough, the observant animal darts swiftly up and seizes it. It can scarcely be maintained that this characteristic behaviour is acquired by association of any kind, to say nothing of association of ideas. If the flat-fish or crab had to *learn* to look out for prey, where would its instruction come from? It would certainly have a poor chance of survival. The attentive attitude is frequently found in the very first performance of an instinctive activity.

That systematic watching and searching and attentive behaviour in general are possible without mental images, may be shown in the case of human beings, and especially in certain pathological cases. One curiously interesting case has been recently published.* A man called Voit was quite unable to name objects or their

* Gustav Wolff, "Ueber krankhafte Dissoziation der Vorstellungen." *Zeitschrift f. Psych. u. Phys. der Sinnesorgane*, Bd. xv., Heft 1, 2.

properties, unless they were actually present to his senses. Thus if he were asked, "What colour is a meadow?" he could not answer, if he did not see the meadow. Similarly, he could not tell how many legs a horse has unless he saw the horse. Yet he understood language so far as to be able to do what he was told, appropriately and accurately. Nor was his inability merely an inability to find words: when a number of coloured tablets were laid before him, and among these a green tablet, and when he was asked, "What colour are the leaves of trees?" he could not answer by pointing to the green tablet, but remained totally helpless. When the questioner pointed to the green tablet, and asked, "Are the leaves of trees like this?" Voit could only reply, "Perhaps," and he made the same answer when the question referred to the blue, yellow, or red tablets. What held good of sight extended also to the other senses in an even greater degree. Voit was quite unable to assign any of the sensible qualities of objects named to him. He could not so recall the idea of the object as to bring to consciousness its visible, audible, tangible, or other sensible characters.

Now the truly remarkable point is this: In spite of his inability to recall by way of ideal representation* the appearance of an object, he could none the less systematically search for anything named to him; and in

* The student should bear in mind the essential character of an idea as stated in bk. i., ch. ii., § 9: "(1) Any reproduction which can be called an idea must have sufficient independence to be capable of forming a distinct link in a train of thought; (2) it must be the thought of an object, such as a thing, quality, relation, or event, and not a mere crude sensation, however faint." All ideas have two constituents, an image and the meaning which the image has acquired in previous experience. The image may be merely a mentally revived word.

so far as he actually perceived, he could accurately describe it. On being asked the colour of leaves, he went to the window and looked for a tree. As soon as he saw a tree, he said, "Green." Merely to see green objects of any kind was of no assistance to him. But when he saw the leaves themselves, he recognised their colour and named it. When the object inquired about was of such a nature that it was useless at the time to look for it, he refrained from the attempt to do so. Thus, when he was asked in summer what colour the snow was, he made no attempt to look for snow, but was quite content to acquiesce in the suggestion that it was black. On the other hand, when the question was, how many legs a horse has, he would, if permitted, go to the window and watch until a horse passed. When some one remarked that people were walking about naked in the street, he was quite content to accept the statement, but only while there was no one passing. As soon as he caught sight from the window of a passer-by, he exclaimed, "No, no, clothes!" Perhaps the most curious illustration of the man's mental condition is the following. He was asked what the colour of blood is. After a period of bewilderment, in which he looked helplessly about the room, he finally pressed a pustule which happened to be on his hand, until the blood came. He then answered, "Red." Note next that he could not, on merely seeing an object, name any other of its sensible qualities than those immediately presented to sight. If he were shown a piece of sugar, he could name it and say it was white; but even with the sugar in full view, he could not tell how it tasted merely by seeing it. He sought to get hold of the sugar and put it into his mouth.

Only when he succeeded in doing this could he find the word, "Sweet." Again, Voit could not tell whether the surface of a mirror was rough or smooth until he had touched it himself. It was not enough for him to see others pass their fingers up and down it.

The grand lesson of this case is to be found in the conjunction of great impairment if not total absence of ideational activity with comparatively unimpaired perceptual activity. When Voit saw a thing, he knew how to make proper use of it. He sat on a chair when he saw it, covered his head with his hat when he saw it, carried a glass to his mouth and drank when he saw the glass with liquor in it. Words had meaning for him as practical signals inciting to trains of action, though they did not call up trains of ideas.

§ 4. *Persistency with Varied Effort.* — Even in the earliest performance of its instinctive activities, *viz.* those activities for which it is pre-disposed and pre-adapted by the inherited constitution of its nervous system, an animal may display persistency with varied effort. It keeps on trying when it does not succeed at first, varying its procedure so far as it is unsuccessful. Professor Lloyd Morgan gives a good example, communicated by Mr. Batchelder. Mr. Batchelder had taken squirrels from their nest when they were very young; they were at first unable to take solid food, and had to be fed through a quill on a mixture of cream and hot water. Afterwards they took to bread and milk, biscuits, and bread crusts. Mr. Batchelder then gave them some hickory-nuts. "They examined the nuts attentively, evidently looking upon them as unusually interesting novelties, and at last the more enterprising

of the two set to work on a nut, as if he wished to find out what prize it might contain. With hitherto unexampled patience he laboured over it, until at last, after more than half an hour's diligent gnawing, he gained access to the kernel. With a few days' practice they acquired skill and speed in extracting these hard-shelled delicacies; and after that they lost all interest in such things as biscuits, and hickory-nuts formed the principal item on their bill of fare."* Persistency with varied effort also shows itself in more indefinite ways. "I have noted it," says Lloyd Morgan, "again and again in the case of young birds. It was especially noticeable in jays. Every projecting bit of wire or piece of wood in their cage was pulled at from all points, and in varied ways. Every new object introduced into the cage was turned over, carried about, pulled at, hammered at, stuffed into this corner and into that, and experimented with in all possible ways."†

Obviously, persistency with varied effort is a precondition of learning by the results of by-gone experience, and not merely a consequence of it. In itself it is an adaptation to present experience rather than to past. Further, it is an adaptation which can only be understood by reference to the continuous impulse or conation which pervades and constitutes perceptual process. Just because the impulse is a tendency towards an end, it guides the course of the action. When the action enters into a phase which checks instead of furthering the return to equilibrium, the current of activity diverts itself into a relatively new channel. The process would not be a process towards

* *Habit and Instinct*, p. 122. † *Op. cit.*, p. 154.

an end, if it could persist without variation in an unsuccessful course.

§ 5. *Free Adaptation to Varying Conditions.* — We have just seen that perceptual process exhibits adaptive variation, according as activity is successful or unsuccessful. But, besides this, we find in it also adaptive variation in accordance with varying external conditions. We may quote first a simple and rudimentary example from Lloyd Morgan. "I took a young pheasant, which had been hatched some time in the night, from the incubator drawer at nine o'clock in the morning. He was very unsteady on his legs, so I held him in my hands, and tried to induce him to peck at a piece of egg yolk held in a pair of forceps. He did not do so; but he followed, with his head, every movement of the object in a narrow circle about two inches in front of his beak. Simple as the action seems, it shows a striking example of congenital co-ordinated movements accurately related to movements in the visual field, the whole performed without any possibility of learning or practice, and less than half an hour after the bird had first seen the light of day.*

All adjustment of the sense-organs, in looking, listening, exploring by touch, and the like, must vary according to the varying position, distance, and shape of the object. Similarly, the act of darting upon a moving prey and seizing with beak or claw or mouth involves precise and delicate adaptation of movement to varying space relations. Think of swallows catching flies, and similar instances.

The same kind of purely perceptual adaptation is

* *Op. cit.*, pp. 38-39.

often found in human beings. In boxing, in fencing, and similar activities, rapid adaptation to constantly varying conditions is required, adaptation which involves perceptual attention, so that eye and hand may keep pace, but which would frequently be hindered, rather than helped, by mental imagery. Or take the simple act of leaping from point to point. A man with the avenger of blood behind him may have to jump from crag to crag to save his life. His eye measures the distance to be crossed, and his muscles are adjusted accordingly so as to land him in a certain spot. If he stopped to mentally picture himself moving through the air over a certain space, he would in all probability perish. He must trust to his eye.

Perhaps the most striking instances of adaptation to varying conditions determined purely by congenital endowment, independent of prior experience, are to be found in the behaviour of ants.* All the activities characteristic of ants, as well as of bees and wasps, are in their main outline instinctive. They are displayed by ants which have been taken from their nest immediately after being hatched, and set apart to form a new nest. Independently of prior experience, the processes of nest-building, the rearing of the young, the capture of the so-called slaves, the maintenance of domestic animals, and the like, vary in adaptation to varying circumstances. The mode of building the nest varies with the situation and accessible material. Change in the weather causes them to make corresponding changes in

* These adaptations are not *free* in the same degree as those described in the preceding paragraph. They are relative to comparatively fixed and specific circumstances.

their nest. When the nest is too damp, they pierce holes in it so that it looks like a sponge. This facilitates evaporation and keeps their home drier. In the tending of their young they show a similar plasticity. The youngest larvae are generally kept in the deepest chambers of the nest: the half-grown in those above, and the fully-grown, together with the pupae, in the highest. When the weather is cold and rainy, they carry the more mature larvae from the higher into the lower chambers. The evidence seems to show that these and similar adaptations to varying circumstances are not learnt by experience, but are due to original plasticity of congenital endowment.*

§ 6. *Learning by Experience.* — In contrast to the sensation-reflex, perceptual activity profits by the results of past experience. It can do so without any distinct revival of the special items of sensation, as they originally occurred. The unity and continuity of impulse which binds a sequence of distinct acts into a single action has its counterpart on the side of retentiveness in the formation of a cumulative disposition. On the first occurrence of the process the traces left by prior phases persist in and contribute to determine succeeding phases. They unite in a single cumulative disposition. When the activity is repeated, whatever stimulus prompts, it re-excites the total cumulative disposition left behind by its previous occurrence. The cumulative disposition has been modified in the anterior experience, and accordingly the re-aroused activity takes a correspondingly modified

* See *Vergleichende Studien über das Seelenleben der Ameisen und der höhern Thiere.* Von E. Wasmann S.J. Freiburg: Herdersche Verlagshandlung, 1897. Pp. 122. Price, 1*s.* 9*d.*

course. This is the process which we have described as *acquirement of meaning*.* Without this there can be no learning by experience of an intelligent kind; and intelligent learning by experience may be due to it alone. Where further processes of reproduction are present, they co-operate with the acquirement of meaning, and make it more definite; but the acquirement of meaning is the primary and indispensable condition of the variation of future activity, in intelligent correspondence with the results of past activity. We shall have hereafter to discuss at what point learning by experience leaves the merely perceptual level and involves ideas. We now give instances of typically perceptual cases. Let us refer once more to Mr. Lloyd Morgan's chickens. "A young chick two days old . . . . had learnt to pick out pieces of yolk from others of white of egg. I cut little bits of orange-peel of about the same size as the pieces of yolk, and one of these was soon seized, but at once relinquished, the chick shaking his head. Seizing another, he held it for a moment in the bill, but then dropped it and scratched at the base of his beak. That was enough; he could not again be induced to seize a piece of orange-peel. The obnoxious material was now removed, and pieces of yolk of egg substituted, but they were left untouched, being probably taken for orange-peel. Subsequently, he looked at the yolk with hesitation, but presently pecked doubtfully, not seizing, but merely touching. Then he pecked again, seized, and swallowed." † This illustration well brings out the in-

* See bk. i., ch. ii., §§ 9-10. The examples which follow in the present section will serve to give definiteness to the somewhat vague exposition of the earlier chapter.

† *Op. cit.*, pp. 40-41.

telligent nature of the learning by experience. The chicken looks hesitatingly at the yolk; he then makes a tentative peck, only touching it to try what it is like before venturing to seize it. When this preliminary trial proves satisfactory, he pecks again, seizes, and swallows. Take another illustration from a widely different part of the animal creation. Cephalopods, such as the octopus, grope about in all directions with their arms on the ground and on rocks for small mussels and prawns, or they push their arm-like tentacles into holes or chinks of rocks, in search of crabs. Now Schneider observed a very young octopus seize a hermit-crab. The hermit-crab covers the shell in which it takes up its abode with stinging zoophytes. Stung by these the octopus immediately recoiled and let its prey escape. Subsequently it was observed to avoid hermit-crabs. Older animals of the same species managed cleverly to pull the crab out of its house without being stung.

Persistence with varying effort is in itself a learning by experience, although it is in the first instance a learning by present experience rather than by past. But it is also a most important pre-condition of profiting by past experience. Repetition of trials with variation of procedure is a sort of perceptual experiment. The results of previous experiment determine and facilitate future action, inasmuch as unsuccessful modes of procedure are gradually eliminated and successful modes alone survive. I quote from Dr. Wesley Mills' valuable papers* on the "Psychical Development of Young Ani-

* Recently collected in part iii. of a book entitled: *The Nature and Development of Animal Intelligence.* New York: The Macmillan Company, 1898. Price, $2.00.

mals" a very good illustration of this process. The method of Mills was to keep a very careful diary of the behaviour of young animals from their birth. The following entries occur in the register of his observations of a kitten. *26th day:* The kitten "leaves its box and goes to a part of the room where there are some book-shelves, the lower ones of which are not completely filled with books, but hold other things. The mother follows it. The kitten is put back into its box. . . . *27th day:* On getting out of box the kitten starts on a little *run* for the book-shelves. It was taken from among the objects on the shelf, turned towards the box and given a few taps. It ran on to the box and got into it. . . . The kitten continues to show a strong desire to get to the book-shelves. . . . *28th day:* . . . About 5 P.M. the entrance to the book-shelf was barred up. The kitten first tries every part of the barricade, then pushes in the curtain — cries with vexation — climbs upon a box near—leaps from this on the curtain, holding on with the claws. After trying again and again desists, and after a few moments returns to the attack. At last she gives it up, returns to her box, settles down and sucks her mother, and then soon after falls asleep. *30th day:* It makes many attempts to get into the book-shelf, and at last succeeds. . . . *31st day:* In the evening, it is found behind the barricade of the book-shelf sleeping on some books. It is taken out, but works its way back again. It finds getting out difficult, but perseveres. . . . *32nd day:* . . . It tries the book-shelf barricade, but, not succeeding, gives up and sits in its box near by and grooms itself well. Later it makes a more *determined attempt* on the barricade, and with

success. It has difficulty in getting out; but soon goes in again and remains from half to three-quarters of an hour. . . . *33rd day:* Found behind the barricade this morning before daylight, when, trying to prevent its advance in a certain direction the kitten evades me by running under a rocking-chair where it is partly hidden. . . . Though the book-shelves were closed by a curtain tacked on them, the kitten managed to get in, though I do not know how. . . . *35th day:* . . . It scrambles into the book-shelf by a new way and at much greater height."

I have reproduced this book-shelf drama at length because it is a typical instance of how animals learn by experience. We must especially note the gradual nature of the process. Having succeeded once, the kitten does not therefore succeed the next time without further trial and failure. What happens is that the amount of tentative groping gradually diminishes, until at last the end can be attained directly without let or hindrance. The clever tricks of animals, which excite surprise by their resemblance to behaviour distinctly human, seem to be acquired in the same way. There is a sad lack of systematic observation of the process by which animals come to do such things as opening a door by lifting a latch. But in the few instances in which the successive steps have been examined, it has been found that the perfect result only emerged after successive trials and failures involving much tentative groping, and that to succeed once by no means entailed immediate success the next time. This view has been corroborated by a series of experiments conducted by Mr. Thorndike of Columbia Univer-

sity, on dogs, cats, and chicks. "The method was to put the animals when hungry in enclosures from which they could escape (and so obtain food) by operating some simple mechanism, *e.g.* by turning a wooden button that held the door, pulling a loop attached to the bolt, or pressing down a lever. Thus one readily sees what sort of things the animals can learn to do and just how they learn to do them. Not only were the actions of the animals in effecting escape observed, but also in every case an accurate record was kept of the times taken to escape in the successive trials. The first time that a cat is put into such an enclosure, some minutes generally elapse before its instinctive struggles hit upon the proper movement, while after enough trials it will make the right movement immediately upon being put into the box. The time records [plotted down in curves] show exactly the method and the rate of progress from the former to the latter condition of affairs. . . . What happens in all these cases is this: The animal on being put into the box, and so confronted with the situation 'confinement with food outside,' bursts forth into the instinctive activities which have in the course of nature been connected with such a situation. It tries to squeeze through any openings, claws and bites at the walls confining it, puts its paws through and claws at things outside, trying to pull itself out. It may rush around, doing all this with extraordinary vehemence and persistence. If these impulsive activities fail to include any movement which succeeds in opening the door, the animal finally stops them and remains quietly in the box. If in their course the animal does accidentally

work the mechanism (claw the button round, for instance), and thus win freedom and food, the resulting pleasure will stamp in the act, and when again put in the box the animal will be likely to do it sooner. This continues; all the squeezings and bitings and clawings which do not hit the vital point of the mechanism, and so do not result in any pleasure, get stamped out, while the particular impulse, which made the successful clawing or biting, gets stamped in, until finally it alone is connected with the sense-impression of the box's interior, and it is done at once when the animal is shut in. . . . Although it was of the utmost importance to them to get out of the various boxes, and it was therefore certain that they would use to the full their mental powers, none of the animals gave any sign of the possession of powers of inference, comparison or generalisation. Moreover, certain of the experiments seem to take the ground from beneath the feet of those who credit reason to animals. For it was found that acts (*e.g.* opening doors by depressing thumb-latches and turning buttons) which these theorisers have declared incapable of performance by mere accident *certainly can be so done.* It is, therefore, unnecessary to invoke reasoning to account for these and similar successes with mechanical contrivances, and the argument based on them falls to the ground. Moreover, besides destroying the value of the evidence which has been offered for the presence of reason in animals, the time-records give us positive evidence that the subjects of these experiments could not reason. For the slopes of the curves are *gradual.* Surely if a cat made the movement from an inference that it would open the door, it ought, when again put

in, to make the movement *immediately*. If its first success was due to an inference, all trials after the first should take a minimum time. And if there were any slightest rudiment of a reasoning faculty, even if no real power of inference, the cat ought at least some time in the course of ten or twenty successful trials to realise that turning that button means getting out, and thenceforth make the movement from a decision, not a mere impulse. There ought, that is, to be a sudden change from the long, irregular times of impulsive activity to a regular minimum time. The change is as a fact very gradual.*

Finally, experiments made in another connexion show that these animals could not learn to perform even the simplest acts by seeing another do them or by being put through them by the experimenter. They were thus unable to infer that since another by pulling a string obtained fish, they might, or that since fish were gained when I pushed round a bar with their paws it would be gained if they pushed it round themselves." †

The best examples in adult human beings of this gradual emergence of the right way, and gradual disappearance of wrong ways of doing a thing, are presented by the process of acquiring bodily or other dexterity merely through practice. The cook who can concoct a sauce

* "Thus the successive times taken by one cat in a certain box were (in seconds) 160, 30, 90, 60, 15, 28, 20, 30, 22, 11, 15, 20, 12, 10, 14, 8, 8, 5, 10, 8, 6, 6, 7." The animals "would, in the case of some difficult associations, happen to do the thing six or seven times, but after long periods of promiscuous scrabbling, and then forever after would fail to do it." (*Psychological Review*, vol. v., No. 5, p. 552.)

† *Science*, new series, vol. vii., No. 181 (June 17, 1898), pp. 818, 820-821; an abstract of the original paper in Monograph Supplement, No. 8, of the *Psychological Review*.

in a peculiarly felicitous way, but cannot teach anybody else to mix the ingredients in the right proportions, must have attained success mainly by mere tentative groping without the aid of definite comparison or general ideas. Mr. Thorndike points out that association, as it existed in his animals, "is not homologous with anything in human association except such conscious connexions as a man feels in playing tennis or billiards. The essential thing in it is not the idea, but the impulse. That this sort of human associations is homologous with the animal sort is borne out by the fact that they are, like the latter, formed *gradually* by the stamping in of successes due to trial and error, and are not able to be formed by imitation or by one's being put through them." *

§ 7. *Reproduction in Perceptual Process.* — In purely perceptual process, the only forms of reproduction are (1) *Acquirement of meaning*, (2) *Complication*, and (3) *The revival of general states of nervous excitement and their concomitant organic sensations.*

(1) *Acquirement of meaning* is the most primary and essential. It is grounded in the very nature of perceptual process considered as appetitive activity. The whole process, in so far as it is one and continuous, leaves behind it a cumulative disposition. Hence, when it is repeated, it is modified as a whole from the outset.

(2) *Complication* is a process for which there are probably special pre-arrangements in the original constitution of the nervous system. It consists in modifi-

* *Psychological Review*, vol. v., No. 5, pp. 552-553. I am greatly impressed by the coincidence between the conclusion which Mr. Thorndike draws from his experiments and that which I had previously formed on more general grounds.

cation of the quality and increase of the complexity of certain sensations by association with other kinds of sensation in past experience. It mainly takes place between sensations belonging to different senses such as sight and touch. In looking at a hard object, our visual experience is different from that which we have in looking at a soft object, and the difference is due to the corresponding tactile experiences.

(3) *The revival of general states of nervous excitement and their concomitant organic sensations* is of especial importance in connexion with emotion. A dog which has been whipped will whine and display signs of fear and distress at the sight of the lash. The original pain-sensations produced a diffused nervous excitement, which gave rise to a general disturbance of organic functions, and to organic sensations. The sight of the whip revives an analogous nervous and bodily excitement and with it analogous experiences.

§ 8. *Ideas accompanying Perceptual Process.*— So far we have treated of perception and perceptual process in its pure form. We have distinguished it sharply from ideational process. But in the actual mental life of man the two run into one another, so that we do not usually find pure perceptual processes, but rather what we may call perceptual processes not absolutely, but only *a potiori*. The same is true to some extent of the higher animals also. Free ideas may accompany a process without interfering with its essentially perceptual nature. The free ideas may fulfil a function essentially analogous to that fulfilled by perception, and not any function which by its very nature requires the presence of ideas. This happens when the

only office discharged by mental imagery is to prompt or guide the execution of an action, and not to lay out the plan of an action beforehand in the form of a train of thought. Mr. Batchelder's squirrels gnawed at the nuts and by reaching their contents satisfied their congenital craving without any mental image of the kernel inside. Suppose that on a future occasion they start with this mental image, the character of the process is not essentially altered. The image of the kernel inside now only contributes to prompt and guide the action, just as the mere perception of the nut prompted and guided it before. Free images may be especially useful and even necessary in this way, when the activity is comparatively complicated, and undetermined by definite congenital impulses. Take for instance the case of a monkey imitating a train of actions which it has seen performed by a man, — those concerned in shaving, for instance. Possibly percepts would alone suffice in such a case. The sight of the razor might prompt the act of sharpening it, and the act of sharpening it might next prompt the lathering, and so on. But certainly it is easier to understand the action if we suppose that in different phases of its progress some mental image of the behaviour of the man arises in the mind of the monkey, and helps to guide him.

It would seem that in animals ideas, so far as they exist* at all, are isolated and, so to speak, sporadic. They do not as a rule give rise to further ideas following each other in a train. Their function is rather to

* There is room for difference of opinion on this point. Personally, I do not think that there is much evidence for the presence of ideal images in the animal mind, except in the case of the more intelligent monkeys and perhaps of elephants.

guide the development of a motor impulse as percepts guide it. As Mr. Thorndike says, the impulse and not the idea is the essential thing.

In our own mental life, free ideas are almost constantly present, so that purely perceptual activity is comparatively exceptional. But it certainly takes place. If I have once been bitten by a dog, and meet the same dog on another occasion, I do not need to summon up in my mind a mental image of being bitten again in order to take practical measures of an intelligent kind.

The vast interval which separates human achievements, so far as they depend on human intelligence, from animal achievements, so far as they depend on animal intelligence, is connected with the distinction between perceptual and ideational process. Animal activities are either purely perceptual, or, in so far as they involve ideas, these ideas only serve to prompt and guide an action in its actual execution.* On the other hand, man constructs "in his head," by means of trains of ideas, schemes of action before he begins to carry them out. He is thus capable of overcoming difficulties in advance. He can cross a bridge before he comes to it.

§ 9. *Impulsive Character of Perceptual Process.* — Any single train of perceptual activity has internal unity and continuity. But where conscious life is mainly perceptual, the several trains of activity are relatively isolated and disconnected with each other. They do not unite to form a continuous system, such as is implied in the conception of a person. We must

* There may be exceptions to this rule, but the general statement is broadly true.

deny personality to animals. They are in the main creatures of impulse. The word *impulse* is properly applied to any conative tendency, so far as it operates by its own isolated intensity, apart from its relation to a general system of motives. Action on impulse is thus contrasted with action which results from reflexion or deliberation. In deliberation a man, instead of following out the impulse arising from the circumstances of the present moment, brings the contemplated course of action into relation with the total system of his mental life, past and future. He appeals from the Self of the present moment to the total Self. If the strength of the momentary impulse determine action without giving time for deliberation, regret or remorse is likely to follow. When the momentary impulse has ceased to dominate consciousness, the idea of his past action may come into conflict with the more general tendencies which give unity and consistency to his life as a whole. Regret or remorse of this kind is impossible on the purely perceptual plane; simply because on the perceptual plane there is no unified system of tendencies with which the isolated impulse could collide; there is no personal Self including in one whole past, present and future experience. It is nonsense to punish a dog for an action which he did a week ago. Thus the purely perceptual consciousness is compact of relatively detached impulses. The end attained in one perceptual process does not constitute a starting-point for the attainment of further ends. The several processes, each having its own internal unity and continuity, are disconnected with each other much as games are disconnected with each other. We do not assume the result

of one game at chess or rubber at whist as the starting-point of the succeeding game. Each game starts completely afresh on its own account. It is true that the skill of the player is increased by practice, but this also holds good of trains of perceptual activity, and makes the analogy more perfect. Summing up, we may say that on the perceptual plane there is no single continuous Self contrasted with a single continuous world. Self as a whole uniting present, past and future phases, and the world as a single coherent system of things and processes, are ideal constructions, built up gradually in the course of human development. The ideal construction of Self and of the world is comparatively rudimentary in the lower races of mankind, and it never can be complete. On the purely perceptual plane it has not even begun.

CHAPTER II.

IMITATION.

§ 1. *Introductory.* — Imitation is a process of very great importance for the development of mental life in both men and animals. In its more complex forms, it pre-supposes trains of ideas; but in its essential features it is present and operative at the perceptual level. It is largely through imitation that the results of the experience of one generation are transmitted to the next, so as to form the basis for further development. Where trains of ideas play a relatively unimportant part, as in the case of animals, imitation may be said to be the sole form of social tradition. In the case of human beings, the thought of past generations is embodied in language, institutions, machinery, and the like. This distinctively human tradition pre-supposes trains of ideas in past generations, which so mould the environment of a new generation, that in apprehending and adapting itself to this environment it must re-think the old trains of thought. Tradition of this kind is not found in animal life, because the animal mind does not proceed by way of trains of ideas. None the less, the more intelligent animals depend largely on tradition. This tradition

consists essentially in imitation by the young of the actions of their parents, or of other members of the community in which they are born. The same directly imitative process, though it is very far from forming the whole of social tradition in human beings, forms a very important part of it.

§ 2. *The Imitative Impulse.*—We must distinguish between ability to imitate and impulse to imitate. We may be already fully able to perform an action, and the sight of it as performed by another may merely prompt us to reproduce it. But the sight of an act performed by another may also have an educational influence; it may not only stimulate us to do what we are already able to do without its aid; it may also enable us to do what we could not do without having an example to follow. When one man sees others dancing, his own feet may become restless and he may be carried away by the impulse to join them. But he may not have anything to *learn* from them. He may be a better dancer than any of them to begin with. He is simply prompted to do on this particular occasion what he is already quite capable of doing. The case is different with the child's early imitation of the words spoken by his elders. The result at first very imperfectly corresponds to the model, and success is attained only by repeated trials. In very many instances there is learning by imitation with little or no direct impulse to imitate. The imitative process is enacted not for its own sake but for the sake of some ulterior end. Thus if I am learning billiards and someone shows me by his own example how to make a particular stroke, the case is different. It is not his example which in the first

instance prompts me to the action. He merely shows the way to do what I already desire to do.*

We have then first to discuss the nature of the imitative impulse—the impulse to perform an action which arises from the perception of it as performed by another.

This impulse is an affair of attentive consciousness. As such it must be distinguished from merely automatic imitation. Automatic imitation is of two kinds. It may be due to habitual association as when the cough of one man sets another coughing. Or again it may be due to the general habit of doing as others do when there is no special motive to the contrary. This habit is constantly operative in human society. It seems to have manifold sources. I may here mention three. (1) It is easier simply to follow the current mode of procedure than to be continually striking out new lines of action for ourselves. Thus the habit of following suit constitutes an enormous economy of time and trouble. (2) It is generally disagreeable to attract attention by singularity and to disturb others by aimless novelty. (3) We learn by experience that what others do is very often based on good reason, and that deviation from it is likely to be disadvantageous. Such conditions as these lead men to form the settled habit of doing as others do, where they feel no special interest in attending to a matter for themselves and forming an independent judgment.

The imitative impulse in distinction from such mere routine repetition is a conation which seeks satisfaction in the imitative process itself. The perception of an

* So far as this is capable of being taught, and does not depend on "practice."

action prompts us to reproduce it when and so far as it excites interest or is at least intimately connected with what does excite interest. Further, the interest must be of such a nature that it is more fully gratified by partially or wholly repeating the interesting action. Thus imitation is a special development of attention. Attention is always striving after a more vivid, more definite, and more complete apprehension of its object. Imitation is a way in which this endeavour may gratify itself when the interest in the object is of a certain kind. It is obvious that we do not try to imitate all manner of actions without distinction, merely because they take place under our eyes. What is familiar and commonplace or what for any other reason is unexciting and insipid, fails to stir us to re-enact it. It is otherwise with what is strikingly novel or in any way impressive, so that our attention dwells on it with relish or fascination. It is of course not true that whatever act fixes attention prompts to imitation. This is only the case where imitation helps attention, where it is in fact a special development of attention. This is so when interest is directly concentrated on the activity itself for its own sake rather than for the sake of its possible consequences and the like ulterior motives. But it is not necessary that the act in itself should be interesting; in a most important class of cases the interest centres not directly in the external act imitated, but in something else with which this act is so intimately connected as virtually to form a part of it. Thus there is a tendency not only to imitate interesting acts, but also the acts of interesting persons. Dogs often imitate their masters. Men are apt to imitate the gestures and modes of speech of those who excite their

admiration or affection or some other personal interest. Children imitate their parents, or their leaders in the playground. Even the mannerisms and tricks of speech of a great man are often unconsciously copied by those who regard him as a hero. In such instances the primary interest is in the whole personality of the model; but this is more vividly and distinctly brought before consciousness by reproducing his external peculiarities.*

Our result then is that interest in an action prompts to imitation in proportion to its intensity, provided the interest is of a kind which will be gratified or sustained by imitative activity. But here we must make a distinction. The interest may be either primary or acquired through previous experience. The imitative impulse in young animals and children is to a large extent independent of previous experience. It depends on congenital tendencies. A young duck brought up by a hen among chickens imitates its social environment only in a limited degree. Where there is an instinctive tendency towards a certain form of action, the action is interesting when another performs it, so that the imitative impulse comes into play.

As a rule, this instinctive imitation not only prompts the action, but also determines more or less its special character. The child has a congenital tendency to utter articulate sounds; but the special character of the sounds it utters is largely determined by the sounds it hears from the persons who surround it. The same is true of the song of birds. But sometimes imitation

* Of course the society in which we live is always interesting to us. Hence the tendency to acquire a provincial accent when we are constantly associating with people who have it.

seems only to supply an occasional impulse, and does not in the first instance create the power of performing an action or appreciably modify its character. As an example in which the presence of a model simply stimulates an activity and does not modify it, we may take the repetition of a danger-cry by young birds when they hear others utter it. The danger-cry itself is undoubtedly instinctive. Any disagreeable or disturbing experience will elicit it from a young chicken which has not heard it before. Its effect also on the birds who hear it is instinctive. When a parent bird utters the cry, the chick which is yet in the egg will suddenly cease in its endeavour to pierce the shell and become motionless. In just the same instinctive way, the sound of the alarm-note uttered by one bird prompts another to repeat it, so that the alarm may be communicated to a whole group. It is mainly in this manner that birds and other animals learn to avoid dangers which at first they had disregarded. The sight of a man with a gun on a previously desert island may evoke no alarm in its feathered inhabitants; but after a few experiences of the fatal consequences connected with a man so armed, the birds in general will become shy. Those who have actually been disturbed or wounded by the gun have uttered the alarm-note; this has thrown yet others into a state of alarm, and they also utter the alarm-note; these, when they again see a man, utter the alarm-note, although they have never experienced any harm from human beings.

§ 3. *Learning by Limitation.*—Let us now turn to the other side of the question. Let us consider the case in which the power of performing an action is acquired

in and by the process of imitation itself. Here there is a general rule which is obvious when once it is pointed out. It is part of the still more general rule that "to him that hath shall be given." Our power of imitating the activity of another is strictly proportioned to our pre-existing power of performing the same general kind of action independently.* For instance, one who is devoid of musical faculty has practically no power of imitating the violin playing of Joachim. Imitation may develop and improve a power which already exists, but it cannot create it. Consider the child beginning for the first time to write in a copybook. He learns by imitation; but it is only because he has already some rudimentary ability to make such simple figures as pothooks that the imitative process can get a start. At the outset, his pothooks are very unlike the model set before him. Gradually he improves; increased power of independent production gives step by step increased power of imitation, until he approaches too closely the limits of his capacity in this direction to make any further progress of an appreciable kind.

But this is an incomplete account of the matter. The power of learning by imitation is part of the general power of learning by experience; it involves mental plasticity. An animal which starts life with congenital tendencies and aptitudes of a fixed and stereotyped kind, so that they admit of but little modification in the course of individual development, has correspondingly little power of learning by imitation. Among animals, mon-

* Mr. Thorndike's animals, referred to in the previous chapter, failed to imitate actions so strange and unfamiliar to them as the pressure of buttons, etc. The result with an intelligent monkey would probably have been different.

keys have the greatest plasticity and the greatest aptitude for imitation. They are incessantly active in all kinds of ways, and they are in a very high degree capable of learning by experience. Thus, when admitted to the company of human beings, they will spontaneously learn the use of knives, forks, cups, plates, etc. In general, the more intelligent monkeys have a wider and more varied sphere of activity than other animals. They are incessantly trying to do things, experimenting in all sorts of ways, and learning rapidly by the success or failure of their attempts. The wide range of their activity involves a wide range of interest. They attend to all kinds of things without any directly practical aim; and the imitative impulse is, as we have seen, a special development of this form of attention. The readiest way of bringing before their consciousness vividly and distinctly an action which interests them, is to re-enact it themselves.

Of course at higher levels of mental development the imitative impulse is far less conspicuous because *impulsive* activity in general is checked and overruled by activity organised in a unified system.* Civilised men imitate not so much because of immediate interest in the action imitated as with a view to the attainment of desirable results. As experience widens, the pure imitative impulse becomes combined with other motives to imitation and to a large extent supplanted by them. To begin with, the young child imitates the sounds uttered by those around it merely for the sake of the imitative activity itself. But as it becomes acquainted with the value of words as means of

* See last chapter, § 9.

social intercourse a new motive is added. Every new word now means for it a possible acquisition of new knowledge and power. When the adult learns to speak a foreign language it is this kind of ulterior motive which is usually predominant. The mere process of imitating the sounds he hears may be a dull and disagreeable task. It should also be noted that the general habit of imitating, which leads us to follow suit, when there is no reason to the contrary, is only in part an outcome of the imitative impulse. It is mainly due to ulterior motives which we have already mentioned.

CHAPTER III.

PLEASURE-PAIN.

§ 1. *Introductory.* — The hedonic tone of perception is determined by varying conditions. We may distinguish broadly the pleasure or displeasure which is directly due in the first instance to the perceptual process at the time of its occurrence, and that which arises from pre-formed associations.

Whatever obstructs or disables perceptual process at the time of its occurrence is disagreeable; whatever favours or furthers it is agreeable. Here it is important to distinguish two functions of perception: (1) the apprehension of objects, or mere attention; (2) the performance of actions which are guided by attention, but do not merely consist in the process of attending.

§ 2. *Feeling-Tone of Attention.* — The conditions of pleasure-pain in the process of attending, as such, have been well stated by Dr. Ward: "There is pleasure in proportion as a maximum of attention is effectively exercised, and pain in proportion as such effective attention is frustrated by distractions, shocks, or incomplete and faulty adaptations, or fails of exercise owing to the narrowness of the field of consciousness and the slowness and smallness of its changes."*

* Article on "Psychology" in *Encyclopaedia Britannica*, ninth edition, xx., p. 71.

The monotonous continuance or repetition of the same kind of presentation after its interest is exhausted, involves a restriction of mental activity which may be highly disagreeable, as in travelling along a road where the scenery is uniform in character, and the villages all similar and similarly situated. A certain amount of variety is necessary for the free play of attention. Where this is lacking, the mind will strive to find objects to exercise its activity upon, and fail disagreeably. On the other hand, a too rapid succession of varying external impressions may be equally unpleasing. The mind, while pre-occupied with one object, is interrupted by the obtrusion of another, and yet another, so that attention is being perpetually warped. This gives rise to the pain of distraction, which may also occur when disconnected objects simultaneously claim attention, so that it cannot be efficiently exercised by any one of them. In attending to the same complex object, pleasure or displeasure may arise from the relation of its parts, which may or may not be adapted to what Kant calls "our faculty of knowing." Where the apprehension of the whole prepares and facilitates the apprehension of the parts, where the apprehension of one part prepares and facilitates the apprehension of another, and where the apprehension of the parts prepares and facilitates the apprehension of the whole, the total activity is pleasant, if it has a sufficiently varied field for its exercise. On the other hand, where at one stage of the process the mind is prepared for a certain kind of continuation and meets with another for which it is not pre-adjusted, the activity is unpleasant. As examples we may refer

to "the pleasurableness of a rhythmic succession of sounds or movements, of symmetrical forms and curved outlines, of gentle crescendos and diminuendos in sound, and of gradual variations of shade in colour, and the painfulness of flickering lights, false time, false steps, false quantities, and the like. In all these, whenever the result is pleasurable, attention can be readily accommodated,—is, so to say, economically meted out; and whenever the result is painful, attention is surprised, balked, wasted."* To understand this, we must remember the essentially *prospective* nature of the attentive process. It is always a pre-adjustment for what is coming, and the pre-adjustment varies in its specific nature according to circumstances. If what actually occurs is that for which a specific pre-adjustment has been made, the mental activity proceeds smoothly and successfully without waste of energy. If on the other hand what actually occurs does not fit in with the pre-adjustment, there is a shock of disappointment and a waste of energy.

The pleasure or displeasure experienced in observing movement on the part of other persons or things partly depends on the same conditions as those which determine the feeling-tone of our own motor activities. In discussing imitation, we saw that actions which by their intrinsic interest attract attention, produce in the observer a tendency to repeat them himself. This tendency is always present, even when it does not issue in overt imitation. The sight of external movement occasions the revival of corresponding motor experiences in the subject who is attending to it. This motor revival

* *Op. cit.*, p. 69.

forms an integral part of the perceptual complex, not of course a distinct idea. The conditions of pleasure and displeasure which apply to motor process in general, apply also to the reproduced motor process involved in attending to a moving object. When it takes place with special ease and facility and fineness of adjustment, we call the external movement that excites it "graceful." But it is not merely the perception of movement that involves the revival of motor activity on the part of the subject. A slender column supporting an apparently disproportionate weight has a disagreeable effect on the spectator. It is as if he himself were supporting a burden to which he is not equal. The mere thought of Atlas bearing up the heavens on his shoulders makes one uncomfortable. The pleasing or unpleasing effect of geometrical forms is also to a large extent due to the motor activity involved in perceiving them. In part, this motor activity consists in actual movements, such as those of the eye following an outline; but in a great measure it arises from our mode of apprehending lines and surfaces as if they were in themselves active. We speak of a column "raising itself" into the air; of a path "winding"; and so on. Language of this kind marks a fundamental feature of perceptual process. The direction of lines and surfaces is apprehended as if it were a direction which the lines and surfaces themselves actively take and maintain. Hence, in apprehending them there is a sympathetic revival of motor activity in us, which may be pleasing or unpleasing.* When the geometrical outline is so ir-

*This view is developed in full detail in Dr. Lipps' recent work *Raumästhetik und geometrisch-optische Täuschungen.*

regular in its course as to defeat pre-adjustments on our part, and to demand abrupt changes for which we are unprepared, it is disagreeable. On the other hand, a gently flowing curve is agreeable. Of course, if the figure is too simple, it will be almost neutral in feeling-tone, but when it is at once complex and graceful, it may give rise to considerable pleasure. Marked displeasure occurs when sufficient regularity is present to create a pre-adjustment which other conditions disappoint. The experience is also unpleasant when, owing to the simplicity or monotonous repetition of the object, attention is not sufficiently occupied. In this case an active tendency is thwarted because it does not find adequate material for its exercise. Of course what is too simple or too complex for one person may not be too simple or too complex for another.

§ 3. *Success and Defeat as Determining Pleasure and Pain.* — Under the second head is included a very extensive class of cases so familiar and obvious that it scarcely seems necessary to mention them. Everybody knows that it is unpleasant to be defeated in an endeavour by adverse external circumstances, and that circumstances which facilitate the attainment of the end of an activity are for that reason pleasing. The cat is displeased when the mouse escapes it; the golf-player is displeased when he digs up the turf instead of hitting his ball; the sportsman is displeased when he misses his bird. An analysis of such cases is unnecessary. We need only insist on their importance for the general theory of pleasure-pain. The very fact that they are obvious and familiar makes them important. If we can reduce other instances in which the

conditions of the feeling-tone are less obvious to the same general principle, we may fairly claim to have given an explanation. It should be noted that the physiological theory which refers all pleasure-pain to relations of wear and repair in nervous tissue can scarcely be made to apply here. We are pleased when we hit a nail on the head and displeased when we miss it; there seems to be no reason whatever for supposing that in the one case surplus-stored energy is being used up, and in the other not. One would suppose that whatever surplus existed would be common to both. These remarks apply to those conditions of success or failure which arise from external circumstances.

There is another group of cases in which the conditions of efficiency or inefficiency are found, not in external circumstances, but in the activity itself as a subjective process. The simultaneous and successive co-ordination of movements directed towards one end involves delicate adjustment of innumerable motor impulses. Each of these must have a certain intensity, duration, and rapidity, and they must accompany and succeed each other in a certain order. In general, failure in adjustment, disturbing the activity as a whole and rendering it inefficient, is unpleasant. The peculiar experience of losing one's balance is a good illustration. Part of the unpleasantness of extreme fatigue lies in the muscular tremblings and convulsive jerks to which it gives rise. On the other hand, ease and certainty of adjustment in performing complex movements is a source of pleasure when the movements have not become so habitual as to lose feeling-tone. A free and easy flow of delicately adjusted

movements is pleasurable, as such. The pleasures of play in children and young animals are largely of this kind. Compare the mental state of a dog in its struggle to keep standing on its hind legs with that of the same dog in its natural gambols, its mock-fights with its companions, and the like.

There are certain general conditions which contribute to easy and effective motor adjustment. Among these perhaps the most important is rhythm. In rhythmic movements the same adjustment is repeated at regular intervals, so that it is possible to prepare for it beforehand. In this way waste of energy is avoided, and the maximum of efficiency is attained. All workmen who have to repeat a movement again and again, as in striking with a hammer, or hauling on a rope, fall into a regular rhythm. Concurrence in rhythm between two distinct and simultaneous processes, greatly facilitates both. Each process is not only facilitated by its own rhythm, but also by that of the other, and the result is often intensely agreeable. The best instances are dancing and marching to music.*

§ 4. *Feeling-Tone due to Pre-Formed Associations.* — Acquirement of meaning, complication, and associative re-excitement of organic sensation, play an extremely important part in determining the feeling-tone of perception. "The cawing of a rook . . . in itself, is certainly not agreeable. This sound, in the case of those who have lived in the country in early life, and enjoyed its scenes and its adventures, is well known to

* Rhythmic activity also produces a diffused excitement of an agreeable kind which intensifies the effect of other pleasure-giving conditions. Thus the rhythm of verse intensifies the effect of poetic ideas and sentiments.

become a particularly agreeable one. . . . The explanation is that this particular sound, having been heard again and again among surroundings . . . which have a marked accompaniment of pleasure, . . . produces a faint re-excitation of the many currents of enjoyment which accompanied these."* To take a simpler instance, the sight of a delicious fruit may give pleasure more because of previous experiences of taste than because of its appearance to the eye. It is important to note that in such cases it is not merely the feeling-tone, the abstract pleasantness or painfulness which is revived; the feeling-tone of the pleasant perception is determined by previous experience only because the perception itself in its cognitive and conative aspect has been modified and developed by this experience. The acquired feeling-tone of the cawing of rooks is the feeling-tone of its acquired meaning. It re-excites a total disposition left behind by previous perceptual experience, and this is the source of its pleasantness. Probably the re-excitement of organic sensations also plays an important part in this instance. In other instances it is very prominent. The sight of food disgusting to the taste may produce actual nausea. The sight of a drawn sword produced in James I. a highly unpleasant organic disturbance. The mere sight of another person sucking a lemon makes some people vividly experience the corresponding organic sensations which may be to them highly disagreeable.

* Sully, *The Human Mind*, vol. ii., p. 78.

CHAPTER IV.

EMOTIONS.

§ 1. *General Characteristics.* — If we ask the question, What is an emotion? the first answer that occurs to common sense is a list of specific emotions, — fear, anger, hope, suspense, jealousy, and the like. When we push the inquiry further, and ask what character these states have in common which leads us to apply the same name, *Emotion*, to all of them, we find psychologists giving varying and inconsistent answers. According to some, emotion is essentially a kind of sensation, due to general organic disturbance. According to others, it is the massive revival by association of past pleasures and pains. According to others, it is a tendency to behave in a particular way, and must be regarded as a mode of conative consciousness. The best course for us to pursue in view of this disagreement, is to take certain typical emotions, and to attempt to fix characteristics distinctive of them and common to them in all their manifestations.

(1) There is one *prominent* fact about emotion which confronts us at the outset; — its wide range. The same specific kind of emotion may occur at very various levels of mental development. Sometimes it appears to be an affair of mere sensation. "The signs"

of anger* may be readily provoked in the case of the average infant by firmly grasping and holding one of the movable members of his body, or by causing him any sudden, strong, and not overpoweringly painful sensation.* From the lower forms of perceptual consciousness up to the higher forms of ideational and conceptual activity, the same typical kinds of emotion are everywhere present. Anger may arise in connexion with the pain of a wound or the smart of a blow. The wounded lion bites at sticks and stones and at its own wounds. The cat will become angry if you interfere with its kittens. A child will become angry if you take away its toy. A man will become angry if you fail to understand his argument or if you unfavourably criticise his book. A saint may also be angry *qua* saint, as St. Paul was angry with the foolish Galatians. It follows from this wide distribution of emotion over different stages of mental development, that we must be very careful to avoid giving too limited a definition of its specific forms. Bain, for instance, seems to err in this direction when he says that anger "contains an impulse knowingly to inflict suffering upon another sentient being, and a positive gratification in the fact of suffering inflicted."† This would only apply to a somewhat developed stage of ideational consciousness; and even then it would not cover such cases as St. Paul's righteous anger with the foolish Galatians.

(2) Closely connected with the wide distribution of emotion is the varied nature of the conditions that arouse it. Any kind of thwarting or opposition may

*Ladd, *Psychology, Descriptive and Explanatory*, p. 538.
† *Mental and Moral Science*, p. 261.

excite anger. Any kind of danger may excite fear. You may produce anger in a dog by disturbing it while eating, or by interfering with its young, or by pulling its tail. It is a certain general kind of situation, not a specific class of objects, which excites a certain kind of emotion.

The behaviour in which emotion finds expression is correspondingly general in its character. It is not an adaptation to the specific nature of this or that specific object, but a general mode of action adapted to a certain kind of situation. The behaviour of the angry dog is generically the same, however the anger is excited. It adopts the same bodily attitude, shows its teeth, growls, attempts to bite, and the like.

(3) There are two sources of emotional states which it is important to distinguish. Emotions may arise in connexion with definite perceptions or ideas, as when good news excites joy; on the other hand, they may be primarily due to organic changes, such as those which follow the use of alcohol or other drugs. A man's temper varies with the state of his health. The organic changes may operate in one or both of two ways. They may directly change the condition of the nervous system by altering the nature or amount of nutrition with which it is supplied, or in other ways. They may also, by altering the general state of the body, alter the nature of the impulses received by the central nervous system from the internal organs. Owing to the diffusive nature of organic sensations, this occasions a general change in the state of the nervous system, which on the psychological side is experienced as an emotional *mood*. An emotional mood is not quite the same thing as an

emotion properly so called. An emotion properly so called must be felt in relation to some definite object; to be angry we must be angry about something. But the general state of irritation due, let us say, to a sleepless night, has not, as such, any definite object. As we shall see under (4), it tends to find objects for itself, and it may pass from one object to another, giving rise to a series of emotions of the same kind. In general, the occurrence of a definite emotion tends to leave behind it an emotional mood of a corresponding nature.

(4) An emotional mood, whatever may be its primary origin, tends to persist when once it is aroused, and to fasten upon any object which presents itself. Ill-temper or gloomy depression or hilarity may originate in the first instance in the use of drugs; but when these moods are once in existence they create objects for themselves. A man who gets up in the morning in a bad temper, due to want of sleep or similar causes, is apt to be irritated by almost everything that occurs; though in another mood the same incidents would be received with complacency. The cook angered by her mistress will box the ears of the scullion; a herd of cattle, enraged by the sight of a comrade in distress, will vent their fury on their unfortunate companion; the reason being simply that he is the only object on which their attention is fixed. Their excitement must find an outlet; and in the absence of any other definite channel for it, it discharges itself on the injured animal. "It is sometimes seen in dogs, when three or four or five are met together, that if one suddenly utters a howl or cry of pain, when no man is near it and no cause apparent, the others run to it, and seeing nothing turn round

and attack each other."* So it is dangerous to approach the males of many species of animals in breeding time, when their angry passions are aroused by sexual rivalry. An emotion involves a certain general trend or direction of activity, which particularises itself in whatever way it can, according to circumstances.

(5) The fifth feature of emotion is what we may call its parasitical character. So far as emotions are excited by general situations, and not merely by general organic changes, they are usually secondary phenomena, and pre-suppose the existence of more specific tendencies. This is true of all but the simplest and most primitive emotional states. The anger produced in a dog by taking away its bone pre-supposes the specific appetite for food. The anger produced in it by interfering with its young pre-supposes the specific tendency to guard and tend its offspring. So the presence of a rival who interferes with its wooing causes anger because of the pre-existence of the sexual impulse.

(6) In all the more intense phases of emotion, organic sensations form an important constituent of the total state of consciousness. This is true whether the emotion has been primarily introduced by organic changes, or whether it has in the first instance arisen in connexion with definite perceptions or ideas. This fact has been made the basis of a general theory, according to which the essential nature of the emotional consciousness consists in sensations arising from change in the internal organs of the body, including both viscera and muscles.

* Hudson, *The Naturalist in La Plata*, ch. xxii. (towards end).

§ 2. *General Theory.* — The general theory of emotion which is most favoured at the present time is that to which we have just referred. It is at least as old as Descartes, but is now specially connected with the name of Professor James, who has advocated its claims with great force and eloquence. We cannot do better than quote his statement of the main argument in favour of the view that emotion is simply organic sensation and nothing else. "I now proceed to urge the vital point of my whole theory, which is this: *If we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind,* no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains. . . . What kind of an emotion of fear would be left if the feeling neither of quickened heart-beats nor of shallow breathing, neither of trembling lips nor of weakened limbs, neither of goose-flesh nor of visceral stirrings, were present, it is quite impossible for me to think. Can one fancy the state of rage and picture no ebullition in the chest, no flushing of the face, no dilatation of the nostrils, no clenching of the teeth, no impulse to vigorous action, but in their stead limp muscles, calm breathing, and a placid face? The present writer, for one, certainly cannot. The rage is as completely evaporated as the sensation of its so-called manifestations, and the only thing that can possibly be supposed to take its place is some cold-blooded and dispassionate judicial sentence, confined entirely to the intellectual realm, to the effect that a certain person or persons merit chastisement for

their sins. . . . The more closely I scrutinise my states, the more persuaded I become that whatever moods, affections, and passions I have are in very truth constituted by, and made up of, those bodily changes which we ordinarily call their expression or consequence; and the more it seems to me that if I were to become corporeally anaesthetic, I should be excluded from the life of the affections, harsh and tender alike, and drag out an existence of merely cognitive or intellectual form." *

This passage is certainly eloquent, but it lacks logical stringency. It does not follow that because A is necessarily and essentially connected with B, that A and B are identical. A stone cannot fall into water without making ripples, but the ripples are not the stone. A line cannot have length without direction, but length and direction are not the same. There is no smoke without fire, but smoke is one thing and fire another. So it may be impossible for emotion to exist without expressing itself; but it does not therefore follow that the expression constitutes the whole emotion. Supposing Professor James's thesis to be true, it is evident that we cannot invert it. Certainly not all organic sensation is emotion; hunger and stomach-ache are not emotional experiences. To complete the theory therefore it is necessary to distinguish the kinds of organic reaction which produce emotion from those which do not. So far as we can gather Professor James's view on this point from his own statement, it would seem that he connects emotion with diffused disturbance affecting many organs. But all organic disturbances are diffused

* *Principles of Psychology*, vol. ii., pp. 451–453.

in this way. The experience of a cold douche, or of being shampooed after a Turkish bath, ought on this theory to be emotional.

It is evident that the organic sensations which enter into an emotional state must either occasion, be preceded by, or accompany, a special kind of disturbance in the nervous system, which is not present in the case of all organic sensations. Now no doubt to some extent organic sensations can produce such specific nervous excitations. They do so in so far as the emotional mood is traceable to such causes as the state of health or the use of drugs. But here we must allow for the direct effect of organic conditions on the nervous system itself and its nutrition, as well as for the sensory impulses which proceed to it from the internal organs; and even when the neural disturbance is due to sensory impulses, it cannot for that reason be directly identified with the organic sensations themselves. When we consider the emotions which arise in connexion with definite perceptions and ideas, the inadequacy of the theory becomes still more evident. In such instances the diffused organic disturbance has its primary origin in a disturbance of the nervous system, which is propagated over the body as a whole. It follows that the first stage of the process by which the emotion arises, cannot be, as James says it is, a "cold and neutral intellectual perception." I have at this moment a somewhat cold and neutral intellectual perception that I shall some day die: but this awakens in me no perturbation of visceral or motor consciousness. On the other hand, a madman presents a pistol at me: here too, I have an intellectual perception of the madman as presenting

the pistol; but this time it is followed by general organic disturbance. Now what is the difference between the two intellectual perceptions which accounts for the difference in their result in the two cases? On the physiological side, the perception of the presented pistol must correspond to an intense and diffused disturbance of neural equilibrium; for otherwise there is nothing to account for the intense and diffused disturbance of organic equilibrium. On the other hand, the mere recognition that I shall die some day does not upset my nervous balance so as to cause an organic shock. Now on the psychical side, what corresponds to the original neural disturbance which pre-conditions the organic disturbance? If the correlated psychical state is not of the nature of emotion, what can it be? It is perfectly arbitrary to suppose that organic sensations have a mystic efficacy which can belong to no other sensations. After all, they only occur in the same way as other sensations: they arise like the rest only through stimulation of the brain by impulses passing along afferent nerves. If they contribute to produce or heighten emotion it can only be because they help to excite an intense and widespread nervous disturbance. But there is no reason in the world why impressions coming from external objects should not operate in the same way. In fact they must do so if we are to account for the organic disturbance at all, and this agrees with what we may call the normal, unsophisticated view, that emotion essentially precedes and pre-conditions its expression. There is nothing in the perception of a bear, as such, to produce symptoms of fear. The symptoms of fear arise only when the

sight of a bear startles a man, either because it is a strange and big animal approaching, or because previous experience has taught him to apprehend it as dangerous. In any case, it is not the visual perception, as such, but its startling character, which is essential.

The only mode of attempting to escape this confusion is by saying that the organic disturbance arises in the first instance in a mechanical way. On this theory there are certain innate or acquired physiological pre-arrangements owing to which certain visual or other perceptions set up organic disturbances. Such a view is irreconcilable with the facts. Emotions accompanied by marked organic disturbance are not occasioned merely by the perception of certain objects. They are occasioned only by occurrences which powerfully thwart or further pre-existing conative tendencies. A man does not feel fear merely because he sees a bear, but because his life is threatened, and "all that a man has will he give for his life." The theory of James simply ignores this relation of the circumstances which produce emotion to pre-existing conative tendencies. According to this theory, it is the mere sight of a kitten being removed which excites anger in the mother-cat. Parental affection has nothing to do with it. But obviously the interference with parental instinct is a most essential constituent of the emotional state. It is directly accompanied by a nervous disturbance which precedes and conditions the organic reaction. If the organic disturbances accompanying emotion were occasioned in the mechanical way assumed in James's theory they would arise from excitement of the lower nervous centres. But the organic shock of emotion

arises only from impressions which excite the higher nervous centres in an especially intense way. The lower nervous centres are just those which are most stable, and which behave in a calm and equable manner. They discharge automatic functions which are matters of routine. We cannot ascribe to them widespread and irregular perturbations of the whole system. Indeed Professor Dewey, who advocates this theory, contradicts himself when he says that emotion arises from the interruption of normal and habitual co-ordinations. Such interruptions are occurrences which essentially involve the higher centres, and are accompanied by intense consciousness, not by "cold and neutral perceptions."

We might go on discussing this question interminably. I shall only draw attention to one point more and then leave it. I refer to the variability of the organic symptoms in what is specifically the same emotion and their similarity in different emotions. This is already recognised as regards motor expressions. Thus Mr. Lloyd Morgan, who in general accepts James's theory without criticism, yet denies that what is specially characteristic of emotion as such, takes its origin in the motor elements. "Take the case of a young frightened moorhen. On land he runs away, and perhaps crouches in the rushes; in the water he dives, and comes up quietly under the bank and there stays still. The activities involved in running and diving are very different; must not the activity-feelings be very different too? And yet we must surely suppose them to have a common emotional element. Again, when a moorhen catches sight of a worm and runs hard to secure it, the

activity-feelings must, as such, one would suppose, be very similar to those experienced when the moorhen runs vigorously away from a goose. And yet in the one case he is frightened and in the other case he is not. Here similar activity-feelings are associated with wholly different emotional states."* This contention appears to me to be perfectly justified. There is indeed an identity in the general trend or direction of the activity displayed in a certain kind of emotion. But this cannot be reduced to any kind of identity or similarity in the actual movements or the joint-, tendon-, and muscle-sensations arising from them. But Lloyd Morgan and others seem to suppose that visceral sensations at least are fairly constant in the same emotion on different occasions and in different circumstances. Now the problem is an obscure one; for visceral sensations are difficult to investigate. But so far as any distinct appeal to experience can be made, it seems that they also may be more or less similar in different emotions, and variable in the same emotion. The Maori women of New Zealand when they meet for festive purposes enjoy themselves by squealing and crying, so that a stranger would suppose them to be in a state of intense grief. One traveller tells how he was roused at night by the most doleful cries, and went out to see what human creature was in misery. He found that it was a woman rejoicing over a meeting with her long-lost son. Here the respiratory changes and increased secretion in the lachrymal glands were the natural expression of joy. Consider, too, the different expressions for anger. There is "white" anger and "red" anger.

* *Habit and Instinct*, p. 201.

The circulation of the blood must be different in the two cases.

This criticism leaves untouched the thesis with which Professor James starts. It would seem that this thesis must be admitted. We cannot imagine what an emotion would be like apart from the organic sensations which it includes. Even in faint and transient emotional experiences, the organic element appears to be present. It accompanies a slight touch of irritation or a slight tinge of contempt, as it accompanies intense disdain or wild fury.* The difference seems to be only one of degree. But in admitting that organic sensation is an essential factor in the constitution of those states which we call emotional, we do not admit that it is the sole factor. Where the emotion arises in connexion with perceptions and ideas, it involves a primary disturbance of mental equilibrium, connected with the furtherance or hindrance in special ways of pre-existing conative tendencies. This primary disturbance, being the pre-condition of the organic reaction, cannot be regarded as its effect. It is therefore an independent factor in the constitution of the emotion. In so far as the primary source of the emotion lies in organic conditions, the case for Professor James seems stronger. But there are two points to be considered. (1) The organic changes may directly involve the brain itself and its nutrition, so that the whole effect cannot be referred to sensory impulses coming from the internal

* Of course overt expressional movements, or other bodily changes visible to the external observer, may be absent in slight, and sometimes even in intense emotions. But what is important is not this overt expression, but internal organic changes, affecting for example the circulation and respiration.

organs. (2) We must allow for what Professor Ladd calls "surplus excitation." The sensory impulses, besides producing the special sensations corresponding to their specific character, also tend to produce a more or less diffused excitement of a vague kind, which may be similar for sensations differing in their special qualities. This surplus excitation may be analogous in its character to that which arises in connexion with perceptions or ideas, so that the emotional mood of irritation may have its primary source either in the annoying behaviour of a companion, or in a bad state of health.*

* James's theory of emotion has recently been more or less modified both by himself and others. In the text, I deal with it in its most original and distinctive form. Some would correct James's statement by saying that the expression is not a pre-condition of the emotion, but one aspect of the occurrence of which the emotion is another. I do not dispute this, but I should like to know definitely what it means. Velocity and direction may be said to be two aspects of motion, but emotion and expression are not connected in this way. The brain is a locally separate part of the organism; and organic changes occasioned by brain excitement follow the neural process both logically and in time. It may be admitted that the neural process could not exist if it could not discharge itself; and in this sense expression and primary neural disturbances may be regarded as different aspects of the same occurrence. The real question is, whether the primary neural disturbance is itself correlated with consciousness of an emotional kind, or at any rate with consciousness which forms an essential constituent of the complete emotion. According to James, as I understand him, this is not so: according to him, the primary nervous disturbance must first produce changes in the other organs of the body; and these changes must by a backstroke react on the nervous system before the emotion can begin. Emotion is in his view the consciousness connected with the re-impression following expression. The initial nervous excitement is on this view excitement of the lower centres and has no appreciable concomitant in consciousness. James does indeed speak of the initial perception which gives rise to an emotion as being the perception of an *exciting* fact. But he does not refer to mental excitement. The fact is exciting because the perception of it sets up organic changes which in their turn by way of backstroke give rise to mental excitement As he says, the feeling of these changes as they occur is the emotion. Thus his phrase, "the bodily changes follow directly the perception of the exciting fact," means that they follow the fact that excites *them*,

§ 3. *Relation to Pleasure-Pain and Conation.*— Every special kind of emotion essentially involves a characteristic end or direction of activity, mental or bodily. Anger tends to destroy or disable its object; fear, to avoid or evade it. The relation of special emotions to pleasure-pain is not so definite as their conative aspect. Some emotions are invariably pleasant and others unpleasant; grief for instance is always disagreeable,* and joy agreeable. So fear is constantly disagreeable. But other emotions may be either pleasant or unpleasant, according to circumstances. A surprise may be either welcome or unwelcome. Anger is highly disagreeable when it is impotent; but when it can wreak itself on the enemy, it may be intensely agreeable. In general we may say that an emotion is agreeable or disagreeable according as the conative tendencies involved in it are thwarted or gratified. In fear and grief, they are from the nature of the case

not the fact that excites *us*. If he does not mean this there is nothing distinctive in this theory at all. Very few would dispute that organic resonance is an essential factor in fully formed emotion. Bain has said this as clearly as James; and the present writer would be the last to deny it. But if there is a mental excitement preceding the organic resonance, this also must be counted as belonging to the emotion. His whole theory seems to be a counterpart of his theory of motor consciousness. Just as motor consciousness is according to him wholly due to re-impressions from muscles, joints and tendons, while the primary nervous discharge has nothing to do with it, so emotion is wholly due to re-impressions following bodily changes which originate in a primary nervous discharge; and the primary nervous excitement itself is not directly a factor in it, but only an antecedent condition.

* There is such a thing as the "luxury of grief," but the mere existence of the grief does not constitute the luxury. A person may be grieved and at the same time he may be pleased to know that he is grieved. Sorrow over the loss of a beloved object may be accompanied by the pleasure due to tender reminiscences, and this pleasure may overbalance the pain of grief. But grief in and for itself is never pleasant.

obstructed; when the obstruction ceases, the emotion ceases also. In joy, on the other hand, they are gratified by the very nature of the conditions which occasion it.

§ 4. *Ultimate Qualitative Differences.*—Emotion in its various specific forms involves correspondingly specific kinds of feeling which cannot be explained away as resultants or complications of more simple elements. When we have said that a specific emotion is characterised by a certain trend or direction of activity, that it is accompanied by certain kinds of organic sensation, that it is pleasant or painful, and the like, though all this may be true, it is not exhaustive. Each specific kind of emotion has also something in it peculiar and undefinable. It is a unique kind of feeling-attitude towards an object. As Professor James observes: "There are infinite shades and tones in the various emotional excitements which are as distinct as sensations of colour are." Besides its own specific quality of feeling, an emotion has no doubt also a feeling-tone of pleasure or pain. But its peculiar colouring cannot be resolved into mere pleasantness or unpleasantness. It stands out as a fact unique and irreducible.

§ 5. *Emotional Dispositions.*—An emotion is always an actual state of consciousness; an emotional disposition is a persistent tendency to feel a certain kind of emotion in the presence of a certain object. Thus the cat, after having its tail pulled frequently by a child, has a permanent tendency to feel angry whenever the child approaches it. We have pointed out that the original conditions of emotion are rather certain general kinds of situation than specific persons

or things. But in the course of experience they come to be connected with specific persons or things, as the anger of the cat comes to be connected with the approach of the child who pulls its tail. In this way emotional dispositions are formed which manifest themselves in the form of actual emotion on appropriate occasions. An emotional disposition is not the same thing as an emotional mood. The mood is an actual affection of consciousness; but the disposition persists when neither the mood nor the emotion itself is being felt. Such words as liking and disliking, hate and love, indicate emotional dispositions rather than actual emotions. We say that the cat dislikes the child, meaning, not that it is actually feeling angry with the child at the moment, but that it has a permanent tendency to feel the emotion of anger whenever it sees the child in its neighbourhood. On the higher levels of mental life, where ideas and concepts play a prominent part, emotional dispositions are very complex, and are called *Sentiments* or *Interests*.*

§ 6. *Analysis of Fear.* — To describe and analyse all the various kinds of emotion would be an endless task. We therefore select for special treatment two typical forms, — fear and anger. We shall have occasion to deal with some other modes of emotional experience at a later stage, when we come to treat of ideational as distinguished from perceptual activity.

In fear, as in all painful feeling, conative tendency is at once excited and obstructed. But the conation must be of a special kind. It must be a tendency to practical adjustment more or less imperatively demanded by

* See bk. iv., ch. ix., § 5.

a practical emergency of a serious nature. Thus the conditions which cause fear must be aggressive or otherwise obtrusive in their character. The occasion of fear must not come before consciousness as something that can be avoided or evaded with ease and certainty.

The experience must invade consciousness in a more or less violent and persistent way so as to call imperatively for a practical adjustment to the situation. At the same time it must be of a nature to destroy efficiency, —to disorganise and disable the activity which it excites. It may seem from this account of the matter that fear is always disadvantageous, and that it can be nothing but a drawback in the struggle for existence. This inference is partially true. Fright often serves the predatory animal rather than the frightened prey. "Many birds though scarcely wounded by small shot, fall to the ground as though struck by lightning, panting with wide open mouth."* Seal-hunters often make use of the paralysing effect of fright in order to secure their prey. But even when terror strikes an animal motionless the result is not always disadvantageous. By becoming quiescent it is more likely to escape notice. Where mental and bodily perturbation are not violent enough to deprive the animal of all power of effective action, it takes to flight or hides itself. So far as these movements of escape or evasion are the direct expression of fear, they are to be explained on the general principle that psychical activity, when its way is barred in certain directions, diverts itself into whatever channel it can find. Thus an animal disabled by fear from

* Hudson, *Naturalist in La Plata*, ch. xv.

more positive and complex modes of adjustment, will have recourse to flight. Now the circumstances may be actually such that flight is the best course or the only course that can be of use. When this is so, the fear that expresses itself in flight is an advantage. In point of fact when animals run away or hide, it is generally the best thing they can do. But this is not always so. A dog that runs away scared at the noise of a cracker, derives no benefit from so doing. Further, fright is to some extent a disadvantage to an animal even in escaping from an enemy. The excitement of the emotion may indeed accelerate its movements. But at the same time presence of mind is more or less lost. Watchfulness and readiness of resource are diminished. Thus the animal rushes wildly into the danger which it is striving to avoid, or into some other danger of a yet more deadly nature. The game old fox may be but little influenced by fear when in escaping from the hunters it displays its wonderful command of all kinds of cunning resources, its wariness and keenness of perception. Whyte-Melville says of such a fox: "His heart like his little body was *multum in parvo*, tough, tameless, and as strong as brandy." As regards the general question of the utility of fear, we may say that on the whole it is a means of preservation from injury and death. But it is rather a clumsy means, and in part defeats itself, especially when the emotion is very violent. As Mosso remarks: "The graver the peril becomes, the more do the reactions which are positively harmful to the animal prevail in number and in efficacy. . . . We might almost say that nature had not been able to frame a substance which should be excitable enough to com-

pose the brain and spinal marrow, and yet which should not be so excited by exceptional stimulation as to overstep in its reactions those physiological bounds which are useful to the conservation of the creature." *

We may now enumerate the conditions which generate fear.

(*a*) Actual bodily pain produced by wounds is, when sufficiently intense, accompanied by the same kind of impotent excitement, the same kind of disablement of bodily and mental activity which is characteristic of fright. Wild efforts to escape, laboured breathing, palpitation, trembling, etc., are expressions of actual bodily pain as well as of strong fear. Now we find not only analogy but genetic relation between the two states. When an object which has previously caused pain is again perceived, the emotional tone is one of fear, unless fear is displaced or overpowered by anger. This has suggested to Herbert Spencer the theory that the fear consists in the revival of bygone painful sensations produced by the object feared. "Everyone," he says, "can testify that the psychical state called fear consists of mental representations of painful results." † Against this view we urge that whereas the painful sensations vary greatly in specific quality, the emotion of fear which they generate is substantially identical, and differs more in its character from them than they do from each other; we urge also that the emotion of fear is sometimes more violent and disagreeable than the original experiences of which it is supposed to be a revival, or mental representation.

* *La Paura*, Appendice, p. 295; quoted and translated by James, *Principles of Psychology*, vol. ii., pp. 483–484. † *Psychology*, § 213.

What appears really to happen when a previous experience of pain gives rise on a subsequent occasion to the emotion of fear, may be illustrated as follows. A child, attracted by the brightness of a flame, grasps it and is badly burnt in consequence. Subsequently, on seeing the flame, he feels fear. The emotional tone belongs to the present perception because of the previous painful sensation inflicted by the perceived object. The original painful sensation, when it actually occurred, occurred as part of a perceptual activity which was one and continuous in all its aspects. The painful sensation was not merely superadded to the visual perception of the object as a separate and isolated event, it was an integral phase of the same continuous process. The visual perception and the sensation of burning form part of the perception of one and the same object. The advent of the burning pain must therefore make a profound difference in the character of the perceptual process as a whole, and in the total disposition which the experience as a whole leaves behind it. Hence, when the object is again seen, the mere sight of it, even before previous painful experiences recur, will be a profoundly different state of perceptual consciousness from what it would have been if they had never existed. The motor attitude will be essentially modified. There will be a tendency to retreat from or avoid the flame, instead of grasping it. Further, a state of diffused nervous excitement analogous to that which accompanied the actual burning will be re-excited; and this will overflow the organism as a whole, producing constriction of the superficial blood-vessels, palpitation, trembling, and the like, with the corresponding organic sensations.

(*b*) That this account of the matter is correct becomes clearer when we consider that fear arises in other ways than through experience of previous pain or injury. The mere suddenness or intensity, or the combined suddenness and intensity, of an impression are sufficient to cause fear. A loud noise for which we are unprepared startles us with momentary alarm. Many people cannot help being scared by a reverberating peal of thunder, though they know that it is harmless. Of course much depends on the nervous organisation or on its state at a given time. It is extremely easy to startle a hare or a rabbit. Even a slight noise will give us a disagreeable shock of alarm if we are half-asleep. In some pathological states the patient is liable to be frightened by almost anything. Fledgelings shrink down in the nest when a strange animal or object suddenly approaches, though they may show no uneasiness when their deadliest enemy approaches them unobtrusively as snakes do. "A piece of paper blown suddenly by the wind is as great an object of terror to a young bird as a buzzard sweeping down with death in its talons."* The sudden approach of an object, the abrupt occurrence of an intense sensation, stimulate to action: there is a demand for practical adjustment to the obtrusive experience. At the same time its very suddenness or intensity disconcert and startle, so that efficient reaction is impossible. This is the more conspicuously so, where the impression is not only sudden but unfamiliar. Mere unfamiliarity or strangeness, apart from suddenness or exceptional intensity, suffice to cause fear even in a violent form. The

* Hudson, *Naturalist in La Plata*, ch. v.

young gorilla brought home by the members of the Loango expedition much disliked strange noises. "Thunder, the rain falling on the sky-light, and especially the long-drawn note of a pipe or trumpet threw him into such agitation as to cause a sudden affection of the digestive organs, and it became expedient to keep him at a distance."* The kind of unfamiliarity which so disturbed the gorilla consisted apparently in mere novelty.

Unfamiliarity may, as I have said, consist in mere novelty. But there is another kind of unfamiliarity which involves not only novelty but direct conflict with ordinary experience. Strangeness of this sort may cause profound alarm. An experience may be so discordant with the normal course of events as to utterly check and disorder the process of conscious life and destroy the possibility of effective adjustment. In the case of human beings the fright caused by a ghostly apparition is a good illustration. This is not so much due to any definite or indefinite anticipation of positive evil as to the utterly abnormal character of the experience. It lies so wholly outside the circle of ordinary events, and is so completely opposed to the conditions of ordinary experience, that it destroys all presence of mind. It stimulates intensely by its strangeness, and at the same time, owing to this very strangeness, all lines of activity, theoretical and practical, are obstructed. It is instructive to contrast this overwhelming terror in the supposed presence of a ghostly apparition with the predominantly agreeable

* R. Hartmann, *Anthropoid Apes*, p. 265; quoted by James, *Principles of Psychology*, vol. ii., p. 417 (note).

experience of reading or listening to a tale of marvel. The actual fact obtrudes itself as actual, and demands immediate practical adjustment to it, and yet by its very nature makes such adjustment impossible. Where this practical need is not felt, the free play of imagination liberated from the trammels of ordinary experience may be a source of delight.

Animals are capable of analogous experiences. James gives a good example.* A dog belonging to Professor Brooks, the well-known biologist, was frightened into a sort of epileptic fit by a bone being drawn across the floor by a thread which he did not see. As James remarks, any man's heart would stop beating, if he perceived his chair sliding unassisted across the floor.

§ 7. *Analysis of Anger.* — The child manifests this emotion at an early stage. "Anger initially expresses and satisfies itself by a peculiar form of violent motor discharge. Even at the outset it takes the form of an effort to overcome resistance by main force. The young child who has acquired no definite mode of wreaking its passion, shows it by vague kicking and struggling, by movements which antagonise each other, and which encounter resistance in external objects. The development of cognitive consciousness simply serves to restrict this diffused mobility within more definite channels. The child in a later stage throws his plaything violently to the ground, or pushes it away, or breaks it, or in the case of a person who thwarts his will, he kicks, pushes, or strikes. Even the adult may find some satisfaction for his irritation in destroying furniture, and he nearly always has a strong

* *Principles of Psychology*, vol. ii., p. 420.

disposition to break, crush, tear, or rend something. Inasmuch as his anger has become enlightened and defined, his destructive impulse will become more specially directed against the object by which his desires are crossed or thwarted. But when the conditions deny him this satisfaction, it is well known that the angry man is very apt to wreak his anger on inoffensive things or persons, thus approximating to the condition of the child. Though the tendency to overcome resistance by violent exertion of bodily force seems always to play some part in anger, yet with the advance of intellectual development it gives place more and more to an ideal satisfaction; it becomes enough to know, or sometimes even to imagine, that the opposing forces have been crushed by our agency. This is of course a direct consequence of the growing importance of the life of ideas as compared with that of perception. But even in the ideal satisfaction of anger the impulse to destroy or break down opposition may be satisfied to some extent by wreaking it on other objects than those which immediately awaken resentment. The relief afforded by swearing comes under this head. It is a breaking down of the ideal barriers which social convention or religious sentiment sets up." *

Turning now to animals, we find that their proneness to anger depends to a great degree on inherited organisation and general habits of life. Spencer observes: "The destructive passion is shown in a general tension of the muscular system, in gnashing of teeth and protrusion of claws, in dilated eyes and nostrils, in growls:

* *Analytic Psychology*, vol. ii., pp. 96-97.

and these are weaker forms of the actions that accompany the killing of prey."* Here there are two implications that deserve notice. It is implied that the expression of emotion consists in actions which are only rudiments of more developed activities. This is of course untrue. Actual tearing and rending may be as much an expression of the destructive passion as the gnashing of teeth and protrusion of claws. In the second place it is implied that anger is distinctive of predatory animals. But this is not the case. The elephant is not a beast of prey, but can be easily roused to fury. It is the combative rather than the hunting instinct which is essential. Many graminivorous animals which are usually peaceful are highly dangerous in the breeding season, when the combative impulse is excited in connexion with the sexual, and finds its proper field in sexual rivalry. In general we may say that some animals, such as the elephant, meet danger and opposition by main force; others, such as the rabbit and hare, by flight and concealment. Yet others mostly resort to evasion and escape, but become combative and even aggressive at certain seasons. The combative tendency is the pre-disposing cause of that emotional seizure we call anger. All animals whose play takes the form of mock-fights may be roused to fury. Any kind of opposition, any thwarting or restriction of psychical activity may cause anger. It is the more likely to do so the more distinctly the interference wears the appearance of coming from some positive external agency and especially from some other animal. We may be merely grieved at the loss of a valued

* *Principles of Psychology*, vol. ii., p. 546.

object if we accidentally mislay it ourselves: but if somebody or something breaks it before our eyes we are more apt to be angry. It must not however be supposed that the emotion of anger vents itself exclusively on an offending object. On the contrary the emotion is essentially a general impulse to crush and destroy. It fastens by preference on the cause of irritation; but failing this it may vent itself impartially on anything which comes in its way. It is only through experience and education that it becomes restricted and defined.

The conditions which occasion fear in one animal may occasion anger in another. Any condition which thwarts conation may give rise to an outburst of destructive violence. But in fear mental and bodily activity is at once stimulated and thwarted. Now the obstruction and oppression which in a timid creature paralyses or disorganises all activities, save those of flight and concealment, may in a combative animal rouse to active resistance and counter-aggression. This holds good of actual bodily pain. The attitude of a man in bearing bodily pain is different according as he gives way to it or fights against it. The smart of a wound received in the heat of combat usually infuriates the combatant. All fierce animals, such as the lion or tiger, become fiercely aggressive when they are hurt. Belt supplies an interesting illustration from insect life. Speaking of leaf-cutting ants he says: "The effect of a little corrosive sublimate sprinkled on one of their paths in dry weather is to make them mad and exterminate one another. . . . In a couple of hours, round balls of the ants will be found all biting each other;

and numerous individuals will be seen bitten in two, while others have lost their legs or antennæ." *

§ 8. *Emotional Gestures.* — Darwin, in his great work *Expression of the Emotions*, has attempted to account for the distinctive gestures accompanying the various specific forms of emotional consciousness. The principle of explanation on which he lays most stress is that of Serviceable Associated Habits. Many expressive movements are partial survivals of actions which have proved useful to the subject himself or to his ancestors in situations exciting analogous emotions. "So slight a symptom as the snarl or sneer, the one-sided uncovering of the upper teeth, is accounted for by Darwin as a survival from the time when our ancestors had large canines, and unfleshed them (as dogs do now) for attack. Similarly the raising of the eyebrows in outward attention, the opening of the mouth in astonishment, come, according to the same author, from the utility of these movements in extreme cases. The raising of the eyebrows goes with the opening of the eye for better vision; the opening of the mouth with the intensest listening, and with the rapid catching of the breath which precedes muscular effort." † A fainter form of the act of ejecting an unsavory morsel constitutes the facial gesture expressive of all forms of disgust. A smile calls into play the same muscles as those employed in sucking the breast, and in a similar manner.

* *Naturalist in Nicaragua*, p. 79.

† James, *Principles of Psychology*, vol. ii., p. 470.

Division II. Special Percepts.

CHAPTER I.

CATEGORIES OF PERCEPTUAL CONSCIOUSNESS.

Categories are forms of cognitive consciousness; they are universal principles or relations pre-supposed either in all cognition or in all cognition of a certain kind. It was a main part of the work of Kant to exhibit the categories involved in our knowledge of the external world, such as Quantity, extensive and intensive, Causality, Substance, etc. These are the ultimate relations between the specific contents of our experience, and constitute the forms of synthesis which give unity to that experience.

Now in a rudimentary way these forms of synthesis, or some of them, appear at the level of perceptual activity. There are five which require special treatment, — External or Physical Reality, Space, Time, Causality, and what for want of a more familiar word we must call *Thinghood*. The first three of these will receive consideration in chapters especially devoted to them.* Of course such forms are not distinctly apprehended by the perceptual consciousness in abstraction

* We shall deal with Causality and *Thinghood* in the present chapter.

from the concrete matter of experience to which they give order and unity. But neither are the categories of human thought distinctly apprehended, as such, until a comparatively advanced stage of development is reached. Even then, they are only imperfectly and incompletely detached from the more concrete matter in which they are, so to speak, embedded. If this were not so, Logic and Theory of Knowledge would have nothing to do.

J. F. Ferrier puts the case extremely well. "Men reasoned generation after generation long before they knew a single dialectical rule, or had any notion of the construction of the syllogism. The principles of logic were operative in every ratiocination, yet the reasoner was incognisant of their influence until Aristotle anatomised the process."* Ferrier further illustrates by referring to other constitutive forms which have only been gradually disengaged by reflective analysis from their specific embodiment. "It is," he says, "always very late in the day before the seminal principles of speech are detected and explained. Indeed, the language which owed to them both birth and growth may have ceased to be a living tongue before these, the regulating elements of its formation, come to light and are embodied in written grammar. That most elementary species of instruction which we familiarly term the A, B, C, had no express or articulate existence in the minds or on the lips of men, until thousands of years after the invention and employment of language; yet these, the vital constituents of all speech, were *there* from the beginning."†

* *Institutes of Metaphysic*, p. 15. † *Ibid.*, p. 14.

It is only in this sense that we suppose the categories of perceptual thought to exist for the percipient. They exist for him as the alphabet existed before its discovery. Now in this sense Causality is undoubtedly a category of perceptual consciousness. Perceptual process is directed towards practical ends; and it learns by experience how to attain these ends. Actions which prove ineffective are gradually discontinued, and actions which prove effective are maintained and repeated. Consider the dog or cat in Mr. Thorndike's experiment previously quoted.* The animal is confined in a box, with food outside. It can only escape by turning a wooden button, pulling a loop, or pressing down a lever. It struggles to escape in all kinds of ways, squeezing and biting and clawing. Ineffective modes of action are discontinued and give place to others, which in their turn are discontinued if they prove fruitless. If in this way the animal does accidentally work the mechanism, it is likely to do it sooner when again put into the box. Thus in repeated experiments "all the squeezings and bitings and clawings which do not hit the vital point of the mechanism . . . get stamped out, while the particular impulse which made the successful clawing or biting, gets stamped in," until it alone is executed. This gradual adaptation of means for the attainment of ends involves in a rudimentary way the category of Causality. It involves the distinction between efficiency and inefficiency. It is the starting-point and pre-supposition of all subsequent developments of thought which proceed according to this category.

But we must notice the essential difference which

* See p. 269 *ff.*

separates the merely perceptual category from that of ideational and conceptual thought. The perceptual category is always purely and immediately practical in its operation. It is a constitutive form of thought only because it is a constitutive form of action. The question Why? has no existence for the merely perceptual consciousness. It does not and can not inquire how it is that a certain cause produces a certain effect. It does not and can not endeavour to *explain*, to analyse conditions so as to present a cause as also a *reason*. It does not compare different modes of procedure or different groups of circumstances, so as to contradistinguish the precise points in which they agree from those in which they disagree, and in this way to explain why a certain result should follow in one case and a different result in another case. Causality in this sense can only exist for the ideational consciousness, and the development of the ideational consciousness in this direction is a development of conceptual thinking, — of generalisation.

What corresponds on the perceptual level to Kant's category of Substance is a category which I can only describe as that of *Thinghood*. In considering it we must lay aside the notions which connect themselves with the scientific view of substance as a stuff or material which persists and passes into various forms and combinations without increase or diminution of quantity. We must rather think of that unity and identity, and independence, which characterises what in ordinary practical life we call a "thing." A thing is a portion of matter which is apprehended as identical with itself and distinct from all else under its varying aspects and throughout its varying changes of state.

This distinctness and unity depend on distinctness and unity of interest. Thus different sensible qualities as severally presented to touch, sight, hearing, etc., are united in one thing because they have unity of interest, and on the perceptual level this interest is purely practical. The practical interest lies in the power of the subject to act on the thing, and of the thing to act on the subject. But in all such activity the different senses co-operate so that the experiences they yield form part of one continuous whole. The visual appearance of the thing serves as a guide to the movements which lead to contact. Tactual and visual extension correspond point for point, and the practical value of the visual appearance lies in this correspondence. There is a similar practical relation between sounds or smells proceeding from an object, and its space-relations as presented to sight and touch. By approaching the object the sounds and smells become intensified. Action on the object, though initially prompted by sound or smell, must by guided by sight and touch. In this way an object comes to exist for perceptual consciousness as the same in its diverse appearances to different senses. But this, so to speak, only accounts for the *stuff* of which things are made; it does not account for the *division* of this material into separate things. We have therefore to inquire why this or that group of sensible qualities is separated from its surroundings and treated as one thing. For ordinary common sense the world is mapped out into a plurality of these relatively independent units. Each of them emerges from its environment like an island from the sea. It is detached from its surroundings by

its separateness and unity of interest. This interest is ordinarily of a practical kind; and the further we trace back the course of human development the more exclusively practical it becomes. It is true that for our highly complex consciousness the form of *Thinghood* has become very variable and fluctuating in its application. A stone is a single thing to a boy about to fling it at another boy. To the geologist examining its structure it may be several distinct things. It is nearly always possible to mentally break up what appears as one object into parts each of which has an identity and distinctness of its own. But we only do so in so far as the interest of the moment leads us to do it. The relativity and variability of our application of the category of *Thinghood* depends on this fluctuation of interest. In general however the division of the world into separate things is determined by more or less permanent and common interests of a practical nature. Thus if I were asked what things are in a room in which I happen to be lecturing I should say there was a blackboard, a desk, and so on. I should not begin to enumerate the dints and scratches on the blackboard, or the different planks in the flooring. I should be still less likely to mentally divide the uniform surface of the blackboard into different compartments and count each of these as a distinct thing. I should not do this unless I had a special interest to serve.

In more primitive stages of mental development, human interests are at once more exclusively practical in their nature and more limited in their range and less fluctuating. Hence for primitive man the division of the external world into separate units called things is

more fixed and absolute. But the limit in this direction is reached in the perceptual consciousness. Animals distinguish from its environment and treat as a separate thing whatever portion of matter appeals to their peculiar instincts and affords occasion for their characteristic modes of activity. Thus what is a separate thing for one animal is not so for another. The interests of each species are to a very large extent determined by the connate pre-dispositions which belong to it like other specific characters. What possesses unity and distinctness of interest to an ant is nothing to the cat, and so on.

There are however also more general conditions under which a thing may detach itself from its environment and become a separate centre of interest for the animal consciousness. Thus it may be a source of peculiarly intense sensations, or it may move in an obtrusive manner. Moving objects have a peculiar power of attracting attention. This is partly because the sensory experience which they produce is more intense than that produced by things at rest. But the chief reason is that a thing which moves in an obtrusive way, challenges practical adjustment. There is need to run away from it, or at any rate keep a watch on it; for no one knows what it may do.

In general, whatever appears to the perceptual consciousness as separate is so because it is a centre of practical interest. It is capable, in its relation to the percipient, of acting independently and as a whole or of being acted on independently and as a whole. Thus *Thinghood* as a perceptual category is, like causality, purely and immediately practical. Like causality it is

a constitutive form of cognition only because it is a constitutive form of action. And just as the perceptual consciousness is incapable of inquiring how or why a certain cause produces a certain effect, so it is incapable of inquiring how or why a thing possesses its unity and independence and its peculiar modes of behaviour. For the perceptual consciousness individuality is unanalysed and unexplained, unanalysable and unexplainable. In this respect the perceptual consciousness stands at the one extreme, and modern science at the opposite extreme. Modern science explains things till it appears almost to explain them away. It would do so altogether if it could. It obliterates the lines of demarcation drawn by common sense; it seeks to dissolve the self-subsistent units of common sense, and exhibits them as mere modes or phases of one continuous process embracing the whole material world. It must indeed have distinct units of its own to serve as centres of action and reaction. But the ultimate units which it seeks for and more or less succeeds in finding are merely vehicles of the application of abstract and universal laws, without intrinsic character or quality of their own. It is the ideal of science to exhibit the internal unity and the distinctive behaviour of individual things as mere resultants of the complex interaction of these characterless units. For the perceptual consciousness, as we have seen, the extreme opposite is true. The unity and distinctive behaviour of the individual thing is for it unconditional and ultimate. For primitive human thinking it is also in a large measure unconditional and ultimate. The tendency of the primitive man is rather to use the unity

of the individual as a principle of explanation than to regard it as something to be explained. Herein lies, as we shall see in the sequel, a most important clue to the nature and origin of primitive beliefs, magical, mythological and religious.

CHAPTER II.

PERCEPTION OF EXTERNAL REALITY.

All animals whose conscious processes rise above the level of the sensation-reflex must have some kind of apprehension of physical reality. It may be very rudimentary, and it may differ very much in its specific nature from our own perception of the external world. But there must exist for them some difference between experience so far as it merely involves their own changing states, and experience so far as it involves the presence and operation of external objects. The very conditions of their existence, from a purely biological point of view, render necessary a different mode of behaviour, according as the processes occurring in their nervous system are or are not due to the present operation of agencies external to their own organism.

I say external to their *organism*. The Self at this stage in the development of mental life is an embodied Self. The distinction between the pure stream of conscious experience and the body with which it is connected is a late product of psychical evolution. But there is a subtlety involved here which must be carefully noted. The body is directly identified with the Self only in so far as it is the instrument of sense-perception. But one part of the body may be perceived by

another part; the eye may look at the hand; in this case the hand as seen belongs *pro tanto* to the Not-Self; the eye, as instrument of perception, to the Self.

There are, as a matter of fact, two groups of experiences originating in different ways which we from our own point of view can clearly distinguish in the case of any animal which has to maintain its existence by perceptual adaptation to its environment. On the one hand, there are all kinds of organic sensations and appetites and active impulses and emotions which are relatively independent of external impressions on the organism. Their specific nature does not correspond in any definite manner with the specific nature of external agencies affecting the senses, and they may originate quite apart from the operation of such agencies. On the other hand, there is the stream of special sensations produced by external conditions, and varying from moment to moment as these conditions vary.

We from our point of view can easily draw this distinction. The problem for the psychologist is to inquire how the distinction manifests itself in the experiences of the percipient subject. The essence of the answer lies in the different relation of the two groups of experiences to motor activity. The sensations which vary in a specific or definite manner with the operation of external agencies, also vary continually with the movements of the animal itself. Visual sensations alter as the eye is moved; tactual sensations as the hand is moved.

The animal's movements alter its spatial relations to the things which surround it; and in this way determine, to a large extent, the nature and intensity of the

impressions which it receives from its environment. But experiences occurring independently of the present operation of any external stimulus are unaffected by the changing position of the organism and its parts in relation to surrounding objects. The hungry animal carries its hunger about with it, and the wounded animal carries its wound about with it.

Our first result, then, is that the presentation of external objects arises in connexion with those experiences which vary with the changing position of the organism and its parts. It arises in connexion with experiences which are dependent on motor activity. But this result is not final. It only serves to bring us to the threshold of our inquiry. For it turns out on closer examination that in so far as an experience is merely dependent on motor activity it is not a presentation of an external object. If I walk towards an object, the visual sensation which it produces changes; it changes precisely as it would change if I had remained still and, instead of my moving, the object itself had moved towards me or had increased in size. But the change being produced by my own movement the object itself is not apprehended by me as moving or becoming larger. Similarly, if I get up from my chair I do not apprehend this as a movement on the part of the chair, but the case is different if the chair gives way under me. An animal, if it acted as if changes purely due to its own changing position were due to change in things themselves, would inevitably perish. So far as they depend merely on the changing positions and movements of the organism, they do not correspond to external conditions, and cannot therefore

determine actions effectively adapted to these conditions. Just so far as they are due to the animal itself and not to its environment, they must be useless as determinants of the actual course of practical activity. There is a libellous story about the ostrich burying its head in the sand on the approach of danger, and resting satisfied with this sage precaution. To behave in this manner would be to behave as if the mere disappearance of an object from sight were equivalent to its actual removal. This is so only in case the conditions are such that, if it were present, it would be seen. The closure of the eyes, or the burying of the head in the sand, makes no difference in the external conditions; the consequent discontinuance of impressions arising from the dangerous object is merely a self-initiated change without practical significance.

We appear to have involved ourselves in paradox. On the one hand the presentation of external objects occurs only through those experiences which vary with the motor activity of the subject: on the other hand, the presentation of external objects occurs only through experiences which are independent of the motor activity of the subject. This seems a plain contradiction. But the inconsistency disappears when we consider that the kinds of experience which vary with our own movements may *also* vary in partial or complete independence of these movements. Thus the contradiction is removed, as many apparent contradictions are; the contradiction is present when we assert that A is at once B and *not-B*; it disappears when we say that A is partly B and partly *not-B*. The change in visual sensation, which

occurs when we approach an object, may also occur when it approaches us; only in the second case does it constitute presentation of movement on the part of the object. In this simple instance the contrast may without serious inaccuracy be regarded as a contrast between change which is exclusively due to the animal's own activity and change in other respects similar which occurs in the absence of such activity. But for the most part the antithesis is of a subtler kind. The two factors co-operate so that the resulting change in part depends, and in part does not depend, on the varying position and movements of the organism. A given movement may always give rise to altered impressions from surrounding things. But the specific nature of the change is not entirely determined by the specific nature of the movements. On the contrary, the same movement yields varying results under varying circumstances. Opening of the eyes permits access to the light, but it does not determine the special nature of the optical stimulation received. Movement of the eye in a certain direction produces a sequence of optical impressions, but it does not determine what the impressions shall be which succeed each other, or in what order they shall occur. Similarly, the initiation of movement or of effort to move depends on the animal; but various and fluctuating external conditions determine whether a movement in a given direction shall be free or impeded, and if it is impeded what kind and degree of resistance it shall encounter. If the same motor activity always produced the same effect, there would be no such thing as *adaptation to environment:* the phrase would be meaningless. We may imagine

the case of an animal able to command all the external conditions affecting its nervous system purely by its own initiative, so as to obtain any impression on any occasion merely by a suitable innervation of its muscles. Specific olfactory, optical, tactile, and other stimulations of the organs of sense would then be freely producible in the same manner as the specific impressions arising from the changing states of muscles, joints, and tendons, which accompany movements of the body and limbs. A certain mode of sniffing would always yield the smell of roses, and a certain movement of the eye would always yield the sight of roses, and so forth. Similarly, we may suppose that want of food or drink could be satisfied by merely going through the formal motions of eating and drinking, as at the banquet of the Barmecide in the *Arabian Nights*. Evidently, for such a creature as we have imagined, the external world would be virtually non-existent. Such a creature would be a world complete in itself.

Our general result is as follows: (1) The presentation of external objects takes place through those experiences to which the subject must adapt itself if its action is to be efficient for the attainment of practical ends. (2) These experiences which correspond to external conditions and make possible practical adjustment must be of a kind which vary concomitantly with the movements of the animal. (3) But they must only do so in part. They yield effective guidance only in so far as they actually occur partially in independence of the movements of the animal. In other words, an external world exists for the animal only in so far as the same movement may give rise to different consequences, or different

movements to the same consequences. We have now to apply this general principle to a special case of paramount importance. In general, the action which subserves the primary ends of animal life is effective only if and so far as it consists in or prepares the way for what we may call the direct *manipulation* of objects. It is difficult to find a better word; but it should be clearly understood that when we say *manipulation* we imply no exclusive reference to the hand. What is meant is all alteration or endeavour to alter the position, shape, arrangement, etc., of things, by direct putting forth of effort against resistance. All pulling, pressing, rending, tearing, combining, separating, breaking, bending, crushing, moulding, and the like, are included under this conception. It is obvious that in all such operations what lies in the power of the agent is only to make efforts in certain directions and in a certain order. The result varies with the nature of the material manipulated. To be effective the course of action must be constantly guided by varying experiences corresponding to the varying nature of the material. Now the paramount practical importance of the actual manipulation of objects constitutes it the ultimate and dominant test of what is physically real and what is not. The real size or shape of a thing is its size or shape so far as it has a practical bearing on actual manipulation. A man at a distance may look as small as a doll on the table; but he is not really so small, because if I went out and tried to pick him up and bring him away, I should not succeed. So the real size of a hole to an animal is essentially determined by reference to such questions as whether it can

creep into the hole or not. This point is simple and obvious when once stated, but it is of the greatest importance for the whole psychology of perception.

We may now sum up. Perception of physical reality always arises in essential connexion with the experience of active movement. But the connexion is one of antithesis or contrast. Experience of active movement is not, as such, a presentation of external object. Only so far as the motor activity is limited or circumscribed in the attainment of the ends of animal life by varying conditions, is physical reality apprehended. The experiences which determine the adjustment of active movement to these conditions are, as such, presentations of the Not-Self, or external object. In the actual course of practical activity attention in the form of watching, searching, scrutinising, and the like, must be directed predominantly, if not wholly, to the external object. Only those experiences which determine adjustment have an objective reference. All else is ignored by attention. The psychological correlate of inter-organic disturbance of the nervous system consists in animal appetites, emotions, instinctive impulses, and the like. These are merely changing states of the Self. In a sense they may be called passive, inasmuch as they arise and persist independently of the effects of motor activity. But in another and more important sense they are essentially active, inasmuch as they constitute the primary impulses or tendencies in which motor activity has its source. They do not of themselves contain any special contents of consciousness distinctive of external objects. In the actual course of practical activity they do not by their specific quality enable attention to dis-

criminate the conditions to which active movement must adjust itself. On the other hand, as being the source of activity, they constitute the interest which keeps attention alive and at work.

The case is different in the intervals of practical activity. Here attention not being pre-occupied by external object may be directed to the Self and its states. The hungry lion deprived of the opportunity of satisfying its hunger, may attend to the hunger itself, instead of to its prey, and the like. It is very important, however, to note that in all primitive perception of the Self, it is not what is called the pure Self which is presented, but always the embodied Self. In other words, the apprehension of Self is always bound up with the apprehension of a particular external object. For the bodily organism has a two-fold nature. On the one hand it behaves just as other external objects do. One hand can perceive and explore the other hand, or the eyes can perceive and explore other parts of the body, just as eye or hand can perceive or explore external bodies. If we select one sentient portion of the organism, the rest may be regarded as external object to it. So far the body is an external thing. On the other hand, the body as a vehicle of active movement and of sense-perception, and the body in its peculiar and intimate relation to organic sensations, appetites, etc., belongs to the Self. Thus an animal's perception of its own organism constitutes a connecting link between the perception of Self and Not-Self.

We pass now to the case in which the perceived object is not the percipient's own body, but another

living body resembling his own in appearance and behaviour. His experience of his own body as external object is united in the most intimate way with his experience of his own body as the vehicle of active movement and perception, and as the seat of organic sensation, appetite, and emotion. Hence by the working of association, when he perceives another organism resembling his own in its appearances and modes of behaviour, this other organism also will be apprehended by him as an embodied self,—as the embodiment of a self other than his own. When one dog is fighting with another, it is not aware of its opponent merely as a changing complex of colours, pressures, sounds, etc.: it is aware of its opponent as initiating active movement and feeling emotion just as itself is initiating active movement and feeling emotion.

Of course this cognition of other embodied selves may vary greatly in definiteness and vividness. In general the behaviour of others, so far as it resembles the percipient's own, will have an acquired meaning. But the meaning may be made specially explicit by special circumstances. When one dog is actually fighting another, its own combative emotions constitute a presentation of which the other is feeling. If on the other hand he is only watching a couple of other dogs engaged in a fight, their actions will affect him by way of sympathy. They may arouse in him organic sensations, emotions, and active tendencies, like those of the actual combatants. These sympathetic experiences will serve as presentations of the experience of the other dogs. It is especially to be noted that this may take place although the spectator does not attend to himself and his own states at all. When one person is intensely absorbed in watching the

movements of another he sometimes feels a sympathetic tendency to make similar movements, and he may actually do so in a partial and inchoate way. Yet all the time he may be totally unaware of what he is doing, simply because he is not attending to himself at all, but only to the action of the other person. His own sympathetic action merely helps him to realise more fully and vividly the experience of the other person.

We have so far taken account only of the relation of one animal to another of the same species. But what has been said obviously applies though in a less degree outside these limits. It applies for instance to the relation of a dog to a cat, or even of a cat to a bird. Indeed the analogy of the embodied self is in certain respects extended even to inanimate objects. When we attempt to overcome resistance the resisting thing appears to be making a counter-effort, analogous to the counter-effort which is actually experienced when we press our hands against each other. So too, motion as mere change of place is an abstract conception of science. In prescientific perception and thought our apprehension of it is coloured by the analogy of our own active movements.

CHAPTER III.

SPATIAL PERCEPTION IN GENERAL.

§ 1. *Nature of the Problem.*—We have to inquire how the spatial perception develops from indefinite and imperfect to more definite and perfect forms. We have then to consider whether the same conditions which determine its development may not also explain its first origin. To begin with, our inquiry must be limited to the perception of extension, strictly so called. This is a narrower inquiry than that concerning space in general. Sound and smell have spatial determinations. We speak of their direction and distance. But they are not extended. Extension is a continuous expanse composed of positions separated and connected by distances. Now sound and smell are never spread out in this way into an expanse composed of audible or odorous positions separated and connected by audible or odorous distances. Objects are extended only as presented to sight and touch. Our primary concern is therefore with these senses.

§ 2. *Analysis of Extension.*—If we consider extension as it is presented to the developed consciousness, we find in it two constituents, a material and a formal. The formal constituent consists in the relations of the parts of an extended whole in the way of

position and distance. But position and distance must be position and distance of something: and this something is the material constituent. It is plain that the mere conception of position and distance is not sufficient to constitute the conception of an extended whole. For these determinations are found apart from extension. They are found in merely qualitative series, such as those in which colour sensations may be arranged. For instance, in the series of intermediate gradations connecting pure blue and pure green, any blue-green or green-blue has a definite position, and a definite distance from other blue-greens or green-blues. If we select the interval between one blue-green and another as a unit, we may measure the distance between any positions in the scale in terms of this unit. But this series of qualitative gradations is not a line in space: it does not depend on the juxtaposition of the colours, but only on their differences and likenesses as revealed to attentive comparison. It may be represented as a line in space, but only by analogy. In itself, it has no distinctively spatial character. What fixes the position of any special colour in the series is its own intrinsic quality. But in an extended whole, *qua* extended, this is not the case. If we ask why a point in an extended whole has a certain position, we cannot find the answer by considering the intrinsic sensible quality of the point itself, and by comparing it with the intrinsic sensible qualities of other points. Since position and distance do not constitute the whole of our conception of space, we must ask what is left when we think away these determinations. In the case of the colour-series the answer to this question would be easy. If we

cease to arrange the colours in a series, each of them none the less retains unaffected its own intrinsic quality. In the case of an extended whole the answer must be partially similar. Its parts are distinguishable, and capable of being added and subtracted. There must therefore be some qualitative difference by which they are distinguished. This difference is commonly called a difference of *local sign*. Local signature is that differential quality of sensation which varies with the part of the sensitive surface stimulated and not with the nature of the stimulus. There must be some qualitative difference between a contact affecting the tip of the nose, and one affecting the big toe. Otherwise we could not with our eyes shut tell when the one and when the other was touched. It is sometimes said that this difference may be due to association. But this is impossible, because unless the qualities of contact n and contact t were different, association with n would be the same as association with t. t would tend to reproduce whatever n tended to reproduce, and there would be no distinction between them. We may therefore affirm that there is a difference in the quality of sensation according to the point of the tactile surface affected, and we must assume the same for the surface of the retina.* But two points must be carefully noted which distinguish this difference of local sign from other qualitative differences. In the first place, it does not depend on the nature of the stimulus applied, but only on the part of the sensitive surface affected. Difference of local signature cannot there-

* It is difficult to determine the physiological conditions of local signature. They are probably rather central than peripheral.

fore be classed with the ordinary differences of colour and tactile sensations. The local sign of a visual sensation is not a colour-quality such as red, green, white or black, and that of a tactile sensation is not a touch quality, such as roughness, smoothness, and the like. This brings us to the second point. Local sign differences exist unaffected, whether the sensitive surface is stimulated in a uniform manner or not. A uniform expanse of white or blue is still an expanse and contains local differences in spite of the sameness of the colouring.

Local sign qualities differ from the qualities of the special senses inasmuch as they are not discrete and independent. They unite in one continuous total impression, forming a kind of quantity called *extensive quantity* or simply *extensity*. "Suppose," says Dr. Ward, "a postage stamp pasted on the back of the hand; we have in consequence a certain sensation. If another be added beside it, the new experience would not be adequately described by merely saying we have a greater quantity of sensation, for intensity involves quantity, and increased intensity is not what is meant. For a sensation of a certain intensity, say a sensation of red, cannot be changed into one having two qualities, red and blue, leaving the intensity unchanged; but with extensity this change is possible. For one of the postage stamps a piece of wet cloth of the same size might be substituted and the massiveness of the compound sensation remain very much the same."* Now the two postage stamps in this instance present to the touch an object which has not only extensity but

* Article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 54.

extension. One stamp lies to the right or to the left of the other. A certain shape is presented, and within the whole we can distinguish distance, direction, and position. But we must abstract from all these determinations, and consider only the quantitative difference between the one postage stamp and the two. If we fix our attention purely on the quantitative aspect, we are considering extensity as distinguished from extension.

§ 3. *Extensity.* — So far we have only attempted to show that extensity is a constituent of the fully developed percept of extension, and can be distinguished in it by analysis. The next question is whether extensity is not merely distinguishable, but actually separable from extension. Is there such a thing as an extensive quantum in which local sign differences are not distinguished by positions separated and connected by distances? Can the quantitative aspect of space exist without a spatial order? The answer is that though it is perhaps not possible to give examples of absolutely pure extensity, we can nevertheless exhibit many approximations to it. We can point to sensible experiences which have extensive diffusion with a relatively vague spatial arrangement.

The first set of examples is supplied by experiments on tactile sensibility. If the skin receives two punctiform impressions, such as those produced by the points of two needles, or of the legs of a pair of compasses, it is found, as Weber first showed, that the points must be at a certain distance apart, if the two impressions are to be distinguished.* At less than this distance only one

* The distance varies with the part of the skin affected. "In general, it is finest in those regions, as the fingers and lips, which are known by

continuous tactile impression is felt. It might be supposed that this is due to an absence of any local sign differences in the sensation: but the facts prove that this is not the case. Even when the two points are not discriminated, the sensation is often recognised as having a certain indefinite diffusion; and this may even happen when only one point is used. It is also found that the power of discrimination varies greatly according as the impressions are applied successively or simultaneously. When one needle point is removed before another is applied, the two contacts can be distinguished at a very much smaller distance than when they occur simultaneously. This shows that they may be simultaneously applied without being distinguished, although the sensation they produce contains a complexity of local sign differences. The local sign differences unite in one continuous extensive quantum, without internal distinction of position, direction, and distance. When the needle points are successively applied, they may be distinguished without their relative position being apprehended. For apprehension of their relative position or direction they must be a certain distance apart. The experiment may be further varied by applying one needle and afterwards applying the other without removing the first. In this case, they must be somewhat further apart to be distinguished. But what most interests us is that the application of the second point is sometimes only recognised as producing a blunter or more diffuse contact. Finally, the

every-day observation to have high tactual sensibility. It is much finer in the mobile parts, hands, feet, and lips, than in the comparatively fixed parts (the trunk). It is about twice as fine on the anterior as on the posterior surface of the fingers." (Sully, *The Human Mind*, vol. i., p. 106.)

skin may be stimulated by continuous lines such as the edge of a strip of cardboard, instead of by separate points. It is found that this linear impression can be distinguished from a punctiform impression when its end-points are separated by a much smaller distance than what is required for discriminating two separate points simultaneously applied. The linear impression does not give rise to the impression of a line unless its end-points are a certain distance apart; at shorter distances the experience is merely one of indefinite diffusion. Longitudinal direction gradually comes to be perceived as the linear impression is lengthened: but in this process the line is apprehended as such before its direction is apprehended.*

It thus appears that in these experiments on tactile sensibility we have all kinds of gradations between pure extensity and fully definite extension. If we turn from touch to sight, there is more difficulty in exhibiting intermediate stages of this kind, because the optical perception of space is far more completely developed in the adult consciousness than the tactile. But there is a marked distinction in this respect between the central parts of the field of vision and its margin. There is an outer zone of dim imagery which has extensive diffusion, but a comparatively vague spatial order. This is best seen in the gray field which is presented when the eyes are closed. The edges of this field have no definite outline. It is impossible to assign its shape. But perhaps the best example is supplied when one eye is kept open in a fairly strong light, and the other closed.

* "Ueber die Wahrnehmung zweier Punkte mittelst des Tastsinnes, etc." Von G. A. Tawney. *Philosophische Studien*, Band xiii., 2. Heft.

A diffused blackness is presented to the closed eye, but its partial determinations are of the vaguest kind.

Typical cases of extensive diffuseness or massiveness are afforded by organic sensations. Professor James speaks of the "vast discomfort of a colic or a lumbago."* Let us consider such a sensation as that of hunger or of stomach-ache. This is spatial in so far as it is localised in a certain portion of the body, but it is almost entirely without internal spatial arrangement. We do not distinguish in it points of hunger having definite relations of position to each other, — points of hunger separated and connected by hunger-distances. At any rate, if we do so at all it is in the very vaguest way. But there is no doubt that the hunger has extensive quantity. It is, as James says, "voluminous or massive."

It is also sometimes urged that the other special senses, such as sound or smell, have an extensive character. "The reverberations of a thunder-storm," says James, "are more voluminous than the squeaking of a slate-pencil."† But this voluminousness is not a purely auditory experience. It is urged with some show of reason that the extensity belongs not to the sound as such, but to accompanying tactile sensation due to vibrations of the tympanum, and of the external ear, and to similar conditions. However this may be, the fact remains that the voluminousness is present, and that it has no distinctively spatial character, no internal order of positions and distances.

§ 4. *Active Movement.* — Extensity, in order to become extension, must assume more or less definite order

* *Principles of Psychology*, vol. ii., p. 134. † *Ibid.*

of parts. How is this acquired? The serial arrangement of colours in a qualitative scale is directly based on the intrinsic quality of the colours themselves, and it is obtained by deliberate comparison of these qualities. The arrangement into positions and distances which constitutes extension is not arrived at in this way. We cannot take local sign qualities obtained by stimulating different parts of the body, and arrange them by comparison in a qualitative scale. Indeed it is probable that there is less difference between the local signatures of corresponding parts of the two hands, than there is between sensation in the finger-tips and sensation on the back of the hand. In order to account for spatial order, we must have recourse to some factor distinct altogether from extensity. This factor must show definite serial arrangement in the way of position and distance. It must also be so intimately connected with experiences of extensity that the definite arrangements which belong to it may be transferred to them: for it is not enough to have a pure experience of extensity externally conjoined with another experience showing a definite order of positions and distances. Position and distance must come to belong to the extensity itself.

Now the only factor which fulfils these conditions is movement, and, in particular, active movement of the eyes or hands. In any movement of the limbs or of the body as a whole, a series of varying sensations arises, due to the changing conditions of muscles, joints, and tendons. Following Dr. Ward, we may symbolise such a series as $P_1\ P_2\ P_3\ P_4$. "P_1 cannot be presented along with P_2 and from P_4 it is impos-

sible to reach P_1 again save through P_3 and P_2"* or through some other determinate motor series. These motor experiences have therefore a definite arrangement. P_2 lies between P_1 and P_3. P_2 and P_3 constitute a distance separating and connecting P_1 and P_4. Further, if the movement is not merely made in free space, but explores the contours of some object, there is another concomitant and corresponding series having definite arrangement. Suppose the instrument of exploration is the hand. As the finger-tips pass from one part of the object to another, there is a series of tactile experiences having a definite order, and varying concomitantly with the sensations arising from muscle, joint, and tendon. If the object explored is part of the cutaneous surface of the body itself, there is still another definitely ordered series. As the finger-tip passes along the palm of the other hand, the contact is felt not only in the finger but in the hand explored. The successive stimulation of the parts of the hand yields a succession of local sign experiences which occur in a fixed order, and correspond to the succession of motor experiences. All these series have a definite arrangement of positions and distances: but the arrangement is not spatial. It is purely an order of time-sequence. Extension can only exist when the definite order is the order of the parts of an extensive quantum simultaneously presented.

It is essential to the possibility of this that the experience of extensity and the experience of active movement should enter as co-operative factors into a

* Article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 54.

process having unity and continuity of interest. A process having unity and continuity of interest leaves behind it as a whole a total disposition,—a disposition to which each and all of its component factors in their conjoint interaction have contributed. This cumulative disposition is re-excited as a whole when the process is repeated in part. In this way the factors which enter into the process may become profoundly modified by their previous combination, so that each separately assumes a character which it has acquired from its combination with the others. It comes to mean or stand for the others. When an extensive experience has come to mean or stand for a system of active movements, the extensive experience has become a perception of extension. If, on clasping an object in the hand, you know at once how to make a systematic exploration of its parts, so that you will have nothing to learn by actually executing exploring movements, then you have an adequate perception of its shape and other spatial determinations. If, on the other hand, mere contact with the object does not fully supply precise and definite guidance to the movements of exploration, the spatial perception is *pro tanto* inadequate. When the perception is adequate, any two local signs or any group of local signs prompts at once the appropriate movements for passing from part to part of the object. Extensity which has thus acquired meaning is no longer mere extensity, but a continuous complex of positions and distances. Just as the passive touch acquires in this way a properly spatial significance, so the active touch which is at first a purely successive series, also acquires a spatial character. As the finger-tips pass over an

object, the successive tactile experiences do not present themselves as merely a time-sequence. They become for consciousness the successive presentation of a whole of co-existent parts.

Extensity and active movement must, as we have said, be combined as essential factors in processes having continuity of interest: otherwise they could not modify each other in the way described. Their conjoint operation must leave behind it a total disposition which is the cumulative after-effect of the whole process into which they enter. Each, when it occurs separately, will occur modified by its previous conjunction with the other, because it will re-excite the total disposition due to their conjoint operation. Now, if we inquire what the appetitive processes are into which extensity and active movement enter as co-operative factors, we may answer by referring to all the primitive activities by which the ends of animal life are secured. Such practical activity can only be effective in so far as active movement is delicately adjusted to the shape, size, distance, etc., of objects. The guiding clues to such motor adjustment can only be found in touch- and sight-experiences. But just in so far as the touch- or sight-experiences either originally possess or subsequently acquire the power of guiding active movement, they are or become perceptions of spatial order.

We have now at once to explain and to justify these general statements by an account of the special conditions by which the development of (1) the tactual, (2) the visual, perceptions of space is determined.

CHAPTER IV.

SPATIAL PERCEPTION BY TOUCH.

§ 1. *Spatial Perception of the Blind.*—The existence of blind persons enables us to study touch-space dissevered from sight-space. But it is essential for this that the blind persons should either be blind from their birth, or have lost their sight in the first year of their lives; and also that they should retain no trace of sensibility to light or colour.* Those who have become blind in their fourth year translate their tactile impressions into visual imagery as we ourselves do in the dark.

The chief instrument used by the blind in perceiving the shape and size of objects is the hand, or rather the two hands. These are used in a two-fold way. (1) The hand, either open or closed, may touch simultaneously the parts of the object. This may be called *passive touch*, because it does not involve active movement from one part of an object to another. It may also be called *synthetic touch*, because it yields a total simultaneous impression of all or many parts of the object. (2) A portion of the hand, such as the finger-tips, may explore the parts and contours of the object by grad-

* The facts adduced in this section are almost entirely due to Theodor Heller's most valuable "Studien zur Blinden-Psychologie" in the *Philosophische Studien*, xi., 1895, pp. 226, 406, 531.

ually moving over them. This may be called *active touch*, because it essentially consists in active movement. It may also be called *analytic touch*, because it analyses or breaks up into a series of successive impressions what synthetic touch presents as a simultaneous whole. Now the main lesson that we learn from study of the blind is that all development in the definiteness of the perception of spatial order is essentially due to the intimate union and co-operation of synthetic and analytic touch. It must be understood that the observations and experiments on which we rely are all made on blind persons who have already acquired considerable experience. Their spatial perception is therefore at the outset developed in a large measure. What we can observe therefore is only the process by which greater precision and accuracy are acquired. It is fortunate for psychological purposes that spatial perception by touch does not reach full maturity with nearly the same rapidity as spatial perception by sight. Hence, even in the adult blind, it is possible to observe it in the process of growth. The first question with which we have to deal is, What information concerning shape and other spatial determinations is conveyed by synthetic touch apart from analytic? Of course, we cannot bring synthetic touch into play in absolute severance from analytic, for the blind have already had considerable experience in the exploration of objects and especially of their own bodies. In the case of simple and familiar things which they have already often explored by active touch, they can at once recognise shape, size, etc., by merely passive contact. But when objects are presented to them with which they are quite unfamiliar,

it is found that for precise apprehension analytic touch must be combined with synthetic. Synthetic touch alone without the aid of previous experience yields at the most a general and schematic total impression. For instance, they can tell whether the object is round or angular, and whether it is regular or irregular. But for more precise determination of its shape, analytic movements are required. It is particularly noteworthy that the blind are almost incapable of confining themselves to purely synthetic touch when the object is at all unfamiliar. Involuntary twitchings of the hand occur which they find it difficult or impossible to suppress.

In the active exploration of objects there is a great difference in the method of procedure in different persons, and in different stages of development of the same person. The more highly the spatial perception has been developed, the more systematic and appropriate are the movements and their combination. At the highest stage the blind use a plan of procedure identical in its main features in different individuals. This is sometimes acquired in early childhood where the conditions are favourable. If the blind have to work with their hands, they always acquire the power of apprehending simple spatial relations. On the other hand, adults of otherwise good intelligence, who have not been compelled to acquire control over objects by pressure of practical needs, often show great helplessness, and do not appear to have any interest in spatial relations. In such cases, a special education of perceptual activity is required for adequate apprehension of the shape of objects. As education advances, the blind

person becomes more and more capable of determining the size and shape of objects presented to him. At the same time, his active movements of exploration show a more and more systematic and purposeful character.

In higher stages of development the process of analytic touch takes a form such as the following. One hand holds the object in position, and turns it so that it may be conveniently explored by the other. Finger and thumb are the instruments of exploration, and they are used simultaneously. The finger glides along one contour of the object, and the thumb along an opposite contour. The varying distance of finger and thumb, as they proceed from their starting-point, measures and determines the distance and direction of the boundary lines. If finger and thumb retain the same relative position, the boundary lines are parallel; if they move apart, the boundary lines are divergent; if they approach each other, the boundary lines are convergent. Many blind persons have wonderful power of discriminating distance in this way. They can, for example, determine the various thickness of different kinds of paper. When in this process of analytic exploration the object is pushed backwards till it touches the surface of the hand, analytic touch passes into synthetic. The two hands sometimes interchange functions, and at intervals synthetic touch intervenes, the object being clasped and pressed. As a rule, synthetic touch comes first, and introduces analytic. All active exploration is brought into connexion with the total presentation of the object, as it exists for passive touch. The more practised a blind person is in the apprehension of the configuration of bodies, the more rapid and sketchy are

the active movements necessary for adequate perception. Indeed, all the facts show that neither active nor passive touch alone suffices. The perception of spatial order is a product of their union and interaction. This co-operation of synthetic and analytic touch is possible only for objects small enough to be taken in the hand, or at least in both hands. Larger objects cannot be apprehended as a whole by synthetic touch. Active movement, it would seem, must in these cases be the main resource. But this is not quite true. The blind person can often measure the dimensions of the object by the dimensions of his own body, comparing, for instance, its height with his own height.* The significance of analytic touch as applied to larger objects depends upon the significance which it has acquired in co-operation with synthetic touch. Large numbers of blind persons are unable to acquire precise spatial apprehension of those objects which cannot be immediately clasped by the hand. This inability manifests itself in their movements of active touch, which are for the most part limited to the discovery of some striking and distinctive feature of the object which can serve as a sign of it. But it is often possible to induce these persons to undertake a systematic exploration of larger objects in the way of active movement, by putting before them models of these objects on a reduced scale. They are thus prompted to compare originals and copies. Afterwards they freely apply the system of movements thus acquired to all objects which require and admit of them. As in the active exploration of

* We shall presently have to consider the conditions under which the spatial relations of the body itself come to be presented.

small objects the convergence and divergence of thumb and finger play a prominent part, so in the exploration of larger objects, the convergence and divergence of the two arms is of the greatest value. There is a link of connexion between these two methods, inasmuch as it is possible to use either of the two methods for smaller objects. A thing may either be taken between the opposing thumb and finger-tip or between the opposing fingers of the two hands.

So far, we have dealt with the exploration of comparatively limited spaces. We have kept within what may be called the *touch horizon*. This is very much more restricted than the visual horizon. Its utmost limit is the space that can be embraced by the outstretched arms. Larger spaces than these can only be explored by locomotion of the whole body, in which extension previously presented is completely left behind. We thus have a series of fragmentary presentations. For fully precise spatial apprehension these must be gathered together into a single simultaneously presented whole. It is conceivable that this might be effected by ideal reproduction of the parts not immediately perceived. To a certain extent the blind may actually proceed in this way. But they can only do so by reproducing the whole on a reduced scale. The scale of their imagination is limited by the range of their actual perception. The same is true of those who can see. We cannot mentally visualise a spatial expanse larger than the field of view as given in actual perception.* If we are to include in the purely mental field of view

* Of course we can think of such an expanse, although we cannot picture it.

objects beyond the range of actual vision, we must make a schematic representation of them on a reduced scale. Those who are confined to the sense of touch may follow an analogous plan; but their power in this respect varies with the individual, and is in any case very much more restricted than that of persons who can see. But we must not suppose that where the apprehension of the parts of a spatial whole becomes purely successive, the parts themselves are presented as successive, so as to transform a spatial perception into a temporal perception. On the contrary the movements of exploration have already acquired a spatial significance through the experiences obtained within the limits of the touch horizon. Hence the parts of the spatial whole which successively present themselves are apprehended as related in the way of co-existence, although they cannot be simultaneously presented. Similarly, a person who can see, in walking along a road for ten miles, has a number of successive fields of view which cannot be simultaneously presented either actually or ideally. But he does not apprehend these fields of view as forming a time series: he apprehends them as successively presented parts of a co-existent whole. The reason for this will become clearer in the next section.

§ 2. *Extension as Physically Real.*—We may now proceed to consider the movements of exploration concerned in the apprehension of size and configuration from another point of view. They not only contribute to perception of size and figure, as mere modes of extension; they at the same time yield a perception of external reality. The configuration and size perceived

by their means is essentially the configuration and size of bodies existing and persisting independently of us and of percipient activity. In following the contours of an object, our movements are not wholly free, but are bound by certain conditions. We must on the one hand keep in contact with the object, continually preserving the experience of resistance. If contact and resistance cease, we are no longer exploring the object. On the other hand we avoid any effort to overcome resistance by main force; when a body is soft or fragile, this would actually prevent us from attaining our ends, for it would alter the configuration we are exploring; and, in any case, it would be futile. We only feel the resistance in order to yield to it; in this way, it is a condition continually determining our subjective activity. So far as this condition operates, the whole experience is determined for us, not by us, and is therefore the presentation of an external reality. The size and configuration perceived are apprehended as existing independently of our action in perceiving them. The cessation of our activity does not involve the cessation of their existence; they are therefore regarded as persisting even when they are no longer actually presented. This it is which gives the experience practical value, value in the manipulation of objects for the attainment of practical ends. It also explains the sharp antithesis between the successive presentation of the parts of a whole, and their spatial co-existence. The succession is a succession of our subjective states; but the successively apprehended parts persist independently of us and our doings. They therefore co-exist independently of us and our doings.

§ 3. *The Spatial Significance of Free Movements.* —So far, we have dealt only with what may be called restricted movements, movements restricted by the conditions which determine the actual exploration of bodies. But the experiences thus acquired cannot be without effect on free movements. The spatial significance acquired in the exploration of bodies must in some degree cling to analogous movements when they take place without contact with external things. As a matter of fact such movements yield the perception of what may be called geometric configuration, configuration in which the spatial character is not regarded as belonging to any external body, but as the product of our subjective activity. To quote Professor James: "If, with closed eyes, we trace figures in the air with the extended forefinger (the motions may occur from the metacarpal-, the wrist-, the elbow-, or the shoulder-joint indifferently) what we are *conscious of* in each case, and indeed most acutely conscious of, is the geometric path described by the finger-*tip*. Its angles, its sub-divisions, are all as distinctly felt as if seen by the eye; and yet the surface of the finger-tip receives no impression at all. . . . In persons born blind the phenomenon in question is even more perfect than in ourselves."* In these geometric tracings we are making an express experiment, and concentrating attention on the movements of the finger, as such. Under such conditions there is present a very distinct mental image of the path described by the moving finger. It is as if the finger actually left a marked track behind it, and so drew figures in the air. The outline is generally visu-

* *Principles of Psychology*, vol. ii., p. 190.

alised in the case of seeing persons;* the blind presumably image it in the way of passive touch.† It does not appear however that in ordinary movements, on which we do not expressly concentrate attention, this ideal imagery is distinctly present, or indeed present at all. None the less they still possess a spatial significance. The sweep of a limb, or the movement of the whole body, means extension, differing in amount and direction according to the direction and amount of the movement. This extension is not that of any external body; it is free or empty space. Inasmuch as the presentation of it depends purely on free movement, it ought according to principles laid down in the preceding chapter to lack the character of external reality. This is true of geometric tracings in which attention is wholly concentrated on the free movement itself. But, in general, free space is, as Kant says, a form of the external world. This is so, because free movements are usually not wholly free, but in a certain respect conditioned. They take place in the service of practical ends, and they are useful in this way mainly in so far as they effect a transition from one resisting body to another, or from one part of a

* Mr. Welton, who is by no means blind, gives me the following account of his own experience. "I can't get the visual image even in this case, or at any rate it is of the vaguest character, and then only seems to arise when I as it were make up my mind I *will* see it. But it has no colour and I'm not really sure it isn't a *touch* image after all, — so vague is it. What is plainer far *is* the touch image, — my finger seems to go round the outside or inside (either at will) boundary of the figure. I certainly seem to feel the figure much more than see it. If I try writing in the air I seem to vaguely apprehend a nearly invisible finger moving, but I don't see a tracing of the letters made after they are made."

† Unless they have lost their sight after the fourth year; in that case they will probably visualise. It is noteworthy that the blind usually talk as if they saw. This arises because they have to use the same language as those who see, and dislike appearing peculiar.

resisting body to another part. But the necessity of proceeding from one definite point to another definite point imposes restriction on the amount and direction of the movement. This has been well put by Dr. Bain. "Let us suppose the hand moving between two fixed obstacles, — for example, from one side of a box to another. There is, to commence with, the contact with one side of the box felt more or less as a sense of touch, pressure, and resistance, . . . the abrupt departure from this state is a mark in consciousness, a call to attention; and the mind is awakened to the feeling of movement that follows. After a time, the other side is struck, and the mind is again roused and takes note of the cessation of the movement."* In this way free space acquires the character of a space separating and connecting external bodies and thus itself partakes of external reality.

§ 4. *Perception of the Organism as Extended.* — Up to this point, we have been dealing with the further development of a spatial perception which has already attained considerable advancement. The blind persons we have been speaking about were already so far advanced that, by purely synthetic or passive touch, they could obtain at least a vague and schematic apprehension of the shape even of unfamiliar objects. Also it is evident that the movements which they use in the exploration of objects have already acquired a more or less definite spatial value. For example, the relative degree of separation between finger and thumb means for them corresponding spatial distances. We have now to go further down in the scale of development, and to trace the rudimentary beginnings of spatial per-

* *The Senses and the Intellect*, fourth edition, p. 197.

ception. This will be best done by considering the way in which we come to perceive our own body as extended. On this point I may quote Professor Croom Robertson. "I have not the slightest doubt that the first object that we become aware of as resisting, and at the same time spread out, is our own body. Of course, the child from the very beginning sees as well as touches, but I am putting aside vision for the present, and suppose that we have a child, at first unable to discern a difference between subject and object, beginning to acquire objective experience by way of touch. And I say . . . that the first object it would come to apprehend vaguely is not any other body, but its own. That one object it has always with it; other objects come and go, but it has always the power of touching its own body and thus of finding the activity of its own hand impeded."* He also points out with great distinctness one important circumstance which immensely facilitates spatial perception in the case of our own body and its absence in the case of other bodies. This is the fact of *double contact*. "There is this special feature in" the child's "tactile experience of its own body, that whereas in touching *another* body it has an intensification of touch on the hand through which it is exerting pressure, in pressing the hand against its own face it gets, in connexion with the activity put forth and resisted, an intensification of *two* touches: it both touches and is touched. This gives peculiar and better data for the ordering of touch sensations. If, as we have reason to suppose, there is a qualitative difference of touch in every part of the body, then the child can-

* *Elements of Psychology*, pp. 113-114.

not but have its attention drawn to this, that through the fingers it has a variety of touches according to the part touched, both by way of the latter and also of the part that touches. Thus it is helped to finding its body as extended in this double way of learning to discriminate different parts, a way in which it is not helped when touching anything else."*

There is yet another consideration of paramount importance which should always be borne in mind when the perception of the organism is in question. Cutaneous sensation does not wholly depend on contact of the skin with an external object. Such contact gives what Robertson calls an intensification of touch; but the sensitive surface of the skin is normally in a state of excitation, apart from its occasional contact with external bodies. We have only to attend to any special area of the tactile surface, to detect the presence of cutaneous and temperature sensations. Besides this, an external body moving over the skin often leaves behind it in the path which it has traversed an after-sensation, which lasts for an appreciable time. Thus in the case of the organism, synthetic and analytic touch are combined as they cannot be combined in the case of external bodies. In the case of external bodies, active exploration of the parts of a whole, and simultaneous contact with the whole, cannot co-exist; so that synthetic and analytic touch can only come into play alternately; but when the finger-tip passes over a tactile surface, we have not merely a series of successive touches, but also a persistent sensation over the whole of the surface explored. By continual exploration of

* *Ibid.*

the body in various directions, this synthetic touch, which has its organ in the surface touched, acquires a spatial significance. There thus arises a direct sense-perception of the configuration of the body and its parts which is always with us, whatever other spatial perception we may or may not have at any moment. This primitive spatial presentation of our own bodies is of great importance as a preparation for the perception of spatial relations in external bodies. Owing to it, both synthetic and analytic touch as applied to external bodies have from the outset a certain spatial significance. Take for example the act of grasping an object between finger and thumb. When the object grasped is a part of our own organism, such as the hand or the leg, the skin surface which lies between the contact of the thumb and the contact of the finger, is itself the seat of cutaneous sensation which has acquired spatial significance. Thus the interval between finger and thumb is directly perceived as an extended whole by synthetic touch. The extension is greater or less according as the thumb and finger are more or less widely apart. Hence, when an external body is taken between finger and thumb, the interval between them and the variations in the amount of this interval already stand for spatial distance and its varying degrees. There is yet one experience which we have not considered, that in which one cutaneous area is passively imposed upon another, as when one hand is laid on the other. Here there are two contacts; but it does not appear that they are usually discriminated. Supposing that perceptual development is so far advanced that both have spatial significance, the perception is not of two surfaces but

of a common surface. If the two hands are in contact, this surface may be regarded either as the surface of the left hand or of the right, or of both simultaneously. The sensations in each surface contribute to the result. Now in the case of external objects one surface alone can be applied. But the spatial perception will be the more full and distinct, because of previous contact between surfaces both of which are sensitive. Further, when one part of the skin comes in contact with another, the area touched is apprehended as part of a wider area surrounding it; or rather of two wider areas surrounding it. For instance, when the palm of one hand is laid upon the palm of the other, the area of contact is apprehended both as a portion of the total surface of the right hand and arm, and as a portion of the total surface of the left hand and arm. When the palm of the hand is applied to an external object, the area of contact is immediately perceived by synthetic touch as part of the total surface of the hand and arm. It is not directly apprehended by synthetic touch as only a portion of the surface of the external body. But previous experiences of the kind in which one hand is laid on the other must constitute a certain preparation for regarding the area of contact as a portion not only of the body surface, but of the surface of the object touched; and it must therefore help to give significance to the active movements by which other parts of the external object are explored.

§ 5. *Localisation and Projection.* — When a sensitive surface is affected by a stimulus, we may attend principally either to the locality of the part affected, and its relation to the spatial map of the organism as a

whole, or to space-relations in an object external to the organ of sense. Thus if a fly crawls across the face, our attention will be directed to the surface of the face and to that part of it in which the tickling irritation occurs. On the other hand, if we actively explore the contours of an external object, we attend chiefly to the spatial relations of the parts of this object, and not to the spatial relations of the sensitive surface of the body. *Localisation* is the technical term used for perception of the spatial relations of the part of the sensitive surface affected by a stimulus. *Projection* is the technical word used for perception of the spatial relations of an object external to the organ itself.

In order of development, tactual acquaintance with the spatial relations of the surface of the organism precedes acquaintance with the spatial relations of things external to the organism. For this reason, it is sometimes stated that localisation precedes projection. But this is inaccurate; for the knowledge which the child acquires of the spatial relations of its own body involves both projection and localisation. Indeed localisation could only exist in an extremely rudimentary form, if at all, apart from projection. The true way of putting the case is to say that combined projection and localisation precede mere projection. Projection depends on the process of active touch in which the controlling interest lies in obtaining the connected experiences arising from successive application of the tactual surface to different things or different parts of the same thing. This process also gives rise to localisation when the surface explored is the sensitive surface of the body itself. Now during the first four

months of the child's life such active exploration is almost entirely confined to its own body. One hand explores the other, and the hands explore the face, etc. Thus at the outset projection is bound up with localisation and forms a most important factor in the development of localisation. In relation to the exploring hand, the face is an external object. It would be *merely* an external object if the skin of the face were insensible to touch, and there would be no other interest in exploring it than in exploring a surface external to the body. But the face itself feels the contact when the hand moves over it and the experiences which arise in this way are sufficiently interesting to form a motive for continued and repeated exploration. This must result in a perception of the relative positions of the various tactual presentations which arise when the hand moves over the face, and this perception will continue in the absence of the exploring movements. Spatial order will continue to belong to the tactual experience due to the constant excitation of the surface of the skin, and any special intensification of touch due to an external stimulus will be immediately "localised." The development of localisation is also advanced by all movements of the body or its parts in relation to the things with which it is in contact, such as bed-clothes, etc. Again, when the tactual surface is itself unmoved, the motion of other bodies in relation to it also subserve the localising process. The handling of the child by its nurse and other persons is of especial importance.

Tactual exploration of things external to the organism arises, as we have said, at a later period. It develops as the child becomes interested in what we have called the "manipulation" of objects (cf. p. 339). To begin with, the child has everything done for it. Even its food is

carried to its mouth. But from the outset, it clasps in a reflex way whatever comes in contact with the palm of its hand, and this clasping movement becomes gradually more "voluntary" and more definite and persistent. In moving its hand it moves the thing which the hand clasps. The thing may thus be brought in contact with the face and even placed in the mouth. Some of the results obtained by such movements are interesting, and a tendency arises to repeat them. It is after this fashion that the earliest interest in manipulation arises. When it has once got a start, it develops more and more as the child realises its own powers—as new and interesting effects flow from its action. Before the first six months have elapsed, the grasping and handling of objects may begin to be followed and guided in a systematic way by the eye; and at this point external things begin to exist for the child as they exist for the adult.

The development of visual perception in the child is for the first three months at least almost entirely disconnected with that of tactual perception. The interest which guides ocular movement, from the time we can speak of a guiding interest at all, is that of exploration. It is directed towards bringing visual presentations successively within the area of distinct vision or to keeping them there as in following a moving object with the eye.

It is a noteworthy fact that in the case of sight there is projection but no localisation. When we see a thing we are aware of the spatial relations of the parts of the object seen, but never of the spatial relations of the retina itself. This is accounted for by the absence of the conditions of localisation which exist in the case of touch. Nothing analogous to double contact exists in visual experience. Corresponding conditions in the case of sight

would involve the existence of a sense-organ capable of exploring successively the parts of the retinal surface, and of exciting at each point of its path a retinal sensation. But we cannot explore the retina by active touch, and of course there is no possibility of seeing it. The impossibility of localising retinal impressions in the retina itself points to the dependence of localisation on projection.

§ 6. *Tactual Perception of the Third Dimension.*— There is one point which ought to be made clear from the outset. We do not and can not have a perception of solid volume of the same kind as the perception of surfaces. The reason in the case of touch may be easily stated. We cannot touch one thing behind another. We come in contact with things only at their surfaces. What lies behind a surface in the solid volume of the object is intercepted by the parts in front of it. When we apprehend a surface, we have presented at once all its parts. The points, lines, and areas which we distinguish within it may be found by analysis of the total presentation as simultaneously given to synthetic touch. But the indefinite multiplicity of surfaces intersecting each other and connected by cross surfaces in an indefinite multiplicity of ways which compose solid volume, can never be presented to synthetic touch.

It is free movement which plays the leading part in our fully developed perception of the third dimension. We have seen in § 3 that "the sweep of a limb, or the movement of the whole body, comes to mean extension, differing in amount and direction according to the direction and amount of the movement." Now, the

extended arm starting from any given position may move either up and down, or right and left, or in any intermediate direction. Each sweep of the arm to and fro means for consciousness an extended surface; and all these surfaces intersect each other in a line corresponding to the original position of the arm. Or again, consider the movements by which the extended palm becomes the clenched fist. The various intermediate positions form a continuous series: and each of them has an acquired spatial significance, which has arisen through the actual grasping of objects of varying size and shape. When the surface of the fingers meets the surface of the palm, the two surfaces become for perception one. At each intermediate position, they are distinguishable, and are apprehended not merely as part of the superficies of the body, but as surfaces of objects which might possibly be clasped in the hand. Thus we have a series of surfaces which, instead of forming part of one surface, overlie and underlie each other in layers. Hence in clasping an actual object, the position of the hand derives a spatial significance from its place in this serial movement by which we pass from the outstretched palm to the clenched fist. In this way we may account for that peculiarly distinct presentation of solidity which accompanies the grasping of an object.

In exploring an object with the hand by way of active touch, the actual path of the movement as determined by the configuration of the object is only one of an indefinite number of possible paths of free movement. At any given moment the surface which has been actually explored may have an indefinite num-

ber of possible continuations. The relation of the actual continuation to these possible continuations, each of which might have been actual in the case of a different object, is a relation in the third dimension of space. Finally, the constant presentation of our own organism as extended, is a great help towards the presentation of the third dimension. For whenever we touch either our own organism or an external body, two surfaces must be presented simultaneously, with a common part and independent continuations. This is only saying over again what we have already said in § 4. When the palm of one hand is laid upon the palm of the other, the area of contact is apprehended on the one hand as a portion of the total surface of the right hand and arm, on the other as a portion of the total surface of the left hand and arm. When the palm of the hand is applied to an external object, the area of contact is apprehended both as a part of the body surface and of the surface of the object. It has thus two independent continuations, which diverge from each other in the third dimension.

Many other details might be referred to. But the principle is the same in all. We apprehend the third dimension by touch, in so far as we apprehend the same surface as having more than one independent continuation.

§ 7. *Origin of Spatial Perception.* — When we began to discuss spatial perception at the beginning of the previous chapter, we propounded two questions. So far, we have only considered the first of these, relating to the development of the perception from more indefinite and imperfect to more definite and perfect

forms. It is now time to take up the second inquiry. Do the same conditions which account for development of the spatial perception also account for its first origin? This seems at first sight at least abstractly conceivable. We may suppose at the outset on the one hand experience of mere extensity, and on the other experience of active movement. Neither of these experiences is in itself, properly speaking, spatial. Spatial relations begin to exist for consciousness only in so far as the experience of extensity combines with the experience of active movement in the manner which we have already described. If the combination is to begin with entirely absent, so that it only arises in the history of the individual consciousness, spatial perception has not only a psychological development but a psychological origin. If we adopt this view, we commit ourselves to what is called a *genetic* as opposed to a *nativistic* theory of spatial perception.

The corresponding nativistic view would assume the following form. From the outset of mental development there are certain connexions between experiences in the way of extensity and appropriate motor activity, — connexions not learnt by experience, but due to congenital constitution. So far as these original connexions exist, some kind of spatial perception is *born with* the individual, not *acquired by* him.

The evidence for the nativistic view is strong in the case of many animals. The chick, for instance, on emerging from its shell, pecks from the outset at a suitable object in such a way as to show that without the help of experience it is in some manner aware of the direction, situation, and distance of the object. It

would seem therefore that with it spatial perception is to a large extent innate. Human beings, on the contrary, have to learn by a gradual process to discern the shape, situation, distance, etc., of objects. The higher animals, such as dogs and monkeys, go through a similar process, though not to nearly the same degree. But even in the case of human beings there is evidence that some original connexion exists between local sign experience and motor activity, though it may be at the outset very indefinite.* The evidence is strongest for sight. Apart from some congenital connexion, however indeterminate, between local sign experiences and movements, it is difficult to see how subsequent development in this respect could have a starting-point. Thus the most probable conclusion is that a vague spatial perception is congenital even in human beings. So much may be conceded to the nativistic theory. But it will be clear from what we have said and are about to say that this original endowment only supplies a rudimentary starting-point for a highly elaborate and complex development.

* It should be noted that what is congenital in the human being does not necessarily appear in the new-born infant. The nervous system of the new-born infant is very far from being fully grown. Much comes to it by mere physiological growth as distinguished from learning by experience. The same is also to some extent true of the new-born dog and other higher animals, though the growth in this case is much more rapid.

CHAPTER V.

SPATIAL PERCEPTION BY SIGHT.

§ 1. *Perception of Surface.* — There is no difference in principle between the process by which the visual perception of space is developed, and that by which the tactual perception is developed. Both depend on a combination of analysis and synthesis. Active sight corresponds to active touch, and passive sight to passive touch. There is however this important difference, that in the case of sight synthesis and analysis are much more intimately combined. They are for the most part simultaneous rather than successive. We have in the eye an expanded surface sensitive to light, but near the centre of this surface there is one spot in which visual sensation is peculiarly delicate and distinct. Thus there is at any moment of vision a general field of view seen by the eye as a whole, and a limited area within it seen with peculiar clearness and distinctness by the central spot, called from its colour the yellow spot. Within the yellow spot there is a pit or depression called the *fovea centralis*, and here discrimination is most delicate of all. Now, active sight consists in movements of the eye which successively bring the outlying parts of the field of view within the area of distinct vision. A certain amount and

direction of movement is required in order that a stimulation situated in a given position in an outlying part of the retina may be transferred to the yellow spot. Thus by a highly organised system of definite movements the eye is perpetually passing to and fro within the field of vision, bringing its parts successively into the area of distinct vision. The development of the spatial perception is coincident with the perfecting of these movements, and of others connected with the co-operation of the two eyes.

Though the visual and tactual perception of space depend on essentially similar conditions, there are specific peculiarities in the case of sight which require separate treatment. In the first place, visual perception of space cannot be adequately discussed unless we take into account its relation to the tactual experiences which arise in the actual manipulation of objects. The spatial perception is throughout its development determined by practical interest. The object of perception is always ultimately *real* extension, figure, and magnitude; but these are much more directly and accurately revealed in tactual experience than in visual. Variations of the visual experience are constantly occurring, which imply no variations in the size, figure, and position of the objects seen, but only variations in the position of the body or eyes of the observer. Since what we are interested in is the real space-determinations of the objects themselves, we tend to ignore these variations in their relation to the nature of the object. So far as they have meaning for us, they condition the perception of the relative position of the object to the body of the observer. For instance,

the area of the retina stimulated by the object varies greatly according to our distance from it. By introspective analysis, we can discern a varying apparent magnitude of the object corresponding to the varying distances. But in ordinary practical experience, these variations are largely ignored. A man crossing the room towards us does not appear to become twice as tall in the process. His distance appears to vary, but his size to remain the same.* In the second place, the eye has means of perceiving the third dimension which are denied to touch. This arises from the fact that the eye is stimulated by objects at a distance from the body.

§ 2. *Visual Perception of the Third Dimension.*—(a) *As Conditioned by Tactual Experience.* The conditions on which the perception of the third dimension by sight depend are manifold and complex. A celebrated theory was advanced by Bishop Berkeley according to which the eye has no power of directly perceiving distance from the body at all. Its apparent power of doing so is merely due to association between visual and tactual experiences. The sight of an object at a distance is supposed to call up a mental representation of the movement of the body required to reach it. This suggested image of tactile and motor experiences constituted, according to Berkeley, the perception of distance. Similarly, the perception of solid shape by the eye was supposed simply to consist in an ideal revival of experiences of active and passive touch. This theory is con-

* This applies to the developed consciousness, but it is probable that the variation in size is a marked feature of the conscious condition before its meaning is apprehended. Persons blind from infancy, who have recovered their sight by an operation, express wonder that a room should be capable of appearing as big as the whole house which contains it, and so on.

futed by a simple appeal to experience. We have, as a matter of fact, a perception of solid figure and of distance, which is essentially visual. None the less, there is in Berkeley's theory an underlying thought which is true and valuable. It cannot be maintained that the visual experience as such remains unchanged, and that tactual elements are superadded to it merely in the way of ideal revival. But it is certain that the tactual perception of extension must play a great part in moulding the visual perception. Tactual and visual perception develop together. The practical interest of sight depends mainly on its power to guide active touch and the practical manipulation of objects.

The presentation of visual extension depends primarily for its value on its intimate correlation with extension as revealed to touch. There is between them a unity of practical interest, in which the tactual element plays the dominant part. In practice, they are perpetually combined. In exploring a thing by touch, the eye follows the motion of the hand. In so far as sight comes first, it is constantly followed by touch, and is useful only in so far as it guides touch. Now this intimate union cannot exist without mutual modification, and since the tactual experience more directly reveals real extension, the modification of the visual experience will be the more profound. To explain what we mean by this modification, let us take the case of a man handling an object in the dark. As he explores the outlines of the object, he at the same time constructs a visual image of it.* The visual image is throughout de-

* The vast majority of mankind does so. There appear however to be exceptions.

termined by tactual experience. With each feature of tactual extension there is correlated a corresponding feature of visual extension. The visual image is throughout moulded by the touch. Now we are here concerned, not with visual imagery, but with visual perception. What we say is that owing to the frequent and intimate union of tactual with visual perceptions, the visual perception, when it exists without the tactual, will be moulded by previous tactual experiences, much as the visual image of an object in the dark is moulded by a present tactual experience. This is only a special application of the general principle which underlies the whole development of the spatial perception. In the development of the tactual perception of space passive or synthetic touch acquires a certain serial order and arrangement of parts from its connexion with active and analytic touch. In like manner, the visual perception of extension acquires a certain order and arrangement of its parts from its connexion with the tactual perception of extension. It would thus appear that though the eye had no independent means of apprehending those relations of surfaces and lines which pre-suppose the third dimension, it would none the less become capable of apprehending them in some degree through its intimate practical union with touch. The whole process is a case of complication.* It is difficult to say precisely how much of our perception of solid figure and distance is gained in this way, and how much is due to other factors. But there does not seem much room for doubt that the combination of visual and tactile experience plays a part of primary impor-

* See pp. 99-103.

tance. What it does not account for is the great superiority of vision over touch in the apprehension of the distances of objects from each other and from the body. To explain this, we must take into account conditions peculiar to vision. Among these the most important is connected with the fact that we normally use two eyes to see, and not one only.

(b) *As Dependent on the Use of Two Eyes.* Whenever we look at an object with both eyes, we receive from it two impressions, one affecting each eye. But the result is a single presentation of the object. This is so because similar impressions fall on corresponding points of the two retinas. The two points of most distinct vision constituted by the *foveae centrales*, or central pits, correspond to each other in this way, so that light-impressions falling on them give rise to the vision of a single object. Other points of the two retinas also correspond when they are symmetrically situated with reference to the central pit. In general, the left half of one eye corresponds to the left half of the other, and the right half to the right half. Thus a point in the left half of one eye will correspond to a point in the left half of the other when both have the same situation relatively to the centre of distinct vision. If the retina of one eye could be applied to the retina of the other, so as to superpose the nasal half of each on the temporal half of the other, their points of contact would be, roughly speaking, corresponding points. Single vision occurs when corresponding points are stimulated in a similar way. But it also occurs when the points thus stimulated do not exactly correspond, but when the deviation from correspondence, or *dis-*

parateness, as it is called, is small. When this happens, a single object is seen, but it is seen as lying behind or before that area of the field of vision which is most distinctly presented, or, in other words, that part of the field of vision which we are directly looking at. When the disparateness between the points affected is relatively great, double vision may result.

If a finger is held between the eyes and an object, and if we then fix our eyes on the object so as to bring it into the centre of distinct vision, we see the finger doubled. The greater the distance between the finger and the object, the wider apart are the two images of the finger. If the right eye is closed, the left image disappears; if the left eye is closed, the right image disappears. If now, instead of fixing our gaze on the object, we fix it on the finger, the finger is seen as single, and the object as double. The greater the distance between finger and object the wider apart are the two images. When the right eye is closed, the right image disappears. When the left eye is closed, the left image disappears. This experiment succeeds with most people, but not with every one. There are some few who can hardly be brought to see things double at all. But even these, if they really use their two eyes in a normal way, will in all probability be able to see a double image of such a bright object as a lighted candle. The special conditions of the experiment are that the eye should be fixed on one object, and the attention fixed on another, either beyond it or in front of it. Apart from these special conditions, it would appear that double images are not ordinarily discerned by normal persons. When the eyes are moving in a free and natural way from object

to object, and attention is concentrated only on what is seen in the area of distinct vision, double images are not discerned. It should be carefully noted that when vision is distinctly doubled, the distance of the two images from the object which is distinctly seen is very indeterminately apprehended. We may see it now at one distance and now at another, either arbitrarily, or in consequence of some casual suggestion. So far as the distance is determinately apprehended, our perception of it may be referred to other conditions than the disparate position of the two impressions on the retinas of the two eyes. It would seem that this disparateness either yields a definite perception of distance, or a double image, but not both at once.

These facts are well illustrated by the stereoscope. In looking through this instrument, there is set before each eye only a surface and not a solid figure. It is not the same surface which is set before both eyes, but a separate one before each. On these surfaces there is outlined a drawing of the same solid object, but the one surface presents it as seen from a point of view to the left, the other from a point of view to the right. The one figure represents the solid object as seen by the right eye, the other as seen by the left, when both are fixed on it. The result is the presentation, not of two superficial delineations, but of one solid object. The reason is, that when the two eyes are respectively fixed on corresponding parts of the two outlines, other parts of the field of view produce disparate impressions on the retina, just as they would do in looking at the same point of the actual object. The further they lie behind or before this point in the actual object, the

more disparately situated are the impressions they produce, and the same is the case in looking through the stereoscope. The solid effect in the stereoscope is greatest when the eyes are allowed to move freely from one point to another. But it is also unmistakably present when the illumination by which the two pictures are seen is so transient as not to allow time for movements of the eyes. Of course as the eyes fixate one point after the other of the apparently solid object, retinal impressions which have been previously disparate come to affect corresponding points, and those which previously affected corresponding points become disparate. The appearance of solidity is more distinct and impressive, the fewer are the double images discerned. Old and practised experimenters, who concentrate their attention with the view of finding double images, become in time unable to obtain the stereoscopic effect. They see only a flat surface.

Now there is a theory which would regard the above statement as a complete account of the binocular perception of solid figures. Distance from the area of distinct vision, behind or before it, is supposed to find its full and ultimate explanation in the disparateness of the position of like impressions in the two retinas, the degree of distance corresponding to the degree of disparateness. This view seems plausible if we consider visual perception in its fully developed form. It does not appear that any other conditions can be operative when the two slides of the stereoscope are lit by a momentary illumination which allows no time for movements of the eyes. But when movements of the eyes are thus excluded, the stereoscopic effect is compara-

tively dim and imperfect. It must also be borne in mind that when in ordinary vision we steadily fixate a single point in the field of view, and attend to objects before or behind it, we obtain double images rather than a perception of distance from the point fixated. These facts point to active exploration by movements of the eye as an important factor in the perception of the third dimension. An even more powerful reason for introducing this factor is the general analogy of the way in which the spatial perception develops. The apprehension of tactual space develops through a co-operation of active and passive touch. What we know about children and about persons blind from early infancy who have recovered their sight by an operation, shows that the same is true of sight. In a case of operation for congenital cataract,* a boy could not count even as few as two objects by means of passive sight, although he had learnt to count by means of touch. When two objects were placed before him, and he was called on to say how many they were, using sight only, he could do so only by fixing his eyes on each of them in turn. At the outset, it was necessary for him to point to each of them successively with the finger. Pointing without touching was sufficient. At a later stage he was able to count merely by fixing his glance on each object in turn. This he did at first not by movements of the eye, but by lateral movements of the head. It was not till much later that he learnt to count a number of objects at a single glance. In all cases of

* Uhthoff, "Sehenlernen blindgeborener und später mit Erfolg operierter Menschen," in *Zeitschrift für Psychologie und Physiologie der Sinnesorgane*, Bd. xiv., Heft 3 und 4.

this kind, the perception of distance in the third dimension develops very gradually. At the outset, the patient appears to have only the analogies of his tactual experience to guide him.

We may then assume that active as well as passive vision is required for the development of the perception of the third dimension. In principle, this development takes place in a way precisely analogous to the development of the spatial perception in general. When the eyes are fixed on any point in the field of view, those parts of the field which lie behind or before this point are perceived by means of disparate retinal impressions. If and so far as the disparateness does not give rise to double images, it gives rise to a peculiar modification of visual sensation, varying concomitantly with the nature and degree of the disparateness. Thus there are differences in the passive sensibility of the retina corresponding minutely with the varying distances of other objects from the object which is at any moment fixated by the two eyes.

Thus we have given in the way of synthetic or passive sensibility the material for the perception of the third dimension. But this synthetic and passive experience can only acquire spatial order in which its parts become positions separated and connected by distances, when active sight successively explores the data simultaneously given to passive sight. Active sight takes the form of increasing or decreasing convergence of the two eyes. When the eyes are turned inwards, so that the lines of vision* converge, objects nearer

* The line of vision is an imaginary straight line connecting the *fovea* and any point to which the gaze is directed.

than the point first fixed by the eyes, which have for that reason previously produced disparate impressions on the retina, come to produce impressions on corresponding points. Decreasing convergence has the same effect for objects lying beyond the point originally fixated. This process is perpetually going on in every moment of waking life; and it is perpetually required for practical adjustment to the environment. Hence the two co-operative factors, active or analytic and passive or synthetic vision, must combine to form a total disposition, which is excited as a whole by each of them. In this way each acquires spatial significance which it would not have in isolation from the other. The peculiar qualitative differences due to varying disparateness of the retinal impressions become perceptions of relative distance from the point on which the eyes are fixed and the combined movement of the two eyes becomes for consciousness a movement over a tract of space.

In this way we may account for the perception of relative distance from the point on which the eyes are fixed at any moment. But the question still remains, How is the distance of the fixation-point itself determined? Part of the answer has already been given by implication. Whatever determines the relative distance of other points from the fixation-point must also determine the relative distance of the fixation-point from these other points. Thus all objects intervening between the body and the eye contribute to fix the absolute distance from the body of the point distinctly seen. But besides this another factor is no doubt operative in a greater or less degree,—the sensations due to the vary-

ing position of the eyes themselves. There are no joint-sensations because the muscles of the eye do not work on joints. But this defect is compensated by the tactile experiences due to the movement of the eye in its socket; and muscular sensations proper are probably contributory factors. Thus the varying degrees of convergence will be marked by varying tactual and motor sensations in the eyes. These will also help to mark varying direction and extent of movement. But it should not be forgotten that the movements of the eyes, whether in the way of convergence or otherwise, are optical as well as motor experiences. They are accompanied by displacement of impressions of the retina. In converging movements, disparate impressions are in process of becoming correspondent, and *vice versâ*. It has been urged by Professor Hering and others that this purely optical process admits of greater delicacy of discrimination and therefore is a more important factor in our experience of movement and position of the eyes, than the motor sensations themselves. The question is still under debate, but the probability is that Hering is right.

(c) *As Monocular*. Under this head we have to consider conditions which remain operative even when only one eye is used. These conditions are mainly of an auxiliary kind. They do not in the first instance enter into the constitution of the perception of depth; but when once it has been otherwise formed, they reproduce it by association. There is only one monocular experience which appears capable of directly constituting the perception of depth. This is the varying accommodation of the lens by which distinct vision is se-

cured at varying distances of the object from the eye. The importance of this factor seems small in comparison with the part played by movements of convergence of the two eyes. But it does seem to supply within limits the sort of combination of passive and active sight required for perception of the third dimension. The nearer the object, the more convex must the surface of the lens be, if a distinct image is to be focussed on the retina; and the more remote the object, the flatter must it be. If the lens is too convex or too flat, what are called "circles of diffusion" occur on the retina, and the image is indistinct. Thus, in fixing the eye successively on more and more distant points of a line, the lens will be accommodated at any moment for the point looked at and yield a distinct image of this. Points nearer or more remote will produce progressively more indistinct and diffused impressions, the greater is their distance from the fixation-point. As the glance moves to and fro along the line, the indistinct becomes progressively distinct, and *vice versâ*. Thus we have a total experience analogous to that accompanying increasing or decreasing convergence of the two eyes. The result in this case also is a perception of position and distance in the third dimension. Here too, muscular sensations probably contribute to the result. The adjustment of the lens depends upon a muscle which by its contraction slackens a ligament to which the lens is attached. When the ligament is slackened, the lens, owing to its own elasticity, bulges and becomes more convex. There are distinct motor sensations accompanying this process of motor accommodation. As in the case of binocular vision, a series of motor experiences, accom-

panying movement of the eyeball, are conjoined with a series of optical experiences, due to the varying disparateness of retinal impressions; so, in monocular vision, a series of motor experiences accompanying accommodation of the lens, is conjoined with a series of optical experiences, due to varying distinctness and diffusion of retinal impressions.

We have now to turn to another class of conditions operative in monocular as well as binocular vision, which may be called secondary or associative. They would not of themselves produce the perception of depth, but their variations are so intimately conjoined in experience, with varying distance and position in the third dimension, that a process of complication has taken place, so that now they produce depth-perceptions as immediately and distinctly as if they were themselves contributive factors in the apprehension of the third dimension. All conditions of this kind, and no others, are used by the artist in producing the perception of depth in pictures. It should be noted that depth and solid figure as they appear in the work of an artist are actually perceived. We do not in looking at a picture merely see combinations of lines on a plane surface, which call up mental images of objects in the third dimension. On the contrary, the drawing is seen in the third dimension from the outset. The artifices used by the painter do not merely suggest ideal representations of depth, but actually produce the perception of depth. This perception is doubtless different in nature from that which is produced by the actual object, but none the less it truly belongs to the perceptual and not to the ideational consciousness. Among

these associative conditions we may refer first to the variation in the area covered by the retinal impression of an object, according to its varying distance from the eye. This might in itself produce merely a corresponding variation in the apparent magnitude of the thing seen: indeed, by concentrating our attention on the visual sensation, as such, we can detect changes in the size of the object according to its changing distance: but normally our attention is otherwise directed. The real object does not vary in size; and what we are interested in is the real object and not our own sensations. We accordingly tend to ignore these differences in the extensity of retinal sensation except in so far as they mark different distances in the third dimension. This is of course only possible if the actual size of the objects is otherwise known by previous experiences in which we have moved close up to them, so that the retinal image has passed through a series of changes giving place at last to that image which accompanies and guides actual contact. To appreciate the full importance of this condition, we must remember that all the objects within the field of view and the different parts of the same object produce retinal impressions varying in extent in a systematic and regular way, according to their distance from the eye. The imitation of this systematic diminution of size with increasing distance is in the hands of the artist a most potent means of producing stereoscopic effect. Where the varying distance of an object is fixed by other means, the extent of the retinal impression mainly determines perception of magnitude. This is well seen in the case of after-images. "Produce an after-image of

the sun and look at your finger-tip; it will be smaller than your nail. Project it on the table, and it will be as big as a strawberry; on the wall, as large as a plate; on yonder mountain, bigger than a house. And yet it is an unchanged retinal impression."* An actual object producing a retinal excitation of the same extent would vary in size according to its distance. Hence the after-image appears of different sizes, when it is perceived at different distances. But the actual retinal sensation is in all cases the same.

Another group of conditions depends on variation not in the size but in the nature of the retinal impression produced by the same line or curve looked at from different points of view. If we look straight at a rectangular cross, with the lines of vision parallel or equally converging, the impression on the retina also has the form of a rectangular cross. The same is the case if we look straight up at it or straight down at it, or directly to the right, or directly to the left; but if we turn our eyes obliquely upwards and rightwards, upwards and leftwards, downwards and rightwards, downwards and leftwards, the legs of the retinal cross no longer make a right angle with each other, but are distorted so as to slant in varying degrees and in varying ways according to the point of view. The corresponding modifications of retinal sensations are not normally attended to, because they answer to no real differences in the shape of the cross itself. Thus a slanting retinal cross, when the slant is merely produced by the point of view, gives rise to the perception of a rectangular cross lying in a certain direction. Conversely, a

* James, *Psychology*, vol. ii., p. 231.

rectangular retinal cross, produced by an object in the same direction and position, gives rise to the perception of a slanting cross, because a slanting cross under such conditions would actually produce a square retinal impression.

After-images admirably illustrate this point. If we have obtained an after-image of a rectangular cross by looking straight at it, and if we then look straight at the wall of the room in front of us, the after-image is outlined on the wall as a rectangular cross. If we turn our eyes to the upper left-hand part of the wall, we see a slanting cross, as represented in Fig. 3; if we then turn our eyes to the upper

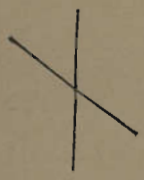

Fig. 3.

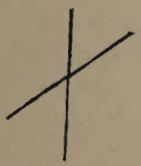

Fig. 4.

right-hand corner, we see a slanting cross, as in Fig. 4. In such cases, the retinal impression and the visual sensation remain unchanged. The nature of the retinal impressions produced by straight or curved lines and their combinations, is constantly varying in a regular and systematic manner with the position of the eyes relatively to the object looked at. The variation depends in a very large measure on the shape of surfaces and on their relative position in the third dimension. Thus the after-image of the square cross if it is seen on a per-

pendicular wall directly in front of the eye, gives rise to perception of a square cross. But if the plane on which it is projected is tilted away from or towards the spectator, a slant-legged cross is perceived. Even an "inclined wall, in a picture, will, if an after-image be thrown upon it, distort the shape thereof, and make us *see* a form of which our after-image would be the natural projection on the retina, were that form laid upon the wall. Thus a signboard is painted in perspective on a screen, and the eye, after steadily looking at a rectangular cross, is turned to the painted signboard. The after-image appears as an oblique-legged cross upon the signboard." * In looking at any solid figure from a given point of view, the lines and contours presented by its bounding surfaces produce varying retinal images according to the shape of the surfaces and their position relatively to the eye. These retinal differences correspond to no real differences in the shape of the lines and contours themselves. Our tendency is therefore as far as possible to ignore them, except in so far as they mark position in the third dimension. In so far as the variation in optical sensation as such is disregarded, it fulfils the function of determining our perception of depth and solid figure. The artist avails himself of these perspective distortions in producing stereoscopic effect.

The play of light and shade also contributes in a very large measure to determine our perception of depth. The mode in which light is intercepted varies with the shape of the solid object on which it falls. The distribution of shade among the parts of the ob-

* *Op. cit.*, p. 254.

ject itself is also determined by its shape. Thus the play of light and shade is exactly opposite in the case of a hollow mask and a projecting face. This "modelling," as it is called by the artist, takes the most subtle gradations, according to the various minute hollows and elevations in the surface of an object, as for instance in the folds of drapery. Besides this what is called the "cast-shadow," *viz.* the shadow thrown by an object as a whole, plays a very important part. "Objects in a landscape stand out much better in morning and evening light when strong and distinct cast-shadows are thrown, than in noonday light."*

Other factors have a peculiar importance in the case of very remote objects. These are covered by the term *aerial perspective*, and include indistinctness of outline and modification of colouring. If two mountains are seen in the distance, and one appears bluish, and the other green, the green is perceived as nearer. The green of the vegetation is only visible at a certain distance; at a greater distance it gives place to a blue tint derived from the intervening air. These associative conditions do not themselves enter into the constitution of the perception of depth, but are able to reproduce it when it has once been formed by other means. It is frequently said that they are signs which the mind interprets. Such phrases are only permissible if we are careful to explain the nature of the signs and of their interpretations. Usually when we speak of interpreting a sign, it is implied that the sign is itself distinctly and separately noticed, and that the interpretation is an additional distinct act of thought. But this is not the

* Sully, *Human Mind*, vol. i., p. 252.

case with the perceptual signs which we have been discussing. They themselves are in the main ignored, and only their meaning comes before consciousness. They have no independent existence for consciousness apart from their meaning. The meaning being inseparably one with the sensations that are its signs, has the immediacy, the obtrusiveness, the fixity, and the detailed definiteness of impressional experience. In other words, it is a percept and not an idea. The connexion between sign and meaning is one of complication and not of free revival.

CHAPTER VI.

TEMPORAL PERCEPTION.

§ 1. *Introductory.* — The apprehension of temporal relations, as they exist for human consciousness, is an extremely complex product of mental development. The part played in it by ideal representation is of predominant importance. Without ideal representation there could be no such thing as the definite apprehension of a time-series, having a distinguishable beginning and end, connected by a train of intermediate events, each having its own position in the series determined by its relation to other events which come before and after it. For perceptual consciousness it is evident that time cannot exist in this form. On the other hand, we find in perceptual consciousness those primary experiences on which our developed apprehension of time is ultimately based.

§ 2. *Immediate Experience of Time-Transience.* — The first fact we have to take account of is that consciousness itself is a process in time. We must here avoid two opposing fallacies. On the one hand, it must be sharply and distinctly recognised that transition of one conscious state into another is by no means identical with the perception of this transition. The mere fact that *B* follows *A* in consciousness does not

of itself constitute the consciousness of *B* as following *A*. On the other hand, we must not jump to the conclusion that because the sequence *AB* is not in itself the cognition of that sequence, it is therefore not experienced at all in any way. We must distinguish between consciousness of change or duration, and change-consciousness or duration-consciousness. Change in consciousness may be felt without being cognised as change, and duration may also be felt without being cognised as duration. Even in a consciousness which has no distinct perception of temporal relations, experience would be different according as change took place in it rapidly or slowly, suddenly or gradually, and the like. Without an immediate change-experience, "cognition of change would be impossible for lack of presentative material. The thought of succession in time must be based on the direct experience of time-transience, as the thought of red colour is based on the corresponding sensation. As the perception or idea of colour-quality is impossible to the blind, so the perception or idea of change would be impossible to a being without the change-sentience."*

§ 3. *Perception of Lapse of Time.*—The immediate experience of time-transience is probably universal in all conscious life. Some rudimentary form of it probably exists even at the level of the sensation-reflex. But in the case of the higher animals, the facts require us to assume much more than this. Their actions are intelligently adjusted so as to occur at the right moment. To explain this, we need more than the immediate experience of time-transience. We must as-

* *Analytic Psychology*, vol. i., p. 160.

sume that a succession of different experiences, or the duration of the same experience, produces a cumulative effect varying with the lapse of time. We have seen that the earlier stages of any process having continuity of interest leave behind them a cumulative disposition which modifies succeeding stages of the total experience. We must now add that this cumulative effect varies in its nature with the amount of time which the process has taken. In this way we can explain why an animal or a human being in preparing for action should be able to wait for the right moment, having no means of determining the right moment except lapse of time. What measures the lapse of time is the cumulative effect of the process of attending. When we are listening to a sound, our experience is different at the end of one minute from what it is at the end of two minutes, although the sound itself may not have altered in quality. This experience is unique in kind, and it certainly does not consist in having the parts of the sound-sensation as they successively occur, spread out before us in a sort of duration-line or duration-block. The same explanation applies to what is called *empty* time. In music, the several notes are separated by temporal intervals. To keep time is to measure these intervals correctly. But it is difficult to say by what means we can measure them, except by the process of expectant attention itself. Certainly it is by no ideal reproduction of a series of events. Of course, empty time is only relatively empty; what is absent from it is the special kind of experience which marks its beginning and end. There are always other experiences going on, especially of a motor and organic kind.

The immediate estimate of lapse of time is most accurate for small intervals.* It appears to become progressively less precise as the intervals become larger. If we go for a walk and ask ourselves at any moment how long we have been walking, we can say immediately without any explicit process of calculation that we have been about half-an-hour or about an hour. The limits of error are indeed very wide, but undoubtedly there seems to be *some* power of estimating lapse of time, even for these comparatively long periods. It is not quite a fair test to try this experiment without previous practice; a man may be able to estimate lapse of time with a fair amount of accuracy, and yet not have established an accurate relation between his subjective estimate and time as measured by the clock. With practice it is found that a person can tell with a tolerable approach to accuracy and without express calculation when an hour, or two hours, or half-an-hour has elapsed.

It should be noted that continuity of interest has varying degrees. We may pass from occupation to occupation, and so have a series of distinct mental processes each having its own special interest. But from another point of view they may all have a certain unity and continuity with each other. We may successively read a book, go for a walk, and eat our dinner. Each of these processes has its own special interest relatively disconnected from the others. But they have unity of interest, as parts of our personal life-history. Hence

* Many experiments have been made to determine more precisely the conditions on which it depends: but the results obtained are so ambiguous and conflicting, that I have not thought it advisable to trouble the student with them.

they may collectively contribute to determine our immediate estimate of lapse of time.

The part played by attention in determining this immediate estimate is illustrated by the fact that conditions affecting attention affect it also. When we are bored by monotony, or when we are distracted by a too great variety and rapidity of experiences, the duration of time is so to speak magnified. We say that it "passes very slowly." When attention is very intensely and disagreeably aroused, as in moments of acute danger, minutes may appear as hours. On the other hand, when attention passes easily from object to object, and is agreeably absorbed by each in turn, time passes rapidly. After an entertaining conversation, we may be astonished to find that the hands of the clock have travelled over so much space. This contrast only holds good for the immediate estimate of lapse of time due to the cumulative effect of past process. When we ideally recall a period of time, and estimate it by the number and variety of the events which have taken place in it, the period which has been agreeably spent is apt to appear relatively longer, and the period in which we have been bored, shorter. In ideal retrospect, periods which appeared interminable while they were passing, shrink as it were; whereas periods that seemed on their actual occurrence to pass rapidly are correspondingly expanded when we review them in the form of a train of ideas.

§ 4. *The Organism as Time-Keeper.* — Some persons before going to sleep at night can determine to wake at a pre-appointed hour in the morning, and succeed in doing so with remarkable accuracy. There are

many who can approximately tell the hour of the day or night without looking at the clock. The explanation of such facts seems to lie in the time-keeping function of the bodily organism. The organism goes through recurrent series of regular changes in periods, and the corresponding organic sensations serve as temporal marks or signs. "All my life," says Professor James, "I have been struck by the accuracy with which I will wake at the same *exact minute* night after night and morning after morning, if only the habit fortuitously begins. The organic registration in me is independent of sleep. After lying in bed a long time awake I suddenly rise without knowing the time, and for days and weeks together will do so at an identical minute by the clock, as if some inward physiological process caused the act by punctually running down."*

§ 5. *Present, Past, and Future.* — Actual sensation is the mark or stamp of present time. The present time as distinguished from the past or future, is the time which contains the moment of actual sensation. The present is never an indivisible instant; it always has a certain duration which is longer or shorter according to circumstances. On the perceptual level it is longer when conation is obstructed or delayed, and shorter when conation proceeds successfully and easily towards the attainment of its end. The present is long to the hungry child or the hungry dog compelled to wait for its food; whereas one present rapidly succeeds another when the child or the dog is enjoying its play.

Distinction between past, present, and future can

* *Principles of Psychology*, vol. i., p. 623, note.

only be apprehended in a rudimentary way at the perceptual level. But there is, even at this level, what we may call a "not yet" consciousness and a "no more" consciousness. The "not yet" consciousness is contained in the prospective attitude of attention, — in the pre-adaptation for what is to come which it involves. This "not yet" consciousness is emphasised when conation is delayed or obstructed, as when the dog is kept waiting for its bone. In this experience not only is the present lengthened, but the contrast between present and future is heightened. The "no more" consciousness emerges most distinctly when conation is abruptly disappointed or frustrated. The dog in the fable which lets go its actual bone in order to seize the reflected bone in the water, would have this experience in a marked manner.

With the advent of ideal representation the "no more" and the "not yet" experiences become much more definite. This must be the case even when ideas occur only as supplements of perceptual process, and not as components of ideational trains. The hungry child seeing preparations for food, may call up a mental picture of itself eating the food. The ideally represented satisfaction stands in sharp contrast with its present impatient hunger. In this case the "not yet" consciousness assumes a very definite form. Sully, who gives this example, illustrates the corresponding "no more" consciousness in the following manner. "A child is watching some interesting object, say the play of the sunbeam on the wall of his nursery. Suddenly the sun is obscured by a cloud and the marvel of the dancing light vanishes. In place of the golden bril-

liance there now stands the dull commonplace wall-paper. . . . The [ideal] image persists, and attracts the attention by reason of its interestingness. At the same time there is the actual present, the sight of the sunless wall. Here, then, both actual experience of the present and represented experience which is not now, occur simultaneously, and so supply the most favourable conditions for the development of a consciousness of their difference or contrast."*

In general, temporal perception is bound up with the process of attention. The primary experience of "pastness" is involved in the cumulative effect of attention on its own process. The primary experience of "futureness," if we may allow the expression, is involved in the essentially prospective nature of attention. The present is characterised by the actual sensations which serve to guide and determine attention at the moment.

* *The Human Mind*, vol. i., pp. 320–821.

BOOK IV. IDEATIONAL AND CONCEPTUAL PROCESS.

CHAPTER I.

IDEAS AND IMAGES.

§ 1. *Introductory.* — We now pass from perceptual to ideational process, — from those trains of mental activity which are prompted and guided by external impressions and directly worked out in bodily movement to those which proceed independently of external stimulation and are worked out "in the head." Up to this point we have taken into account ideas or images only in so far as they enter into the composition of processes which are in their essential character perceptual: we have now to consider processes which reach their end through mental images succeeding each other in a series independently of actual perception. Before expounding the distinctive nature and function of this higher mode of mental activity, it is necessary to examine with some care the characteristic features of a mental image. In what respects does an object as merely imaged differ from the same object as actually perceived?

It should be clearly understood that those visual experiences which are called "after-images" both positive and negative are in reality "after-sensations." They are due to the continued excitement of the organ of sense after the external stimulus has ceased to operate, and cannot therefore be regarded as ideas. They are easily distinguishable from what has been called the primary memory-image. This is the peculiarly vivid and definite ideal representation of an object which we can maintain or recall by a suitable effort of attention immediately after perceiving it. The persistence of the after-image does not depend on an effort of attention, but on the abiding effect of the external stimulus. It passes, for the most part, very rapidly from a positive to a negative phase and undergoes other modifications which do not affect the primary memory-image. There is also another conspicuous and important distinction: whatever may have been the spatial arrangement of the perceived objects, the corresponding after-images are spread out in a flat expanse; but the solidity and perspective of objects as actually seen reappear in the primary memory-image and in ideal images generally.

§ 2. *Distinction and Relation of Image and Idea.* —An idea can no more exist without an image than perception can exist without sensation. But the image is no more identical with the idea than sensation is identical with perception. The image is only one constituent of the idea; the other and more important constituent is the meaning which the image conveys. If I think about the Duke of Wellington, the image present to my consciousness may be only the shadowy outline of an aquiline nose. But this of course is not

my idea of the Duke of Wellington. My idea includes the cumulative result of many complex mental processes, such as the reading of Napier's *Peninsula War*, etc. If I had been thinking of some one else with an aquiline nose, my mental attitude would have been very different indeed. This example shows that virtually the same mental image may have very different meanings according to context and circumstances. The meaning varies with the train of thought in which the image occurs.

There are some people, especially those who are much occupied with abstract thinking, who are inclined to deny that they have any mental imagery at all. They are almost or quite unable to visualise objects, and their general power of mentally reviving auditory and tactile experiences may also be rudimentary. The images which with them mark the successive steps in a train of ideas are mainly or wholly verbal. What they mentally reinstate in the way of an image is the motor process of articulation, or the sound of spoken words, or both. The words and their meaning are all that are present to consciousness in such cases. Images resembling features or concomitants of the object thought about, are absent. But it is inaccurate to say that such persons think without images; for the verbal image is just as much an image in the psychological sense as a visual picture of the object is.

It should be noted however that the verbal image is capable of conveying a kind of meaning which the visual picture or other revivals imitative of the object itself cannot of themselves convey. All higher modes of conceptual thinking are possible only by means of

words. To conceive is to think of the general or universal in contradistinction from the particulars which it embraces and connects. If I think of life, for instance, I think of a general kind of process manifested in an indefinite diversity of special ways. The word *life* enables me to fix attention on the common form of process in contradistinction to its manifold modes of manifestation. A mental picture imitative of the object could not fulfil the same function if it were not accompanied by the word *life*. At any rate it could do so only very imperfectly; and certainly a mind which depended merely on such pictures or similar images could never have formed the conception of life in general for the first time. An imitative image may represent some very special and obvious manifestation of life, but not life in general in contradistinction from its particular phenomena.

Conceptual process may be regarded as a higher development of ideational process. As we shall see later on, the transition is a gradual one, and the germs of conception are present even in rudimentary trains of ideas. What concerns us here is that even the highest developments of conception still involve imagery, though the imagery may be and often is, purely verbal. In the present chapter we have to deal with the nature of mental imagery in general as distinguished from perceptual experiences.

§ 3. *Likeness of Object as Perceived and Object as Imaged.** — The image is a reproduction of the percept; these must therefore agree in their nature. But the

* In what follows the object as perceived is simply called the "percept," and the object as imaged, the "image."

reproduction is easily distinguishable from the original; there must therefore be an important difference or differences. The points of agreement are at least in part easy to assign. The sensible qualities such as colour, sound, etc., in all their varieties enter into the composition both of the percept and of the image, and these qualities can only appear in an image because they have previously appeared in a percept. The complication also and in general the spatial and temporal form of these qualities are common to both percept and image. Both the sensible qualities and their forms of combination originate primarily in the percept and are merely reproduced in the image. The reproduction varies greatly in degree of accuracy and completeness. Here individual differences are very conspicuous. Some can scarcely recall colours at all; others can do so with great vividness and accuracy. A person who almost entirely lacks the power to image colours may be capable of reproducing sounds with precision and distinctness. Some men seem quite incapable of reproducing odours; others can reproduce odours more vividly than any other sensible qualities.

These differences have an important influence on the general character of ideational process in different individuals. There are some who work mainly with visual imagery, others with auditory and others with ideal revivals of motor experiences. Between these extreme types there are of course manifold intermediate gradations.

§ 4. *Characteristic Differences of Percept and Image.*—(a) *Fragmentariness of Image.* Our actual sense-experience at any moment forms a continuous totality.

Particular sensations of touch or temperature form an unbroken unity with the mass of sentient experiences due to the constant excitation of the sensitive surface of the skin over the whole body. The impact of sound waves not only produces auditory sensations, but also tactual sensations due to vibrations set up in the external ear and in other parts of the organism. These tactual experiences on the one hand form part of the general mass of cutaneous sensation and on the other they unite with the proper sensations of sound so intimately that it needs an effort of analysis to distinguish them. Similarly taste-sensations are intermingled with touch sensations of the tongue and palate, and through these are continuous with cutaneous experience in general.

As regards sight, each particular visual sensation is part of the total experience due to stimulation of the whole retina, and the entire mass of visual sensation is bound up with tactual and muscular experiences due to position and movement of the eye-lids and of the eye-ball in its socket. All joint, tendon, and muscle sensations enter into the general "consentience" as we may call it. Finally all the special sensations of touch, sight, sound, taste, smell, tendon, joint, muscle are intimately united with the organic sensibility and its varying modifications.

Now in mental revival there is no reinstatement of this "consentience." The sensory elements of the image are detached from the total mass of sensational experience of which they would form part, if they occurred as actual sensations. If we mentally image a sound, the imaged sound is not part of one continuous whole with the

totality of cutaneous, motor, organic, and other sensations occurring at the moment. Whatever sensations are being produced at the time by the impact of sound-waves on the ear enter into the general consentience; but the merely represented sound is outside the sensational context and remains relatively isolated. Similarly a visual image, however full and distinct it may be as a purely visual experience, is discontinuous with the total sentience. Only experiences due to actual stimulation of the retina or some equivalent condition enter into this. In general we may affirm that all mental imagery as compared with actual sensation has a more or less fragmentary character. The sensory elements revived in the image are cut off from their sensational context and appear in detachment. This is one great distinction, perhaps the most important, between image and percept.

(b) *Intensity.* Hume is perfectly right in affirming that percepts differ from images "in the force or liveliness with which they strike upon the mind." But the statement is ambiguous.

We must examine with great care the nature of this force and liveliness, which according to Hume and others is distinctive of sensations.

We cannot affirm that a sound or a colour as mentally revived is always louder or brighter than the corresponding sensation. On the contrary, it would seem that variations in the *degree* of a sensible quality are reproducible in much the same way as variations in *kind*. I may mentally recall the brightness of an electric light, and I may then actually look at the comparatively dim flame of a candle. On comparing the image with

the percept, I may recognise that the electric light as mentally revived has a higher degree of brightness than the candle-flame as actually seen. It is true that the power of representing gradations of sensible quality varies in different persons, just as the power of representing the qualities themselves varies. But good visualisers seem to possess it in a very high degree. A person so endowed, in giving an account of his mental picture of the morning breakfast-table, says: "I have more power to recall colour than any other one thing; if, for example, I were to recall a plate decorated with flowers I could reproduce in a drawing the exact tone, etc. The colour of anything that was on the table is perfectly vivid."*

Are we then to reject the distinction between images and percepts as respectively "faint" and "vivid"? This is a possible course. There are other differences which may be regarded as ordinarily sufficient to prevent confusion between them. But we ought to hesitate before discarding a distinction generally accepted both by psychology and common sense. On the other hand, if we accept it, we must mean by "vividness" something different from those degrees of sensible quality which may be equally present in the sensible quality as actually perceived and as mentally reproduced. What is this vividness? The answer seems to be contained in Hume's words. According to him the distinctive characteristic of percepts as compared with images is the force and liveliness with which they strike the mind. This "striking the mind" is the essential point. At bottom the difference is a difference of quality, not of

* James, *Principles of Psychology*.

degree. Images do not strike the mind in the same way as percepts.

To bring out the nature of the difference it will be most convenient to consider first cases in which it is conspicuous. It is most conspicuous where the sensation breaks in upon consciousness in a violent manner, so as to interrupt and disturb the flow of mental activity. A dazzling flash of lightning or the piercing scream of a steam-whistle may serve as illustrations. The shriek of the steam-whistle invades consciousness in a violently disturbing way. The degree of loudness of the sound might perhaps be mentally reproduced with tolerable accuracy by a person possessed of exceptional powers in this direction. But the mode of occurrence in consciousness would be different. The mentally revived sound would not "strike the mind" like the sound as actually heard. No mere image ever does strike the mind in this manner.

In such experiences as that of the steam-whistle the primary sensation is by no means the only factor at work. The whole organism receives a shock giving rise to a mass of organic and motor sensations. In ideal revival these concomitant sensations fail to be recalled except in a very imperfect way. It may be suggested that it is their presence in the actual sense-experience which gives to this experience its aggressive character. Now it seems evident that they cannot give an aggressive character to the experience unless they possess this character themselves, and as a matter of fact they are highly intrusive and obtrusive. But if organic sensation can "strike the mind" in this way, there is no reason why other sensation should not do so too. The

ultimate appeal must be to introspection. This shows in the case of the steam-whistle that the sound itself is aggressive in the same way as the organic sensations which accompany it. The organic sensations follow the beginning of the sound after the lapse of about a second, but the sound itself is aggressive from the outset.

The steam-whistle is an extreme case, involving violent shock and disturbance. But there are abundant instances in which sensations strike the mind without overwhelming it in this painful manner. The chimes of a bell heard as we are passing in front of a church break in upon consciousness with notable force and liveliness. But they need not have a disturbing effect, and they need not be accompanied by conspicuous organic sensations. None the less they have an impressiveness or aggressiveness analogous to that of the steam-whistle. The same holds true generally of sensations produced by a stimulus which is stronger than we are accustomed to. But there is a certain normal level of intensity of stimulus at which and below which we do not naturally notice the aggressive character of the sensation, unless it occurs suddenly and finds us unprepared. At these lower intensities the aggressiveness of the sensation does not under ordinary conditions catch our attention: but it would be wrong to conclude that it has therefore ceased to exist. We do not usually take note of what is familiar to us, but only of what is relatively unfamiliar. It is therefore natural that the characteristic of sense-experience, which is expressed by such metaphors as "striking" the mind or "laying hold" on the mind, should only be noticed when it is present in an unusual degree of intensity.

Its presence even in these lower phases of intensity may be detected if we pass from the comparison of sensations with sensations to the comparison of sensations with the sensory element of the image. If we look at a sheet of white paper, and then, closing our eyes, call up a mental picture of the paper, its brightness as actually seen may be revived with approximate accuracy in the image. But if we again open our eyes, and pass from the mental picture to the actual percept, we may note in the moment of transition a difference which can only be described by saying that the image does not strike the mind as the actual percept does. We may vary the experiment by first calling up mentally the image of an electric light, and then looking at a dimmer object, such as a candle-flame. The imaged brightness of the electric light is greater than that of the candle-flame; but the actual sensation of brightness which we have in looking at the candle-flame enters and persists in consciousness in a different manner from the mental picture of the electric light. It strikes the mind with some degree of force and liveliness; whereas the mental image does not strike the mind in the same way.

Our conclusion is that at bottom the distinction between image and percept, as respectively faint and vivid states, is based on a difference of quality. The percept has an aggressiveness which does not belong to the image. It strikes the mind with varying degrees of force or liveliness according to the varying intensity of the stimulus. This degree of force or liveliness is part of what we ordinarily mean by the intensity of a sensation. But this constituent of the intensity of sensations is absent in mental imagery. Since it is distinctive of

sensation, we may call it *sensational intensity*. Sensational intensity may depend on the suddenness of an external impression. A slight sound, when we are totally unprepared for it, may enter consciousness in a violent manner; but in the main sensational intensity increases or decreases concomitantly with the intensity of the stimulus. The smaller it is the less effectively will it serve as a mark distinguishing percept from image. Hence when it is very slight it may be practically inoperative. Thus we may fail to distinguish between a very slight sound as actually heard, and the mental representation of it. The possibility of this has been shown experimentally; but it does not, as has been supposed, constitute a valid argument for regarding the distinction between image and percept as merely one of degree.

(c) *Distinctness.* Images as compared with percepts have for the most part a sketchy or schematic character. Part of the filling in of the actual sense-experience fails to reappear in its reproduction, which is therefore blurred and hazy.

This does not apply without exception to all mental imagery. Most persons, if not all, can reproduce in a precise and delicately differentiated manner certain kinds of experience. The internal language by which trains of thought are habitually carried on in human beings is usually a very precise reinstatement of signs used in the interchange of ideas between different persons. In most cases, probably, words as mentally reproduced are fairly exact counterparts of words as actually spoken. Both sound and motor articulation are revived in a precise and clear-cut way. The image

lacks sensational intensity; but its qualitative content is indistinguishable from that of the percept. In some persons the motor activity of articulation is very precisely revived, but the auditory element is absent or almost absent. Others mentally envisage printed or written characters either in addition to, or instead of, internal speech.

Even those persons who can reproduce articulate sounds with maximum distinctness may be unable to recall inarticulate noises except in the vaguest manner. When they make the attempt, they tend to substitute some imitation by the human voice for the noises themselves.

The schematic character of ideal representation is best exemplified in the mental reproduction of the appearance of material things as they are presented to sight and touch, and explored by movements of the eye and hand. In most persons this reproduction is predominantly visual, though some depend mainly on motor and tactual revivals. We shall here only consider visual imagery. This includes motor revival: for the "inward eye" follows the contours of objects and scans their parts successively much as the bodily eye does.

It is well known that there are very great differences between the visualising powers of different individuals. Some few seem to be capable of calling up mental pictures of what they have seen, possessing a vividness, distinctness, and wealth of detail, little short of actual vision. But the accounts which these people give of themselves must certainly be accepted in many instances *cum grano salis*. They are usually untrained in introspec-

tion, and they probably do not express themselves with rigorous precision. In any case we must make a point of distinguishing between what a man is capable of in the way of visualising when the occasion requires him to do his best and the imagery which enters into his ordinary trains of thought. We shall see at a later stage that the habitual recall of all the concrete detail of actual perception would in ordinary thinking, such as takes place by means of words, be not only a superfluity, but an encumbrance, destroying efficiency. A man who can call up mental pictures equal in distinctness to the reality is no more likely to do so habitually, than a man who can take very long leaps is likely to substitute these for ordinary walking. Setting aside certain exceptional cases as not yet sufficiently investigated, we may affirm that ordinary visual imagery is more or less sketchy and blurred in comparison with actual vision. In some men, including the best introspective psychologists, such as Fechner, it is so very blurred and sketchy that it could scarcely become more so, without ceasing to exist altogether.* The mental pictures of these persons can scarcely be called pictures at all. They are rather the indescribably attenuated ghosts of pictures. They are, to use Fechner's language, "airy, unsubstantial and vaporous." Persons possessing a much higher visualising power than Fechner will readily recognise the aptness of these terms as applied to the greater part of their own visual imagery.

* There are a few exceptional cases, in which the power of visualising appears to be completely absent. Mr. Welton, of the Yorkshire College, Victoria University, assures me that he does not possess even the rudiments of visualising capacity.

Very poor visualisers often find the greatest difficulty in indicating what it is that they actually see with the mental eye. Thus one of James's pupils, asked to call up a picture of his breakfast-table, replies, — "There is nothing definite about it. Everything is vague. I cannot say *what* I see. I could not possibly count the chairs, but I happen to know that there are ten. I see nothing in detail. The chief thing is a general impression that I cannot tell exactly what I do see."* This is a somewhat extreme case. But it brings out the point which most requires to be emphasised in this connexion. The indistinctness of mental imagery is to a large extent of a quite peculiar character. It is different in *kind* from the indistinctness of percepts such as may be due to dimness of light, distance, and the like. It is also different in kind from the indistinctness of positive and negative after-images in the various phases through which they pass. An ideal image is sketchy and schematic, because it contains only an extract from the content of sense-perception. But it is a surprise to most people, who subject these images to introspective scrutiny, when they discover how the extract is often made. It becomes quite intelligible to them that Alice in Wonderland could see the grin without the cat. This applies not only to complex objects, but also in the experience of some persons to apparently simple sensible qualities such as colours and sounds. I attempt to recall a certain definite shade of red and I succeed. On comparing the imaged red with the perceived, I am able to identify the two as the same colour. But they are the same with a difference which does not wholly consist in ab-

* *Op. cit.*, vol ii., p. 54.

sence of sensational intensity. There is a "filling in" in the percept which is non-existent in the idea. What this "filling in" may be I cannot say. All that I am confident about is that it is conspicuously present in the percept and conspicuously absent in the image.*

The comparative indistinctness of images is traceable to various causes. It is partly due to what Dr. Ward has called "obliviscence." Some parts of the percepts have disappeared from the ideal representation, simply because of a deficiency in our power to retain or at least reproduce them. The vagueness of the mental image is also increased by what Dr. Ward calls "reduplication." It is the product, not of a single perception, but of a plurality of perceptions which agree only in certain points, and differ in others. Only the points of agreement are recalled in a fixed and definite manner. The divergent details by their very divergence obstruct the process of reproduction. Hence, so far as they are concerned, the image is vague and fluctuating. "One who had seen the queen but once would scarcely be likely to think of her without finding the attendant circumstances recur as well; this could not happen after seeing her in a hundred different scenes."†

But there is a still more important reason for the comparative indefiniteness of ideal revival. It would be not only useless, but disadvantageous, to recall all the details of actual perception. A train of ideational thought is in its character conative. It takes place in

* I am also confident that the "filling in" does not wholly consist in accompanying motor and organic sensations.

† Ward, Article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 62.

the service of some practical or theoretical interest. Only so much need be revived as may be required by the dominant interest of the moment; all else being irrelevant would be a mere encumbrance, hindering and embarrassing the course of mental activity. If I wish to recall what I did yesterday, in order to find out how far I have fallen short of the moral ideal, or for any other practical reason, a few minutes will probably suffice for retrospect. But how is it that I can recall in a few minutes experiences which occupied twelve hours? Only by omission. "We simply make an outline sketch, in which the salient characters of things and events and actions appear, without their individualising details. Mere forgetfulness in part helps to make this possible"; but there is much also which I do not forget, and yet do not recall. I pass it over simply because it would not help me, being irrelevant to my guiding interest. "If I picture myself as eating my breakfast at the beginning of the day, it is enough to have a generic image of the breakfast-table and the succession of particular incidents which took up the half-hour spent in eating. Hence it is possible for me to recall the whole event of taking breakfast, which occupied half an hour, in the fraction of a minute, and then to pass on to something else." * In general, mental imagery is more detailed and vivid in persons whose interests are concrete rather than abstract. The savage, the uneducated person, and the poet or artist, have usually far more power at least of mental visualisation and often of other modes of imagery than the mathematician or the philosopher. As we noted above,

* *Analytic Psychology*, vol. ii., p. 185.

persons habituated to abstract thinking have often little or no ideal imagery, except reproductions of words.

(d) *Relation to Subjective Activity.* In perception we are relatively passive and receptive, because sensations are determined by a factor which is not psychical at all, — the stimulus. What the stimulus does for us in perception, we have to do for ourselves in ideation. Images are attended to only so far and so long as they connect themselves with the general direction of mental activity at the moment or arouse a new current of activity by bringing into play pre-existing conative tendencies. Sensations on the other hand tend by their sensational intensity to compel attention. If they are sufficiently intense they may forcibly divert attention from the most absorbing train of thought.

Percepts, so long as the stimulus persists on which they depend, display a steadiness which is absent in case of images. Images are maintained before consciousness purely by an effort of attention; when we are attending to a percept, sensational intensity due to the stimulus co-operates with our subjective activity, steadfastly sustaining it. Now attention is never perfectly fixed and continuous. It flags at intervals and constantly tends to pass from one point to another; it is probably subject to a regular rhythm of remission and concentration. Hence the peculiar unsteadiness of images even when we deliberately attempt to arrest and detain them. As Dr. Ward says, the image, in spite of our efforts to fix it, "varies continually in clearness and completeness, reminding one of nothing so much as of the illuminated devices made of gas jets common at fêtes, when the wind sweeps across them. . . . There is not this perpet-

ual flow and flicker in what we perceive.* Dr. Ward perhaps goes too far in attributing this "flow and flicker" to all mental imagery. The statistical evidence seems to show that some exceptionally gifted persons can maintain a visual image before their mental view without these fluctuations. But even in these cases the detention of the image costs a kind and degree of mental exertion which is not required in attending to percepts.

The same contrast manifests itself in another way when we compare perceptual change and transition with the sequence of ideas. Ideas follow each other in accordance with purely psychological conditions; their sequence is determined by preformed associations together with the general trend of mental activity at the moment. The flow of ideas thus partakes of the nature of a continuous development of the attention-process. Changes in the content of perception, on the contrary, are only partially initiated by the changing direction of attention. They are determined to a very large extent by alterations in the nature of the stimulation affecting the organs of sense. So far as this is the case they bear the character not of a continuous development of conscious process, but of something which *happens* in consciousness. This character is most conspicuous when external changes suddenly introduce experiences for which the mind is unprepared, as when the chair we are sitting on unexpectedly gives way beneath us. But even when we are awaiting an event and are prepared to act appropriately when it comes, there is still a certain discontinuity or abruptness in the mode of its occurrence in consciousness as compared with the sequence

* Article "Psychology," p. 58.

of ideas in a train of thought. It is not a continuation of our own mental activity; it is something which happens to us, something which strikes upon the mind from without.

(e) *Relation to Motor Activity.* Inasmuch as percepts depend on external stimulation proceeding from surrounding things, they must vary with the spatial relations of the organism and its parts to environing conditions. Hence our perceptions vary with our movements. We can carry our ideas about with us; but if we turn our head away or close our eyes we can no longer see what we saw before. In particular the sensations we receive vary with the adaptation of our sense-organs. For most distinct vision we bring the eye into such a position that the rays from the object fall on the yellow spot; we accommodate the lens so that they form a distinct image on the retina, and so forth. The presence of these motor adjustments forms an important distinction between actual vision and visual imagery. The same holds good *mutatis mutandis* of the other senses.

It is true that there is also an adjustment to images, and that this adjustment consists in great part of a revival of the motor experiences which enter into actual perception. But the revival is easily distinguishable from actual movement. There is a difference of general attitude. In merely imaging "the attention feels as if drawn backward, towards the brain." The motor revival exists side by side with the sensations due to the actual state of the organism and its parts. We may be scanning a mental picture, and this may involve some ideal revival of the motor processes involved in actual vision. But at the same time we abstain from the

corresponding active movements of the eye. The bodily eye may even be closed. Thus the motor revival is the more easily distinguished from actual movement, because the actual sensations of position and movement which we receive from the eye are incompatible with the movements which are ideally reproduced. The ideal movements appear therefore to occupy an inner circle. Extruded from the periphery they seem to take place within the head.

§ 5. *Relative Independence of Percept and Image.* — Gazing at the blue sky, we may, as Dr. Ward observes, mentally picture a portion of it as red instead of blue. Now it is very important to note that most people, while they are imaging the sky as red, do not cease to see it as blue. The red does not get between them and the sky so as to hide its blueness. Similarly, in calling up with closed eyes a visual image, most persons find that this image does not form part of the grey field which is due to the retina's own light. It may sometimes appear to be merging itself in the grey field. But when this happens it is in reality disappearing altogether. The more distinct it is, the more disconnected and independent it appears relatively to the sensations which have their source in the state of the retina.

The case is similar with other senses. I can imagine how the fingers which are now holding my pen would feel if they were dipped in warm water. But the mental image does not annul actual sensation. Similarly, I can clearly distinguish a mentally articulated word, however faint it may be, though my ears are simultaneously assailed by a deafening din. I can also articulate a

word mentally when my organs of speech are motionless or engaged in uttering other sounds.

Facts of this kind show that percepts and images possess a relative independence. This can be accounted for if we suppose that the nervous tracts excited in perceptual process are not wholly coincident with those excited in ideational process.

This view is borne out by pathological cases. We have already quoted cases in which the power of recalling ideal images, visual, tactual and auditory, was apparently non-existent, whereas the corresponding perceptual processes were comparatively intact. Instances of the converse are not wanting. Wilbrand describes the case of a lady who, sitting in her arm-chair with eyes closed, could distinctly describe streets and houses in their right order, though she could not recognise them when she saw them, and was soon hopelessly lost when left to find her way by herself.*

The question as to the relation of the nervous seats of sensations and percepts on the one hand, and of ideas on the other, is still a vexed one. But the most probable conclusion appears to be that, though they are continuous and more or less overlap, they are by no means necessarily coincident.

In any case it is plain from ordinary experience that the existence of percepts does not imply the possibility of corresponding images. Persons who have little or no power of visual imagery can see actual objects as well as the best visualisers. Similarly, those who have very limited power of mentally reviving sounds may

* See Professor Ward's Article on "Assimilation and Association, ii.," *Mind*, Oct. 1894.

have quite keen auditory perception. Few people, if any, have in a considerable degree the power of calling up mental images of organic sensations. In animals generally, well-developed perceptual powers may be combined with little or no capacity for ideal revival.

§ 6. *Hallucinations, Illusions, and Dreams.* — Two conditions are necessary to constitute an hallucination. On the one hand, a presentation must exist, having some or all of the distinctive characteristics of actual sense-perception. On the other hand, the object as it appears to be perceived must not be actually present to the senses. The specific nature of the object presented must be constituted by subjective conditions, not by the present operation of an external stimulus. Some sort of stimulation may be present and nearly always is present; but it does not determine the nature of the object presented; it only serves to give the experience a sensational character.

In illusion an object is actually present to the senses, and produces to some extent sensations such as it would normally produce: but these sensations are wrongly interpreted. A presentation may be partly an illusion, and partly an hallucination. Thus we may see a man, when what is actually present is a suit of clothes. The special nature of the sensations experienced may be due partly to the suit of clothes, and partly to subjective conditions; so far as the sensations which arise in a normal manner from the external stimulus are wrongly interpreted, there is illusion; so far as other sensations due to subjective conditions enter into experience, there is hallucination. It may happen in such a case that no other sensations are present except those which the suit

of clothes would normally produce: and that the error lies wholly in a wrong interpretation. When this is so, the illusion is a pure illusion without any element of hallucination.

It is not necessary that all the characteristics of perceptual experience should be present in hallucinations. Dreams partake of the nature of hallucinations in so far as the dreamer appears to see and hear what is not actually present to his senses. But it often happens that these dream-experiences are indistinct and lack sensational intensity; and in general they are without that dependence on motor activity which marks percepts. Their perceptual character is mainly due to their independence of subjective activity, — the discontinuity and abruptness of the mode of their emergence into consciousness. We are passive in relation to them in the same way in which we are passive in relation to actual objects present to the senses. Probably the hallucinations produced by suggestion in hypnotised subjects are of a similar kind.

But dream-experiences and other hallucinations have often in a greater or less degree the sensational intensity and the detailed distinctness of actual sense-perceptions. They are in fact actual perceptions in all respects except that the nature of the object perceived is determined by subjective conditions rather than by external stimulation. When this is so, some kind of stimulation is generally if not always present. Among these the most essential modes of stimulation consist of certain variations in the nature and distribution of the blood-supply within the brain, or in pathological affection of the brain-substance. The blood may contain

poisonous substances, such as alcohol, opium, ether, chloroform, and the like, which have an irritant effect on the nervous system. In sleep, owing to lowered respiration, the blood becomes charged with carbonic acid, which may have an exciting effect on the sensory centres of the brain.

Besides these general modes of stimulation, in most cases external conditions of a more special kind operate. So far as this is so, hallucinations assume the character of illusions. In an illusion, there is present some stimulation proceeding from the excitement of a sense-organ; but the object perceived differs more or less widely from that which would be perceived under normal conditions if the sense-organ were excited in the same way. Dream-experiences are to a large extent illusions. A slight pain in the ribs makes the sleeper dream of a stab from the dagger of a threatening enemy or the bite of a dog. Contact with a cold body may give rise to the dream of a corpse. That constant stimulation of the retina which is called the retina's own light* plays a very important part in constituting dream-pictures. On this subject we may quote the interesting experiences of Professor Ladd. "Almost without exception, when I am able to recall the visual images of my dream and to observe the character of the retinal field quickly enough to compare the two, the schemata of the luminous and coloured retinal phantasms afford the undoubted clue to the origin of the things just seen in my dream-life."† By long practice Professor Ladd has acquired the power of dropping gradually into a dreaming sleep and then suddenly

*See pp. 163-164. † *Mind*, N.S., vol. i. (1892), p. 301.

awaking with his attention fixed on the comparison of his dream-pictures with the experiences of light and colour due to the internal stimulation of the retina, which in his case are peculiarly brilliant and varied. "The most elaborate visual dreams may originate in intraorganic retinal excitement. Perhaps a harder problem could not be given to my experiments to solve than the following: How can one be made by such excitement to see a printed page of words clearly spread out before one in a dream? . . . But I have several times verily caught my dreaming automaton in the feat of having just performed this transformation. On waking from a dream, in which I had distinctly seen lines of printed letters forming words and sentences, and had been engaged in reading these lines by sight, I have clearly detected the character of that retinal field which had originated such an extraordinary hallucination. The minute light and dark spots which the activity of the rods and cones occasions, had arranged themselves in parallel lines extending across the retinal field." *

Pure illusions are illusions in which no element of hallucination is present. The impressions made on the senses of the observer may give rise to just the same sensations as they would normally produce, and yet the things and processes apparently perceived may not actually exist or take place. It is mainly this pure illusion, unmixed with hallucination, which is exemplified in the tricks of ventriloquists and conjurers. When a juggler swallows a sword merely in appearance, the sensory impressions made on the eye of a spectator are very much the same as if the juggler had swallowed the sword in

* *Ibid*, p. 302.

actual fact. For this reason, pure illusions may be shared by a great number of persons simultaneously. On the other hand, collective hallucinations, though their existence is guaranteed by the Psychical Research Society, are of rare occurrence, and stand much in need of explanation.

CHAPTER II.

TRAINS OF IDEAS.

§ 1. *Two-fold Aspect of Ideational Process.* — In the last chapter we considered the characteristics of images as compared with percepts. We have now to deal with trains of ideas, — with the sequence and combination of images and their meanings. Trains of ideas, like trains of perceptual activity, have in general a certain unity and continuity of interest. They subserve some end, practical or theoretical. Those transitions in the flow of ideas which show a break in continuity of interest are in general transitions from one train to another. It should be noted that the interest which gives unity to a single train may be very slight and evanescent. Thus the train may be no more than a passing thought. It may appear to consist of a single idea; but if it tends to gratify any interest, however evanescent, it may none the less be regarded as a continuous train.

The course of a train of ideas is determined by two distinct groups of conditions. On the one hand it is reproductive, and on the other productive. The material for it must be derived from past experience. But this material is variously shaped and transformed by the total mental condition existing when the ideal

revival takes place. Even when we are interested in reviving past events, as such, preserving as far as possible their original nature and order, yet the mode in which they appear to consciousness is determined by the circumstances of the present, and by all that has taken place since their original occurrence. It is for this reason that on their revival they come before consciousness as past events; whereas on their original occurrence they bore the character of present experiences.

Every train of ideas has both a reproductive and a productive aspect; though the relative dominance of the two aspects may vary indefinitely. We shall first consider the reproductive side of the process, under the head, Association of Ideas; and then the productive, under the head, Ideal Construction.

§ 2. *Association of Ideas.* — For a general account of the nature of Association, we must refer to bk. i., ch. ii., §§ 7–9. The basis of all associative connexion is the concurrence of distinct experiences in the formation of a single cumulative disposition, which tends to be re-excited as a whole whenever any of the experiences recur which have combined to produce it. If we suppose that two experiences, a and b, have been united in this way so as to form the total disposition *Dab*, the re-occurrence of an experience similar to a will re-excite *Dab*. If the reproduction takes the form of mere acquirement of meaning or of complication, the result is a modification of a, which we may represent by a_b. But in ideal reproduction something more takes place. The occurrence of a_b is followed by the ideal revival of b_a, as a relatively independent phase in the successive flow of mental process.

It must be noted that the tendency is to the revival of the total experience *ab*. Hence, apart from interfering conditions, *b* will tend to be revived in the same relation to *a* as that in which it originally occurred. If in the original experience one object has been apprehended as succeeding another, or as situated on the top of another, or as logically dependent on another, the tendency of the ideal revival will be to represent the object in the same relations. It is evident that these objective relations may be indefinitely numerous and diverse in nature. Hence it is impossible to base on them a classification of the various forms of association of ideas. As Reid remarks: "Every relation of things has a tendency, more or less, to lead the thought, in a thinking mind, from one to the other."* It follows that in classifying the forms of association of ideas, we must consider relations between psychical states, as such, as distinguished from relations between the objects of which they take cognisance. Ultimately, all depends on continuity of interest: but this continuity may be direct or indirect, giving rise to two forms of association which are commonly called association by *contiguity* and by *similarity*.

§ 3. *Different Forms of the Association of Ideas.* — (a) *Contiguity* (*Continuity of Interest*). The law of Contiguity, as ordinarily understood, may be stated as follows, — If *B* has been perceived or thought of together with *A* or immediately after *A*, then, on a future occasion, the perception or idea of *A* will tend to call up the idea of *B*. In other words, the sequence of ideas follows the order in which their objects have

* *Works*, Hamilton's edition, vol. i., p. 386.

been attended to in previous experience. The underlying principle is that mental activity when partially revived tends to repeat itself; it can only repeat itself if its original direction and order are reproduced.

This perhaps is the best form which can be given to the law of Contiguity, as ordinarily understood. But even in this form it requires qualification. It is by no means true that association of this kind connects only those objects which occupy attention in immediate succession. This has been shown experimentally. Professor Ebbinghaus found that after learning by heart a series of disconnected words, which we may denote by *A*, *B*, *C*, *D*, etc., it cost him a much shorter time to learn the same series with regular gaps in it, *e.g.* *A* · · *D* · · *G* · · , etc. Repetition of the series *A*, *B*, *C*, *D* served to establish associative links not only between *A* and *B*, *B* and *C*, *C* and *D*, etc., but also between *A* and *D*, *D* and *G*, *G* and *H*, etc. The same point is more conspicuously illustrated in ordinary experience. In recalling a train of events we usually pass from one salient occurrence to another, leaving out the relatively unimportant details which actually intervened between them. Similarly, in describing an object, I do not mention all the details which I actually observed in the exact order in which I noticed them. On the contrary, I pass from one characteristic and distinctive feature to another, oblivious of much which is not characteristic and distinctive. The dominant interest of the original experience and the dominant interest at the time I recall it, determine a selection of items which is by no means tied down by the condition that objects which introduce each other in

the train of ideal revival must have been attended to in immediate succession.

The truth is that the fundamental principle of association is not *contiguity* in the strict sense of the word, but rather *continuity of interest*. The stronger the dominant interest, the conative tendency guiding the whole process, the more selective is the revival apt to be, links being dropped out which are relatively unimportant to the general trend of mental activity. This is well brought out in the special case in which some process having continuity of interest is carried out with interruptions occurring at intervals. If the interruptions are not themselves of a specially interesting kind, we tend to omit them altogether in recalling the main activity. The gaps, so to speak, close up.

It may be asked why in any case we should remember the interruptions, even when they are specially interesting. For where there is interruption, there is not continuity, but rather *discontinuity* of interest. The answer is that at the moment at which the interruption takes place there is continuity between the two processes which are otherwise disconnected. The interruption is itself an experience which belongs to both equally and serves to link them together.

Immediate succession, then, is not the fundamental condition of the association which is called *association by contiguity*. Ideal revival may and often does proceed by leaps and bounds. But it must be conceded that the immediacy of the succession does count as a very important factor. Other things equal, the direct transition of attention from A to B will be repeated in ideal revival, rather than a transition from A to C

which originally took place through the intermediate link *B*. In proportion as the control of a dominant interest is weak and intermittent, the tendency is to exactly repeat the original order without omissions and inclusive of interruptions. This is well seen in the conversations of feeble-minded persons. Of course the original order will be exactly repeated, where there is an interest in exact repetition, as in learning by heart.

(b) *Similarity*. The characteristic feature of reproduction by similarity is, as Dr. Bain observes, that it is opposed to *routine* and counteracts its effects. In such reproduction one object may recall another with which it has never been connected in previous experience. I see a man who reminds me of the Duke of Wellington by some resemblance in his personal appearance. I have never had occasion before to think of this man and the Duke in any kind of connexion with each other. The ideal revival seems to give rise to a completely novel combination instead of reproducing a past combination.

If this were really so, we could not properly speak of *association* as having anything to do with the matter. *Association* must at least imply that revival depends on objects having somehow come together in previous experience.

In fact a closer analysis shows that this actually is so in the example chosen and in all instances of so-called *association by similarity*. What is really operative in calling up the idea of the Duke of Wellington, is the personal appearance of the man in so far as it resembles that of the Duke. The experience I have now in looking at the man is partially the same in character as the experiences which I have previously had in looking at the Duke's portraits. The mental disposition left behind by these experiences

is partially re-excited, and in consequence it tends to be re-excited as a whole. But this re-excitement of the whole in consequence of the re-excitement of the part is due to continuity of interest, and not to any essentially distinct principle. The principle of continuity alone is operative, but it operates in a very different manner and produces a very different result: reproduction by similarity and reproduction by contiguity respectively. Reproduction by similarity is most aptly described by reference to its effect. It ought to be called reproduction *of* similars rather than reproduction *by* similarity. Its distinctive peculiarity is that the common characters belonging to both *A* and *B*, through which *A* recalls *B*, are separately presented twice over, (1) as characters of *A*, and (2) as characters of *B*. When a photograph reminds me of its original, the points of likeness which mediate the mental transition are twice presented in different and incompatible contexts. To begin with they are constituent items of the presentation of the photograph, and again they are constituent items of the presentation of the person photographed. Reproduction by contiguity may be called by way of distinction *serial reproduction*. Both serial reproduction and the reproduction of similars are in a sense cases of reproduction *by* similarity. Neither involves complete identity. Smoke reminds one of fire because of preformed associations. This is serial reproduction. But the smoke I now see may have features of its own in which it differs from previous experiences. It may be more voluminous, lighter or darker in colour, and so on. In other words, there need only be similarity, not complete identity. The points of difference do not contribute to bring about the reproduction. The partial

identity is alone operative in this. But the specific differences none the less play a positive part in the the process. Though they do not help to bring about reproduction, they modify the nature of what is reproduced. A thin thread of smoke suggests a small fire; a large volume suggests a big fire. Smoke on a moorland and smoke rising from a house in London both suggest fires, but with very important differences. The reproduction is due to their identical character; the difference in what is reproduced is due to their different mental setting.

Now in the reproduction of similars the points of divergence between the reproducing presentation and that which is reproduced play no positive part in determining the reproduction. The partial identity of personal appearance between a man whom I meet casually and the Duke of Wellington calls up in my mind the idea of the Duke. But this idea is not transformed in a special manner by the divergent characters which distinguish the man before me from the victor of Waterloo.

We must carefully distinguish between the actual reproduction of similars and the processes which frequently follow on it. When one presentation has called up another similar to it, the mind may proceed to compare them, and it may make the partial identity which is discernible between them the basis for working out a parallelism in other respects by means of repetitive reproduction. The relation of an apple to the earth reminds Newton, according to the familiar legend, of the relation of the moon to the earth. But he does not stop here. Fixing attention on the partial identity, he strives to enlarge it by tracing identity in other respects also. This takes place by trains of thought in which the effect of serial association is profoundly modified, but not arrested by the difference of the two.

§ 4. *Competition of Divergent Associations.* — The same experience may have, and generally has, a great many connexions in the way of association. The question naturally arises, why one of these rather than another should be operative on any given occasion. "If the sight of a picture, for example, can recall to me the person whom it resembles, the artist who painted it, the friend who presented it to me, the room in which it formerly was hung, the series of portraits of which it then formed a part, and perhaps many circumstances and events that have been accidentally connected with it, why does it suggest one of these · · rather than the others?"* Stated in symbolic terms, the question is as follows: If a has become associated with b, c, and d, severally, why on any given occasion should it recall one of these, b, in preference to the others? Brown enumerates a number of special circumstances, depending on the conditions under which the association has been originally formed. The greater and more prolonged the attention given to a and b and to their connexion at the time they became associated, the firmer will be the association, and the stronger the tendency of a to recall b. Again, the frequency with which a and b have been previously combined is a very important factor. "It is thus we remember, after reading them three or four times over, the verses which we could not repeat, when we had read them only once."† We must also take account of the *recency* of the association. "Immediately after reading any single line of poetry, we are able to repeat it,

* Thomas Brown, *Philosophy of the Human Mind*, vol. ii., pp. 271–272.
† *Op. cit.*, p. 273.

though we may have paid no particular attention to it; in a very few minutes, unless when we have paid particular attention to it, we are no longer able to repeat it accurately, and in a very short time we forget it altogether."* Lastly, much depends on whether *b* has been associated in a similar way with other objects besides *a*. "The song, which we have never heard but from one person, can scarcely be heard again by us, without recalling that person to our memory; but there is obviously much less chance of this particular suggestion, if we have heard the same air and words frequently sung by others."† As Dr. Ward remarks, "the average Englishman is continually surprised without his umbrella,"‡ just because the weather is so changeable that no fixed association can be formed.

These conditions are important, but they are not the most important. The predominant factors determining the actual lines which ideal reproduction takes, are to be found not in the conditions under which associations have been previously formed, but in the total mental state at the time when revival takes place. Those objects tend to be ideally re-instated which are relevant to the general trend of mental activity at the moment. The sight of rain will suggest an umbrella if we are intending to go out; otherwise it may only suggest the idea of somebody else getting wet. If our minds are occupied with scientific discussion, the word *proofs* will suggest one group of ideas; if we are engaged in preparing a book for the press, it will suggest something quite different.

* *Ibid.*, p. 274. † *Ibid.*

‡ Encyclopaedia Article, p. 63.

§ 5. *Ideal Construction.* — We have seen in the last section that the total mental state, at the time at which ideal revival takes place, is a most important factor in determining what ideas shall be revived. We have now to add that the ideally revived objects are in various manners and degrees modified and transformed by the conditions under which their re-instatement takes place. They enter into new combinations and acquire new relations, so that they appear under fresh aspects. If in the past the sight of a house has become associated with the ideal representation of a person living in it, whenever I see or think of the house I shall tend to think of the person inside it. Supposing that I see the house on fire, or hear that it is on fire, the ideal representation of the person who lives in it will be transformed by the special circumstances of the case. I shall think of him as in danger of being burnt. The same transforming influence also comes into play in association of similars. A draper serving at the counter may remind me by his personal appearance of Napoleon; but the special circumstances will tend to make me think of Napoleon in a special way. My mind will dwell on the contrast between the life of the great conqueror and that of the man before me.

In these instances, the object ideally recalled is modified by the relations into which it enters at the time of its recall. In some manner or degree, this always takes place. But there is another kind of transformation which only becomes prominent under special conditions. The ideally revived object may not only be modified by the new relations into which it enters; it may require to be modified as a pre-condition of its entering into

these relations. The nature of any whole is determined, not merely by the nature of its constituent parts, but also by the form of their combination. Now suppose that we have two terms b and d so related as to form a whole bd. If the relation which constitutes this whole is to be maintained while one of its constituents is altered, it may be necessary for the other constituent to be changed in a corresponding manner. If instead of b we substitute β, we must substitute δ instead of d. A familiar illustration is supplied by mathematical ratios. Suppose that we have given the ratio 1 : 4; if 1 be changed into 5, we must change 4 into 20, in order to preserve the same ratio.

Now in ideal revival based on preformed association, it may and frequently does happen that the trend of mental activity at the moment requires the relation between the associated terms b and d to be re-instated. But the given term may be only similar to b, not identical in its nature with it. Let us call the given term β; β may so differ from b that it can no longer enter into the same relation with d, so as to form the same kind of whole. In order to re-constitute the form of combination characteristic of this whole, it may be necessary that the ideal revival should take the form δ instead of d.

A simple instance "is supplied by the singing or mental repetition of a tune in a different key from that in which it has been previously heard. The absolute pitch of the notes is determined by the keynote, which may vary. The identity of the tune is preserved by correspondence in the transitions between the notes." *

* *Analytic Psychology*, vol. ii., p. 57.

To take an example of a more common type, suppose that the sight of a piece of sugar arouses the ideal representation of its sweetness. It is this special piece of sugar as seen by me at this moment which recalls the sweet taste. The special conditions operative at the moment of reproduction enter into and modify process and result. "If the sugar seen is beyond my reach, then the sweetness suggested is a sweetness beyond my reach, though in all my past experiences the sugar may have been easily attainable."* "Mr. Lloyd Morgan tells a story of a little boy who 'after gazing intently at a spirited picture of a storm at sea with a ship being struck by lightning, asked, Mother, why doesn't it rumble?' Now, what kind of a rumble was in this case actually suggested to the boy? Was it anything in the nature of a literal reproduction of any thunder-clap which he had ever heard? If he had heard an actual peal of thunder at the moment, this would not have fitted itself in as a natural complement of the painted scene. If his mother had told him that painted lightning could only be accompanied by painted thunder, the answer would in all probability have appeared to him a satisfactory one."† A little girl, playing with a doll, treats it as if it were a baby. The doll becomes a centre from which a train of associated ideas starts, analogous to those which would be suggested by a living child. But the fact that she has not to deal with a living child, but only with a doll, makes a difference. She puts food to its mouth, but does not expect the food to be swallowed.‡ She would certainly be very

* *Op. cit.*, pp. 44–45. † *Ibid.*, p. 46.

‡ "Some children, it seems, have a way of putting food on the floor near the doll; others go further, and hold the food long to the doll's

much startled if it actually began to cry. The train of ideas connected with babies is only reproduced in analogue.

In these examples, the relations which determine the ideal construction are revived by association. But in other cases, the form of combination is entirely determined by the predominant interest at the moment at which revival takes place; so that objects are brought into relations in which they have never occured before. If a man is in the mood for making puns, or for drawing epigrammatic contrasts, or for tracing relations of cause and effect, these modes of combination will impose themselves on the objects revived by association, and will tend to transform these objects so far as may be necessary to make them fit into the ideally constructed whole. I once heard a man propound the riddle, Why is a sparrow like a chimney? The answer, which of course nobody guessed, was, Because it has a crooked flue! Obviously, his mind must have been very bent on riddle-making, before he could have perpetrated such an atrocity. Hence he utilised most unpromising material and transformed it to suit his purpose in the most uncompromising way. The first clue is probably the verbal resemblance of *flue* with *flew;* but in working out the analogy he had mentally to turn *flight* into *flew* and to do violence to the nature both of sparrows and chimneys. This is probably the worst

mouth; or, insisting on a still more realistic performance, break out some of its teeta, and push the food into the mouth with a pin. Others, again, stopping short of such violent realism, cover the unreality by a dodge, as when one child, after holding the food to the doll's mouth for a while, slipped it down its neck." Sully, Article on "Dollatry," *Contemporary Review*, Jan. 1899.

joke on record; yet many a better has evoked less laughter. Another, I hope more serious example, is the state of my own mind when this illustration occurred to me. I had never before thought of the sparrow and chimney joke as connected with the psychological doctrine I am now expounding, yet my mind, pre-occupied with this doctrine, and bent on using all material which could help in its development, summoned up this reminiscence and wove it into its ideal construction.

It should be noted that differences in the mental constitution of individuals largely consist in differences in the kind of relation in which they are predominantly interested. Some attend by preference to mere relations of contiguity and time and space; others to metaphorical analogy; others to rhetorical contrast; others to logical connexion; and the kind of transition which is relatively dominant in the sequence of their ideas varies accordingly. In the mind of a schoolman, the ruling scheme of connexion was apt to be the form of the syllogism. In many minds, and especially in those which are saturated with the study of Hegel, a special form of transition is favoured, which consists in a triple movement, passing from a one-sided view of the case to the opposite one-sided view, and then to a more comprehensive view which embraces the two extremes in harmony.*

§ 6. *Obstructions in the Flow of Ideal Activity.* — Ideal activity, like perceptual activity, may be successful or unsuccessful. In so far as it is unsuccessful, it tends, like perceptual activity, to persist with variation

* The examples of constructiveness given in this section are elementary; but such complex constructions as the invention of the steam-engine or novel-writing depend essentially on the same conditions.

of procedure. The tendency is of course proportioned to the strength of the interest involved.

The conditions which obstruct and delay the flow of ideas are of various kinds. The hitch may occur either on the reproductive or on the constructive side of the process. When it occurs on the reproductive side, it is merely what is called a failure to remember; as when we find ourselves unable to recall the name of a person or the title of a book. If we are sufficiently interested, such failure is followed by a more or less prolonged effort to recollect. In this effort we vary our procedure, using all the means which present themselves. Supposing it is the name of a person we are endeavouring to recall. We try various clues in succession. We fix attention on objects and circumstances connected with the person. We perhaps inquire of a bystander, or look in a book; or go through a list of names on the chance that we may hit on the right one.

When the hitch occurs on the constructive side, the mental processes which are directed to overcome it may be extremely complex. The guessing of riddles furnishes a good example. We have ideally to reproduce something which shall satisfy all the conditions of the riddle. Certain relations are given, and we have to find another term which shall fit in with these in a harmonious whole. We make trial after trial, we think of this, and then we think of that; but each suggested solution in turn, though it may fulfil part, fails to fulfil all conditions of the problem. Finally we may or may not succeed in completing the ideal scheme, by making the right guess. We may take as another example a case in which the flow of ideas is controlled by the

urgency of a practical need. Suppose a man shut up in prison and bent on devising a mode of escape. Let us assume that the main difficulty lies in the height which has to be descended before he can reach the ground. The notion of letting himself down from a height by means of a rope may be familiar to him by past experience: but in this case he has no rope. What he needs therefore is something which will take the place of a rope, — something which will fit into his ideal scheme as the rope would if he had it. He may proceed to think of various expedients, and he may at last light on the idea of using his sheets and blankets. The first time this suggestion occurs to him, it may not help him out of his difficulty; but it comes nearer to what he wants than anything else he has thought of; therefore his mind tends to dwell on it, and to give it a new shape which will suit his purpose. At last he hits on the idea of tearing up the sheets and twisting them into a rope. Of course we are supposing that our supposed prisoner has not already heard of this expedient. We may assume that he is the first man who invented it. In this, as in similar instances, association by similarity plays an important part. His own case calls up to the mind of the man analogous cases in which ropes have been used. He then proceeds to work out his own case on parallel lines, in so far as the circumstances will admit.

CHAPTER III.

MEMORY.

§ 1. *Definition of Memory.* — Sometimes the word *memory* is used as synonymous with *retentiveness* in general. This application of the term is inconveniently wide. It is better to confine it to ideal revival, so far as ideal revival is merely reproductive, and does not involve transformation of what is revived in accordance with present conditions. This reproductive aspect of ideal revival is best exemplified in those cases in which the controlling interest requires the objects of past experiences to be re-instated as far as possible in the order and manner of their original occurrence. Hence the word *memory* is applied with special appropriateness to these cases. A witness giving evidence in a law-court is a typical example. His mind is bent on recalling past objects and events, as they actually occurred in his previous experience, omitting the inferences which he has subsequently drawn from them, or is inclined to draw at the present moment. The inferences which he drew from them when they occurred he recalls as far as possible only as inferences, and not as actual percepts.

The witness in a law-court recalls his own personal experiences as far as possible in the same time-relations in which they actually occurred. This may be called

personal memory; but there is a large class of cases in which memory is impersonal. What is remembered in these instances is the knowledge acquired by personal experience, and not the particular incidents connected with the process of acquiring it. When a boy first begins to study his Euclid, his natural tendency is to learn the propositions by heart, so as to reproduce the very words of the book. When the process of learning is complete, what remains in his mind may be only the general method of proof. He will to a large extent have forgotten the words of the book, and he will certainly have forgotten much that happened in the process of learning; the particular occasions on which he sat down with Euclid in hand to learn a proposition; his blunders in attempting to reproduce it, and so on. He will finally tend to recall only what he has an interest in recalling, forgetting what is irrelevant. The process is quite analogous to the formation of Habit, as described in bk. i., ch. ii., § 11. As in the formation of habit, two distinct conditions are involved: "The first is retentiveness; the second lies in the essential nature of conation, according to which conative processes cease, if and so far as their end is attained."* This holds good even in learning by rote. In learning by rote the dates of accession and death of the kings of England, a boy will go over them again and again in his book, and will again and again attempt to repeat them; but in the long run he will forget these particular incidents. He will forget his successive attempts to "commit to memory" and his occasional failures and errors in attempting to reproduce.

*See pp. 110-111.

§ 2. *Good and Bad Memory.* — The marks of a good memory are, (1) The rapidity with which the power of recalling an experience is acquired; (2) The length of time during which the power of remembering lasts without being refreshed; (3) The rapidity and accuracy of the actual revival. Some persons can learn quickly and easily, but soon forget; others take a long time to learn, but also retain for a long time what they have once learned. Even when memory is retentive, so that what is once learned is not easily forgotten, there may yet be slowness and hesitancy in the actual process of reminiscence.

As a fourth mark of good memory, we may mention its *serviceableness*, or in other words the readiness with which it reproduces what is relevant to the prevailing interest of the moment. A memory may be extremely extensive without being in this sense serviceable. Dominic Sampson's mind, for instance, was like "the magazine of a pawnbroker, stowed with goods of every description, but so cumbrously piled together, and in such total disorganisation, that the owner can never lay his hands on any one article at the moment he has occasion for it."* Those who cram for examinations often realise this in a painful manner. So long as the questions are straightforward, so that the answers may be taken directly from the books they have used, they may find no difficulty. But as soon as a question is asked which requires them to record their acquired knowledge in a different order and manner from that in which it is given in their text-book, they break down. The materials for an answer may really be contained in

* *Guy Mannering*, ch. xxxix.

what they have learned, and yet they may not be able to recall what is wanted, because the particular question has never been associated in their minds with the particular answer.

The rapidity with which the power of recalling is acquired depends to a large extent on the keenness of the interest attaching to the original experience. Much that attracts attention only transiently and faintly fails to be remembered at all. It is to be noted that we tend to remember, not only what is in itself interesting, but also connected circumstances which may in themselves have little interest. A young child takes little interest in the alphabet for its own sake, but if the letters are made of gingerbread, it is more likely to remember them. So far as the power of acquiring a memory does not depend on interest, it must be set down to the account of congenital constitution. But it may be doubted how far congenital constitution gives the power of remembering without giving capacity for interest in what is remembered. Mozart as a boy of fourteen years old could write down from memory an extremely complex piece of music after having heard it only once; but the musical genius of Mozart caused him to take a most intense and absorbing interest in the actual hearing. Some idiots show remarkable power of memory. They can for instance repeat long lists of disconnected words which they have heard only once. Probably this is connected with the fact that the range of interest in the idiot is excessively narrow and correspondingly concentrated. They are scarcely capable of apprehending any relations except those of bare contiguity in time and space. Hence their re-

markable powers of recalling series of objects which are only connected in this manner. There are no other divergent lines of association to compete with those which are formed by the mere sequence of external impressions.

Differences in the length of time during which the power of recall is retained also depend largely on interest. It is to be remarked that the kind of interest which facilitates the acquisition of memory is not necessarily the same as that which is most effective in causing its permanent retention. The barrister learns the facts bearing on a particular case, but rapidly forgets many of them, which have only a transient interest, when the case is over. The properly legal aspects of the case, on the contrary, will tend to be retained because he has in them a permanent interest.

Another very important factor in determining duration of the power of recall is the frequency with which the remembered experience has been repeated. A boy learning a passage by heart will go over it again and again until he has thoroughly stamped it in. Differences in the retentiveness of memory which are not traceable either to interest or to frequent repetition must be referred to congenital constitution. Here again it is doubtful how far congenital constitution can favour memory without favouring interest.

The conditions on which serviceableness depends are of a different kind. A man who can readily recall what he needs at the time he needs it is said to have his knowledge well-arranged or organised. The mass of his acquirements may be much smaller than that of another man whose knowledge takes the form of cum-

brous and disjointed erudition. Yet his memory may be incomparably more effective both for practical and theoretical purposes, and even in the answering of examination papers. To understand the distinction we must note that a man may be perfectly able to call something to mind when a certain prompting cue is given, and quite unable to do so in the absence of this cue. I may be quite able to recall a line of verse if I have first heard or recalled the previous lines; but I may be quite unable to recall the same line of verse as a quotation illustrating some point in which I am interested at the moment. The reason is that I have never thought of the meaning of this line of verse, or of similar objects, in connexion with this particular point or similar points. It is not necessary that the particular line of verse should have been thought of in a special connexion for it to be recalled in this connexion. All that is necessary is that the general kind of relation involved should be more or less familiar to the mind. I may for instance wish to illustrate the fact that in poetic metaphor the connexion between the metaphorical expression and the reality which it expresses is often identity in the form of combination of a complex whole rather than identity in the nature of its material constituents. For this purpose I may quote Tennyson's line,

"A doubtful throne is ice in summer seas."

A throne is not in the least like ice, nor the dangers to which it is exposed like the warmth of summer seas. There is only analogy of relation. Now for this line of Tennyson to occur to me as an illustration of my point,

it is not necessary that I should have thought of it before in this connexion. But it is necessary that I should previously have thought of other similar illustrations. The more I have done this, so as to familiarise myself with this kind of mental transition, the more readily shall I be able both to recall old illustrations and to produce new ones. Thus we may say that the serviceableness of memory depends on our forming the right kind of associations. The tendency of A to recall B in a certain kind of relation, r, depends on our having previously attended to A and B in this relation, or to things similar to A and B in similar relations.

§ 3. *Decay of Memory with Lapse of Time.* — Though particular memories last for various periods in different cases and with different persons, yet it is the general law that they tend to die away in course of time if they are not refreshed. Professor Ebbinghaus has made experiments with the view of determining the quantitative relation between lapse of time and decay of the power of recall. For this purpose he learnt by heart lists of unmeaning syllables of three letters each; each list contained from twelve to thirty-six syllables. After learning a list so as to be able to repeat it, an interval of time was allowed to intervene before again attempting to recall the syllables. Memory had in the interim become more or less partial and fragmentary. The point of the experiment was to determine the amount of time required for re-learning the list as compared with the time originally required. This yields a measure of the degree of decay of the mental dispositions, and shows the relation between decay and lapse of time. After an interval of 20 minutes, about

40 per cent of the original time was required for re-learning, after 64 minutes, about 56 per cent, after 526 minutes, about 65 per cent, after two days, about 72 per cent, and so on. From this we see that though the amount of decay increases with the lapse of time, yet relatively it is smaller the longer the interval.

§ 4. *Variety of Memories.* — In ordinary language we speak of a person having a good memory for numbers but a bad one for names; a good memory for places but a bad one for faces, and so on. Theoretically, we must carry this division very much further. As memory consists in the power of ideal revival, there must be a relatively separate memory for every experience ideally revived. There must not only be a separate memory for names, but a separate memory for each particular name.

But ordinary language is undoubtedly right in recognising distinct memories for general departments of experience. Mozart had an extraordinary memory for music; but he may have been very bad at recalling numbers. The most wonderful memory for words may be accompanied by a poor memory for dates and events. These differences are very largely due to congenital constitution; but special kinds of memory may also be cultivated.

§ 5. *Improvement of Memory by Practice.* — It is certainly true that the exercise of memory in a special direction improves it in that direction. By long practice actors come to learn their parts more rapidly and easily. The same is true of clergymen who learn their sermons by heart. These effects of practice appear to be strictly confined to the special kinds of ideal revival which are exercised. A man who im-

proves his memory for words does not thereby improve his memory for places.

It has been denied that memory can be *directly* improved by practice. The power of remembering depends on the kind and degree of attention given to the original experience. It has been urged that what is educated by practice is the attention, and not the power of recall. Professor James for instance maintains that "all improvement of memory consists in the improvement of one's habitual method of recording facts."* It is the power of learning, not the power of retaining, which is increased by practice. "I have," says James, "carefully questioned several mature actors on the point, and all have denied that the practice of learning parts has made any such difference as is alleged. What it has done for them is to improve their power of *studying* a part systematically. Their mind is now full of precedents in the way of intonation, emphasis, gesticulation."† There can be no doubt that Professor James is right in assigning increased and better directed attention as a cause of the improvement of memory by practice. It may even be admitted that it is the most important factor. The endeavour to remember is an endeavour to attend; and by repeated and prolonged attention to objects, we not only make the traces more permanent which our experience of them leaves behind: we also bring them into relation with other objects: and so multiply the associations which may severally and conjointly contribute to their revival.

But it may be doubted whether Professor James's

* *Principles of Psychology*, vol. i., p. 667.
† *Ibid.*, p. 664.

account of the matter contains the whole truth. According to him, the power of retentiveness is born with each individual as an essential part of his general physiological constitution. It is "a physiological quality, given once for all with his organisation, and which he can never hope to change. It differs no doubt in disease and health; and it is a fact of observation that it is better in fresh and vigorous hours than when we are fagged or ill. . . . But more than this we cannot say."* On this point also we may admit that Professor James is right. But it seems to have escaped his notice that the congenital constitution which gives superior retentiveness in a certain direction is often connected with special interest in this direction. It might be argued that congenital constitution gives power of remembering only by giving the aptitude and impulse for attending. This is at least true in part, if it is not the whole truth. But if it be so, the distinction between native power of retention and that acquired by practice is not so sharp as Professor James supposes.

Admitting that native power of retentiveness is a fixed quantity, unchangeable by exercise or education, we may none the less demur to the conclusion which Professor James appears to draw from this theory. To maintain this conclusion, he stands in need of an additional hypothesis — the hypothesis that all mental dispositions corresponding to particular objects are absolutely and not merely relatively distinct. If different dispositions have common factors; if they partially interpenetrate each other, then the experiences by which one is formed will have already done part of the work

* *Op. cit.*, p. 664.

requisite for the formation of another.* But the facts of association show that the dispositions corresponding to similar experiences must be regarded as partially the same. This is peculiarly clear in association by similarity. One man, by some similarity in his personal appearance, may remind me of another; I may not discover, even after careful scrutiny, what the point of resemblance is. It has not formed a separate link of association. Yet the disposition left behind by my experience of the one person has been re-excited by the sight of the other. The dispositions left behind by the two experiences must therefore have some common factor. They must partially interpenetrate. In general, so far as the revival of similars by similars is possible, there must be a partial coincidence of mental dispositions. The same applies to association by contiguity. If β recalls γ because b and c have been associated, the disposition left behind by b must be partially re-excited on the occurrence of β; the dispositions left behind by b and β cannot therefore be absolutely independent.

Just in so far as this interpenetration of mental dispositions exists, the exercise of the memory for certain experiences will improve the memory for analogous experiences. When a man has made a certain amount of progress in the learning of a foreign language, further progress is facilitated, just because he has become familiar with certain general characteristics of the language, which do not need to be learnt over again for every particular case. Of course it does not follow that memory in general is improved by its exercise in this or that

* Probably James does not really mean to deny this; but if so, his language is misleading.

particular direction. The progress will only extend to analogous experiences in precise proportion to the degree of analogy. Exercise of the memory in the study of languages will do little to improve it for the retention of chemical formulæ.

§ 6. *Memory and Past Time.* — There is one most important aspect of memory which we have not touched upon. When we remember objects or events, we often apprehend them as having been presented to us in our past experience. It is not necessary or convenient to discuss this point now. It is part of the general question of the origin and development of the ideal representation of time-relations, which will be discussed in the chapters on "The World as Ideal Construction" and "The Self as Ideal Construction."

CHAPTER IV.

IDEATION, COMPARISON, AND CONCEPTION.

§ 1. *Ideal Pre-arrangement distinguished from Perceptual Pre-adjustment.* — Perceptual activity is guided by the actual presence of perceived objects. It is true that perceptual activity constantly involves pre-adjustment of the body and sense-organs for coming impressions. But this pre-adjustment is directly prompted by present or past impressions, and it consists, not in a pre-determination of the future, but merely in an appropriate *waiting* attitude. The only means by which the perceptual consciousness can control the course of its experience is through actual bodily movement. But no bodily movement can overleap a period of time. The most agile animal cannot take a spring into the future. But the ideational consciousness can cross a bridge before coming to it. It can begin by the ideal anticipation of the end, and it can move freely to and fro over the series of links intervening between end and starting-point. Thus, if it meets a difficulty midway in the series, it need not provide for that difficulty at the point where it emerges. It may go backward to an earlier stage or even to the beginning, and there make a suitable re-arrangement. It is plain that the process admits of all kinds of variations,

and re-adjustments of part to part, which are impossible for perceptual consciousness.

§ 2. *Conceptual Analysis and Synthesis.* — All ideational activity as compared with perceptual activity involves some kind and degree of generalisation. We have seen that mental images are in general fainter and much less detailed than the corresponding percepts. They lack the determinate particularity of actual sense-experience. But indeterminateness in the image involves indeterminateness in the meaning of the image in so far as expression of the meaning depends merely on the presence of the image without being otherwise defined and developed. Hence any given mental image taken by itself may be equally capable of representing a great number of diverse objects. If I think of wealth, I may have in my mind a vague mental picture of a bale of goods: but the same mental image might equally have been present in my mind had I been thinking of a wharf, of commerce, or of a warehouse. Similarly, a bag of sovereigns might stand either for wealth, or a miser, or the Bank of England. The mental picture of a spade might stand either for the act of digging, for a garden, for a navvy, or for a grave-digger. But the mere indeterminateness of the mental image is very far from explaining the beginnings of general thinking. We give an essentially inadequate view of the generalising function of thought, when we dwell exclusively on what it omits. This negative side of the process has for its indispensable correlate a positive side. In any train of thought, we are under the guidance of a controlling interest constructing an ideal whole. Each of the several

ideal representations which successively emerge contributes its part to this ideal structure. The details of actual perception which are omitted in the ideal representation are omitted, because they will not fit in to our ideal combinations. We can no more use the complete details of actual perception in building up our mental structure than we can use unhewn stones in building a house. But in this account of the matter it is indirectly implied that the indeterminateness of ideal representation is compensated for by another kind of determination. What is vague and indefinite in the several images and their meanings is made relatively definite and complete by the combination of ideas as the train of thought advances. The several ideas are defined by their relations to each other in the ideal whole. Thus we have side by side a process of analysis and one of synthesis. By the process of analysis, the concrete detail of actual sense-perception is broken up, and certain aspects of it selected. In contrast with the concrete totality of perception, these partial aspects have a more or less general or *conceptual* character. The analysis may therefore be called *conceptual analysis*, and the corresponding synthesis, *conceptual synthesis*. By conceptual synthesis, the partial aspects are recombined into a new whole. Similarly, in building a house, we have first to go to the quarry and detach the single stones from it, afterwards hew them into shape, and then build with them a new structure. This may be illustrated by the simple recall of a series of events in the order in which they actually occur in sense-experience, or of a number of objects in the order in which they were actually presented in

space. The word *now* and the word *here* have different meanings from the point of view of sense-perception and of ideal combination. From the point of view of sense-perception the word *now* means the actual moment of sensation, and *here* means the direct presence of an object to our percipient organism, as immediately revealed by the sensation which produces it. But in ideally recalling a series of events in time, or a grouping of objects in space, actual sensation is absent, and can no longer serve as a distinguishing mark of what is *now* present or what is *here* present. The individualising details of present perception are to a very large extent absent from the ideal reproduction. The *now* and the *here* must therefore be otherwise defined. In fact, they are defined by the combinations into which they enter. They become purely relative terms. To go back to the old example, suppose that I picture myself as eating my breakfast.* I pass in review successive events. I mentally enter the breakfast-room; then sit down at the table; then pour out the tea; then open a newspaper; then help myself to fish, and so on. If I want to represent vividly what took place, I may say *now* instead of *then*, and think in the historic present. Now I am entering the breakfast-room, now I am sitting down, now I am pouring out the tea, and so on. Whether I say *now* or *then*, obviously what I am doing is to define the temporal position of each event by its relation to

* I have supposed this train of ideas to take place by means of a series of visual images. I have done so because the treatment of the function of language is reserved for the next chapter. But as a matter of fact most people would naturally recall a series of past events in the way of verbal description, either as a substitute for, or an accompaniment of, verbal imagery. It is the peculiarity of words that they are indeterminate in their meaning, not in their nature as mental images.

others in a series. The word *now* becomes purely relative in its application. Any part of the series may be regarded as a *now* in relation to what comes before it and what comes after it. Similarly, by changing the point of view, any part of the series which was previously regarded as a *now*, may become a *then*. It all depends upon our point of departure. If we mentally pass from an earlier part of the train to a later, what was previously a *now* becomes a *then*, what was previously future becomes present or past, and so on.

This example is typical. In all trains of ideational thinking, the several parts are made definite and determinate by their relations within the ideal whole which is being constructed. In this way the concrete determinateness of sense perception is replaced by a new kind of determinateness, that which is due to *conceptual* synthesis. In this sense we are to understand the dictum of Hegel, that thought passes always from the abstract to the concrete. One abstraction combines with and supplements another, so as to make the whole more and more concrete. The concreteness thus attained is of course different in kind from that of actual perception, and must always fall short of it. But it is at least equally true that the concreteness of actual perception falls short of that which is attained by ideal synthesis. In the process of ideal synthesis distinctions and relations are apprehended of which sense perception can never become aware. By ideal combination the world comes to be presented as a unified system of which only a very small part is ever actually present to the senses of an individual percipient. Thus sense per-

ception is fragmentary as compared with ideal combination, and in this sense is less concrete.

§ 3. *Comparison.*—"The growing mind, we may suppose, passes beyond simple perception when some striking difference in what is at the moment perceived is the occasion of a conflict of presentations. The stalking hunter is not instantly recognised as the destroying biped, because he crawls on all fours: or the scarecrow looks like him, and yet not like him, for, though it stands on two legs, it never moves. There is no immediate assimilation; percept and idea remain distinct till, on being severally attended to and compared, what is there is known in spite of the differences."*

Such a comparison is a complex process, involving a series of judgments, such as—"It crawls; It does not move; and the like."† There are abundant occasions in animal life which might usefully call into play mental operations of this kind. Whenever things are in appearance different, although they are for practical purposes the same, or whenever they are in appearance similar, although for practical purposes they differ, a problem arises which would be most effectively solved by deliberate comparison. By deliberate comparison I mean a mental confronting of the two objects, and a transition of attention from the one to the other, so as to discover some respect in which similar things differ in spite of their similarity, or in which different things agree in spite of their diversity, and also a fixing of the precise nature of this agreement or difference. If an

* Ward, Article "Psychology" in *Encyclopaedia Britannica*, ninth edition, xx., p. 78.

† *Ibid.*

unpalatable moth resembles in its markings a palatable moth, a bird will be apt to confuse them, and so meet with disagreeable disappointment. The bird might conceivably attempt to overcome the difficulty by setting a specimen of the disagreeable species side by side with one of the agreeable species, and then, examining them alternately, might consider first one character and then another of each, so as to find out distinguishing differences. Or again, without bringing the two actual objects together, it might examine the one as perceived and the other as ideally represented, and go through the same process. This would be much harder because it would require a strong and persistent effort of ideational thinking to keep before the mind a sufficiently accurate image of the absent object. Now the supposed case of the bird actually confronting the two objects, alternately scrutinising each, and passing in turn from one characteristic to another, has a strong air of improbability. As a matter of fact, we never observe animals behaving in such a manner as to make this interpretation of their actions necessary or even probable. But if they do not compare two objects when both are perceived, it is *a fortiori* unlikely that they should do so when one has to be ideally recalled, for, as we have said, this is the harder task. In fact, we have good reason to re-affirm Locke's dictum that "brutes compare but imperfectly." "It seems to me," he says, "to be the prerogative of human understanding, . . . when it has sufficiently distinguished any idea, . . . to cast about and consider in what circumstances they are capable to be compared." *

* Locke's *Essay concerning Human Understanding* (Fraser), vol. i., pp. 204–205.

We have seen that systematic observation of animals confirms this view.* It is the one result most distinctly brought out in Mr. Lloyd Morgan's book on *Comparative Psychology*. I may here quote an experiment which he carried out with great care and patience. Taking with him a dog which had been trained to fetch and carry, he threw a stick into a field surrounded by railings. The dog bounded after the stick, and brought it back in his mouth as far as the railings. But here he was confronted with a difficulty; he could get through himself, but he could not get the stick through. His experience had not taught him that the only way of succeeding was by grasping the end of the stick; instead of this, he tugged now here, now there, in a perfectly uncritical way. If, by accident, he did get hold of the right end of the stick, or if Mr. Morgan showed him how to proceed, this seemed to yield him no assistance on the repetition of the experiment. He had stumbled on the solution, but could not do the trick again. This was no casual observation; it was a systematic experiment repeated day after day, and only one of a course of similar experiments. It is evident that the dog here passed from one alternative to another without selective comparison; so that when he hit on the right one or was shown it, he failed to note the points in which it differed from unsuccessful attempts.

The process by which animals learn to distinguish what they have previously confused, or to identify for practical purposes what they have previously treated as different is rather one of tentative groping than of

* *Cf.* the account of Mr. Thorndike's experiments, bk. iii., div. i., ch. i., § 6.

express comparison. "Even in a blindly tentative process, the failure of the wrong alternatives will gradually decrease the chance of their renewal."* Under circumstances in which it has been previously deceived, an animal will become more cautious and attentive, thus affording opportunity for the presentation of differences, definite or indefinite, which have previously escaped its notice. In so far as this takes place, its behaviour will become gradually altered in the two cases, respectively. The unsuccessful action will become fainter and less persistent until it disappears, and the converse will hold of the successful action. All this may take place without express comparison of two objects, groups of circumstances, or lines of conduct, having for its aim the marking off of points of difference from points of agreement or of points of agreement from points of difference. Thus a dog, in first learning the trick of opening a gate by a latch, will, to begin with, scratch all over the gate. In doing so, he accidentally hits upon the right movement. On the next occasion, there may be almost as much preliminary groping as before. It is only gradually that the unsuccessful activity is discontinued, and the successful method adopted unhesitatingly from the outset. This is simply a case of the general principle that activity, obstructed in one direction, tends to divert itself into other channels. When animals learn in this way, they are not aware why one course is right and another wrong. The right course is simply forced upon their attention by the circumstances of the case.

Comparison in all but a most rudimentary form is an

* *Analytic Psychology*, vol. ii.

ideational activity. Even when the objects compared are both present to the senses, each is scrutinised in turn. For anything more than a vague awareness of resemblance or difference, it is necessary to keep before the mind the ideal representation of the one object in the very act of examining the other. Only in this way can each detail and characteristic in turn be selected for comparison, so as to distinguish the points of difference from the points of agreement. Hence we may attribute the absence of comparison in animals in all but its most vague and rudimentary form, to the absence or extremely imperfect development of ideational activity in general.

When the process of deliberate comparison plays an important part in the mental life, it involves a corresponding development in conceptual thinking, in the distinction of the general or universal from the particular. To compare is always to compare in some special respect. Some theoretical or practical end is to be subserved by the comparison. The difference or agreement to be discovered is not *any* difference or agreement, but one which has significance for the guidance of conduct or for the solution of a theoretical difficulty. Thus comparison takes place only in regard to the characteristics which happen to be interesting at the moment, other characteristics being disregarded or set aside as unimportant. Objects in other ways most diverse may yet in a certain respect be compared and found more or less similar, and objects in other ways most similar may be compared in a certain respect and found more or less unlike. Hence, as the process advances it becomes possible to group objects

according to the degrees of their difference or resemblance in this or that respect without taking into account their other attributes. We may arrange musical tones according to the degree of their loudness, disregarding their pitch, or according to their pitch disregarding their loudness. In the scale of loudness, sounds most different in pitch might occupy the same position, and sounds of the same pitch widely different positions. A shrill note and a low one may be of equal loudness, and sounds of the same pitch may be of different loudness.

It is evident that in this way what we have called the conceptual analysis of the concrete details of sense-perception receives a great development. A complex object becomes mentally separated into a plurality of partial aspects, each of which can form a starting-point for a series of comparisons, giving rise to different series of graduated resemblances such as those of pitch and loudness, and objects which are far apart in one series will be close together in another. To each of the different series there corresponds an abstract character or attribute of the object consciously distinguished from other abstract characters or attributes. Thus the category of Thinghood assumes a new form in ideational thinking from that which attaches to it in perceptual. The unity of the thing is distinguished from the plurality of its qualities, and that kind of predication becomes possible which is embodied in Language. The necessity of doing one thing at a time has led us to describe the nature and progress of comparison without reference to the use of language. But in fact the ideational activity which comparison involves

could not proceed far unless it were guided and supported by expressive signs, *i.e.* signs directly expressing ideas and their relations. The nature, function, and origin of these signs is the topic which will next occupy us.

CHAPTER V.

LANGUAGE AND CONCEPTION.

§ 1. *Language as an Instrument of Conceptual Analysis and Synthesis.* — In speaking of Language, we must remember that what primarily concerns the psychologist is not any special system of external signs such as gestures, articulate sounds, or written characters, but a certain psychical function, — a peculiar mode of mental activity. It is a unique and most important characteristic of this function or activity that many minds can co-operate in it as if they constituted a single mind. But the possibility of this co-operative thinking must be grounded in the nature of the mental process as it takes place in the individual mind. I do not mean that the use of language in individual thinking was or could be prior to its use as a means of intercommunication. What I do mean is that the earliest communication could only take place between minds capable of a certain kind of mental process. Merely perceptual experience cannot be communicated except in presence of the perceived object. In order that *A* and *B* may interchange ideas, it is evident that they must start from a basis of common experience. It is impossible to discuss Greek particles with a person who does not know a word of Greek. But if communication is to be real

and valuable, it must be possible for *A* not merely to convey to *B* what *B* already knows, but also what he does not know. *A* must be able to communicate to *B* something of which *A* has had experience and of which *B* has not had experience. How is this possible? Let us consider an analogous case. I wish to show some one how to pronounce a word which he has never heard. He is either deaf or at a distance, so that I cannot adopt the simple expedient of pronouncing it myself in his presence. My only resource is to write it down for him in phonetic spelling. I thus convey to him the new sound by exhibiting it as a combination of sounds with which he is already familiar. I reconstruct it and thus enable him to reconstruct it out of its phonetic elements. In like manner, *A* can communicate a new fact to *B* by reconstructing it out of elements which *B* has become acquainted with in the course of his previous experience. Intercommunication of ideas therefore implies analysis of the objects and processes presented to perception into certain constituents which recur in varying combinations in various particular cases. The use of language, then, involves the analysis of objects and processes into common factors and their free reconstruction out of these common factors.

It must not, however, be supposed that these common factors have each a rigid and unalterable nature which remains unchanged in the various combinations into which they enter. They are not like printers' types, which merely change their mode of external juxtaposition without inward modification. On the contrary, the elements of experience which are being continually combined in all kinds of varying ways in spoken or

written discourse, mutually transform each other. The meaning of a word varies with its context. Paul emphasises this point in his valuable work, the *Principles of the History of Language*. "In sentences like, 'I never laid a hand upon him'; 'John never drew bridle,' the hand referred to is not a hand in general, but my hand, the bridle referred to is not a bridle in general, but that which was held by John. Compare such instances as 'a good point,' 'a point of honour,' 'the bar of an hotel,' 'the bar of justice,' 'the tongue of a woman,' 'the tongue of a balance.'"* The special meaning assumed by a word in a special context or special circumstances may be called its *occasional meaning*. It is only at a late stage of mental development that an express attempt is made to distinguish an identical and persistent element of meaning pervading the varying occasional significations of a word. When the attempt is made it constitutes an epoch in the history of thought. It is the beginning of definition and of the scientific concept. The fame of Socrates rests largely on his having been the first to insist on a systematic inquiry of this nature. In popular and pre-scientific thinking the occasional meaning is the only one which comes to clear consciousness.

It follows from this account of language as a means of communication that words and their combinations express that process of analysis and synthesis which essentially constitutes a train of ideational thought. The use of language pre-supposes the breaking of the concrete content of actual perception into its partial aspects and constituents, and the re-combination of

* Ch. iv., p. 73. It will repay the student to read the whole chapter.

these to form new ideal wholes. The variation of meaning with context is due to the nature of the constructive process. The word only calls up what is relevant to the controlling interest guiding the train of thought.

Ideational activity would seem from this account of the matter to be a prior condition of the existence of language. In logical strictness, this is so, but it is equally true that ideational thinking could only exist in a most rudimentary and inchoate form apart from the use of some kind of expressive signs. Language is not merely an accompaniment of ideational activity; it is an instrument essential to its development. It is an appropriate means of fixing attention upon ideally represented objects as distinguished from percepts. It becomes the more necessary the more abstract ideal representation is, — in other words, the less it contains of the concrete details of actual sense-perception. The precise mode in which expressive signs serve to fix attention on ideas will be considered later on. Here we content ourselves with provisionally affirming that language in some form is an indispensable tool to think with. Within the mind of the individual thinker it serves to fix attention on the object of his own ideas; in communication with others, it serves to fix the attention of the hearer on the ideally represented objects present to the mind of the speaker.*

For illustration of conceptual analysis and synthesis, we may take any sentence or intelligible combination

* It is unfortunate that there is no word corresponding to *idea* as *percept* corresponds to *perception*. In ordinary language *idea* is used both for the psychical state and for the object apprehended in it.

of words. Each word stands for some partial aspect of the concrete detail of actual perception, — in other words, it stands for what is called a *universal* or *concept*, — the object of the psychical process called a *conception*. The universals expressed by the several words combine in a unity, each helping to determine and particularise the rest, so as to form an ideal whole. Take such a sentence as "Nansen skates." "Nansen" is a proper name, and may therefore be supposed to stand for a particular, not for a universal. This is true from a certain point of view. The word "Nansen" designates a particular human being. But from another point of view it is a universal. The individual Nansen is a universal as the unity and connecting identity of his own manifold and varying states, relations, qualities, and activities. Nansen as perceived must be Nansen eating, or Nansen sleeping, or Nansen lecturing, or Nansen skating, or determined in some other specific way. But the word "Nansen" by itself does not stand for any of these particular determinations rather than others. It stands for Nansen in general. The word "skates" particularises the universal "Nansen." But it does so by means of another universal. Other people skate besides Nansen, in varying manners and in varying times and places. Thus the universal "skating" not only particularises the universal "Nansen," but receives particular determination from it. The skating is not any skating, but the skating of a Nansen. Now if instead of framing the proposition "Nansen skates," we actually saw him skating without any inward or outward translation of the experience into words or equivalent signs, there

would be no conscious contradistinction between the agent in general and his particular act, or between the act in general and the particular agent. The psychical function, then, which is involved in the use of language, is conceptual analysis and synthesis. *Discourse* is the expression of *discursive* thinking.

We now pass to an old and well-worn problem, — that of the origin of language. Of course the question is not capable of what may be called a historical answer. There are no records or remains of remote prehistoric ages which would enable us to state on historical evidence the circumstances under which intercommunication of ideas by means of expressive signs first originated. But we are by no means at a loss on that account. Language actually grows and develops under our eyes, and we can apply the general laws of its growth and development to account for its origin. Besides this, we have in savage races examples of stages of mental development incomparably more rudimentary than our own; and by noting the points in which they differ from us we may obtain a clue to the nature of the differences between ourselves and primitive man.

§ 2. *The Motor Element in Ideal Revival.* — Perceptual process is penetrated through and through by experiences of movement. Passive sensations only serve to guide and define motor activities. Besides the movements which directly subserve the attainment of practical ends, there are also constantly present the adjustments of the organs of sense involved in attending to percepts. There are the movements of exploration by which touch and sight follow the contours of objects. There are the attitudes of listening for sounds,

and sniffing for smells, and the like. Ideal process, being a reproduction of perceptual, tends to reinstate the movements which form an essential part of it. In mentally reproducing the visual appearance of a thing we mentally follow the outline of it with the eye, and in general we tend to repeat in idea the movements of ocular adjustment. Similarly, in recalling a sound, we may mentally repeat the attitude of listening, or better still, mentally imitate the movements by which the sound is produced. If it is a sound which we are able more or less successfully to imitate by means of our own vocal organs, we mentally articulate it. Our power in this respect is greatest with the words of ordinary speech, so that when we recall them in the form of mental images, we constantly reproduce the motor process of articulation as well as the mere sound.

This revived motor element has a peculiar importance, because our power of freely controlling, detaining, modifying, and repeating mental images depends in a very large measure on our power of controlling their motor constituents or accompaniments. "The reason why revived movement is capable of discharging this special function is that our control over it is analogous and proportionate to our power of controlling actual movements."* "To show that this is so, we have only to point out that the more intimately a given experience is connected with motor processes peculiar to it and distinctive of it, the greater is our command over it in ideal representation."† A good example is supplied by the articulate sounds of ordi-

* *Analytic Psychology*, vol. i., p. 213. † *Ibid.*, p. 215.

nary speech. "Let any one select for mental experimentation any word or sentence; he will find that he has almost as great a control over the internal articulation as over the external. The chief restriction appears to lie in the inability to make the represented sound as loud as the actual sensation; but, apart from this, one may do almost what one likes with it. We may repeat it thousands of times with unfailing definiteness, precision, and certainty; we may say it rapidly or slowly, with emphasis or without emphasis or with emphasis that varies; we may even invert the order of the sound with as much freedom as in actual utterance. The same holds good with the simpler geometrical figures. We can trace them mentally much as we trace them physically."* Contrast such cases as that of smells, or of organic sensations. Many persons can mentally reproduce odours with great vividness and accuracy; but vivid and accurate reproduction is one thing, and free control is another. We cannot, as in the case of articulate words, pass from one odour to another in a series, with greater or less rapidity, varying the order of succession according to our caprice or convenience. We cannot repeat the same odour "thousands of times with unfailing definiteness, precision, and certainty"; we cannot vary its intensity at will as we can the loudness of articulate sounds. So far as we have any power in this respect, it appears to be indirect and depends on the recall of the appearance of odorous objects or of other associative circumstances. We cannot simply take some smell, and in idea freely run up and down the scale of its varying intensities; according to all

* *Ibid.*

analogy, we should be able to do this, if we possessed and habitually exercised the power of actually producing the smell, and varying its intensity by our own movements.

It is in the motor elements of the mental image, and in the control which they yield over the image as a whole, that we have ultimately to look for the origin of expressive signs, or in other words, of language, in the broadest sense of the term. We have said that language is an appropriate means of fixing attention on ideally represented objects, as distinguished from perceived objects. Since the means of controlling ideal representations lies in the motor constituents of mental images, the source of language must be found here or nowhere. The first definite stage in the development of expressive signs is constituted by the tendency of ideas in so far as they have a motor aspect to issue in actual movements.

§ 3. *Tendency of Motor Reproduction to pass into Actual Movement.* — No one has done more than Dr. Bain to bring into prominence the importance of the motor constituents of ideas, and he has also laid great emphasis on the tendency of ideal movement to pass into actual movement. In the mental revival of experiences of energetic action, "it is," he says, "a notorious circumstance that, if there be much excitement attending the recollection, we can only with great difficulty prevent ourselves from getting up to repeat them. . . . A child cannot describe anything that it was engaged in, without acting it out to the full length that the circumstances will permit. . . . No better example could be furnished than the vocal recollections. When we

recall the impression of a word or a sentence, if we do not speak it out, we feel the twitter of the organs just about to come to that point. The articulating parts — the larynx, the tongue, the lips — are all sensibly excited. . . . Some persons of weak or incontinent nerves can hardly think without muttering — they talk to themselves." *

"Thinking is restrained speaking or acting." † Since Dr. Bain first wrote these words, psychological investigation has very strongly confirmed their general purport. The tendency of ideas to act themselves out is now a commonplace of psychology. Probably Dr. Bain exaggerates the degree in which this tendency is ordinarily realised. The twitter of the organs of speech about to come to the point is not a constant feature of inward articulation in all persons. But there is no doubt that it is very frequent, and in some people almost invariably present. In what he says about thinking aloud, he rather understates his case; this habit is by no means confined to persons of weak or incontinent nerves. It is often found in those who become intensely absorbed in their own trains of thought to the disregard of their social surroundings. Social convention has a great deal to do with the restraint which we ordinarily put on the actual utterance of the thoughts which pass through our minds.

The general theory of the tendency of ideas to pass into movements is as follows. Ideational process is correlated with brain process. The brain is so intimately one with the rest of the organism, that processes

* *The Senses and the Intellect*, fourth edition, p. 357.
† *Op. cit.*, p. 358.

in it cannot take place without in some measure overflowing to other parts of the body; and in particular to those parts with which it is most directly connected — the muscles. The whole complex apparatus of efferent nerves creates a functional unity between brain and muscle. This overflow of excitation to the muscles may, and constantly does, take place without the subject being at all aware of it. Thus in thought-reading the place where an object has been hidden is revealed to the thought-reader by slight muscular pressures and twitches unconsciously produced by his guide, who all the time concentrates his attention on the idea of the hidden object and the place where it is to be found.

On the whole, at the level of our present mental development, ideational trains of thought proceed for the most part without any distinct and conspicuous embodiment in actual movement, unless a need arises for communicating them to others. But the conditions are very different in more primitive stages of evolution. Where ideational activity is just struggling into independent existence, so that it may be regarded as little more than an extension or supplement of perceptual activity, ideas can scarcely fail to pass into overt movements. The more life in general is a life of bodily activity, the more likely is bodily activity to enter into ideal process. Besides this, we must remember that the less developed and habitual are trains of thought, the more difficult they are to sustain; so that whatever means offer themselves for the furtherance and support of the process will be utilised. But the partial repetition of the ideally represented object by means of actual movements yields a ready and effective

means of fixing attention on the object. Hence we may regard the actual expression of ideas by movements as primary, and the absence of such expression as the result of a comparatively high degree of mental development.*

But even if we suppose that the tendency to act out an idea does not find distinct realisation in the individual's own private trains of thought, it must do so when occasion arises to communicate with others. Suppose that *A* and *B* are co-operating in some important work. It is *B*'s turn to do something, and *A*'s to wait expectantly. *B* either fails to do what is required of him or does it wrongly. Suppose that *A* has no conventional language to express himself in, or even that he has not used language of any sort until that moment. If he is capable of ideally representing what he wants *B* to do, he can scarcely fail in his impatient eagerness to make movements indicating what is required. It may be sufficient to point to some object actually present. This does not strictly speaking involve the use of language. But if he uses a truly imitative gesture or combination of imitative gestures, then his action is the birth of language. He may, for instance, point to a rope and imitate the act of hauling. The imitation of the act of hauling is simply his own idea of hauling issuing in actual movement. Thus from a psychological point of view the most primitive form of language

* "I fancy the main body of the lower classes of Africa think externally instead of internally . . . even when you are sitting alone in the forest you will hear a man or woman coming down the narrow bush path chattering away with such energy and expression that you can hardly believe your eyes when you learn from them that he has no companion." M. H. Kingsley, *West African Studies*.

is the imitative gesture. We shall now proceed to give evidence in favour of this position.

§ 4. *Natural Signs.*—Many writers appear to assume that all language worthy of the name must consist of conventional signs. Such a view creates altogether unnecessary difficulties. The essential function of language as a means of conceptual analysis and synthesis may be fulfilled by a system of natural signs such as uninstructed deaf-mutes employ and largely devise for themselves. A natural sign bears in its own nature a resemblance to the thing signified, to the mode of using or producing it, or at least to some action, state, or adjunct characteristic of it. Merely demonstrative gestures which stand alone and not as part of a context, expressed or understood, are not to be counted as part of the language of natural signs. It is true that they are signs and that they are natural. But they are not language in the only sense which is relevant; for they are not means of conceptual analysis and synthesis. They consist in acts drawing attention to an object actually present or to be found in a certain direction. But if the object thus indicated is pointed to not for its own sake, but merely as a sign of some absent object which it happens to resemble or with which it has some kind of natural connexion, the gesture is a true expression of ideas and therefore belongs to language in the strict sense. Demonstrative signs also become part of language when they belong to a context. Thus if a man imitates an action and then points to another man, the act of pointing is a sign of gesture-language. For it does not merely draw attention to the man as he presents himself at the moment;

on the contrary the presence of the man at the moment is only used as a means of representing something else; it is used as a means of representing the man as performing an action which at the moment he is not performing. Similarly, the direct expression of emotion cannot be regarded as language. But it is otherwise when the expression of a special emotion is imitated, so as to convey the *idea* of the emotion. Thus if *A* noticing *B* preparing to act in a certain way points to *C* and frowns, this is true language. For *A*'s act is not a direct expression of his own emotion, but only a way of conveying to *B* his idea that *C* will be angry if *B* does not alter his conduct. So, too, the imitation of a characteristic sound made by some animal or thing is not in itself language; it only becomes so when the mimicry is meant to convey the idea of the thing or animal which makes the sound.

Earlier writers on the origin of language have been much perplexed by the difficulty of explaining how a convention as to the meaning of words could be established between the different members of a community who were not already in possession of a means of communicating their ideas. This difficulty has been frequently used as an argument for referring the origin of language to a divine revelation. But it disappears if we suppose the natural expression of ideas to be prior to the use of arbitrary signs.

Positive evidence for the primitive nature of natural signs may be drawn from the case of deaf-mutes and savages. A deaf-mute called Kruse, a highly educated man and a distinguished teacher, has left on record an account of the spontaneous origin of natural language

in the minds of those who cannot command conventional signs. He says: "What strikes" the deaf-mute "most, or what makes a distinction to him between one thing and another, — such distinctive signs of objects are at once signs by which he knows these objects, and knows them again; they become tokens of things. And while he elaborates the signs he has found for single objects, that is, while he describes their forms for himself in the air, or imitates them in thought with hands, fingers, and gestures, he develops for himself suitable signs to represent ideas, which serve him as a means of fixing ideas of different kinds in his mind and recalling them to his memory. And thus he makes himself a language, the so-called gesture-language; and with the few scanty and imperfect signs, a way for thought is already broken, and with his thought as it now opens out, the language cultivates and forms itself further and further."* According to Schmalz, the more intelligent deaf-mutes form natural signs spontaneously, if they are not altogether neglected by their fellow-men. At first they point to the objects in which they are interested, in order to indicate their wishes. If the objects are not in sight they fetch them or conduct others to them. The deaf-mute points to a dish or a jug and so indicates his desire for what the dish or jug contains. "If he wants bread he brings the whole loaf, together with a knife, and he hands both to the person who is to cut a slice for him." There is not much to distinguish such signs from the demonstrative gestures an intelligent monkey may employ. But cases occur in which devices of the kind described are inadequate. "The deaf-mute,

* Quoted by Tylor, *Early History of Mankind.*

it may be, wants a drink of water; he sees neither water nor drinking-glass in the room, so that he cannot point to the one or fetch the other. He takes some one by the hand in order to lead him to the place where the water is. The person to whom the appeal is made refuses to move. The deaf-mute is perplexed and embarrassed. Finally he adopts the device of pointing to his mouth." This is something more than a practical expedient. It is the expression of an idea. But the sign is ambiguous. The person addressed may, through a real or pretended misunderstanding, give the deaf-mute something to eat instead of something to drink. He is thus driven to define his meaning by a combination of gestures — a context of natural signs. He directs his hand towards his mouth again, but now he curves it as if it held a glass, at the same time imitating the act of drinking. "At last he makes himself understood," and "from this time forward, he learns to describe absent objects, and he forms for himself a language of natural signs, at once betokening and producing a distinctively human power of thought."*

In a certain degree what has been said of deaf-mutes applies also to ordinary children. "A child's gestures are intelligent long before it has any extensive command of intelligent speech, although very early and persistent attempts are made to instruct it in the use of words, and no such attempts are made to instruct them in the use of gestures."† "Missionaries, explorers, and shipwrecked mariners acquire the language of

* *Ueber die Taubstummen*, pp. 267 *seq.*

† Col. Mallery in the Annual Report of the Bureau of Ethnology of the Smithsonian Institute, vol. i., p. 276.

savage races through the medium of natural signs. They point to objects and make gesticulations, at the same time observing what articulate sounds are associated with these motions by the persons addressed."* Whenever a person is at a loss to express himself by means of words he naturally has recourse to gestures if the subject-matter admits of it. "Without having ever before seen or made one of the signs used by Indians or deaf-mutes, he will soon not only catch the meaning of their's but produce his own, which they will likewise comprehend."† The primitive character of gesture-language is indicated by its widespread use among savages. This is partly due to the inadequacy of the signs of their conventional language, and partly to the diversities of speech which make the spoken words of neighbouring tribes unintelligible to each other. Travellers have reported the existence of tribes whose oral language is inadequate even for ordinary intercourse. Their evidence has been called in doubt, but apparently without sufficient reason. It is well established that the Bubis of the island of Fernando Po cannot understand each other in the dark. Miss Kingsley in her *Travels in West Africa* tells us that among the Fans it is common to propose to go to the fire in order to see what people are saying. But the second reason we have assigned is probably the more important. The fullest development of natural signs is found among the North American Indians, where the diversities of conventional languages within a limited area are very numerous.

The free and copious use of imitative gestures is al-

* *Ibid.* † *Ibid.*

most universal all over North America, and it is also very widely spread in South America. It must not be supposed that the same signs are everywhere in common use. This is far from being the case. There is no common code. A common code is only possible by convention. It must be fixed by usage. But the vast distance which separates different tribes does not permit of this arbitrary uniformity arising from habit. An imitative gesture delineates the most striking outlines of an object or the most characteristic features of an action. But different individuals and different bodies of people do not always agree in the selection of these outlines and features. A deer for instance may be designated "by various modes of expressing fleetness, by his gait when not in rapid motion, by the shape of his horns, and sometimes by combinations of several of these characteristics."* Besides this, when a sign has become fixed by usage it may become modified and abbreviated in various ways, as conventional understanding takes the place of self-interpreting pantomime. It might therefore be expected that Indians using one dialect of natural signs would not understand other Indians, using a diverse dialect. It would appear still less probable that an Indian should on the first encounter understand a deaf-mute or *vice versâ*. But in fact it is found that in spite of the diversity of signs mutual understanding is possible between all who have any expertness in the use of imitative gestures. However special signs may vary, the formative principle remains the same, and this formative principle adapts itself in the most flexible way to varying conditions. A man may understand at

* Col. Mallery, *op. cit.*

once a gesture which he has never seen before. If any one of the more conventional signs is not comprehended, an Indian skilled in the art of imitative suggestion tries new ways of conveying his meaning. It is often sufficient to reproduce in full pantomimic detail a gesture which had first been given in an abbreviated form. If this expedient fail, it is always easy to try other modes of representation. In one way or another experts in sign-language manage to interchange ideas in the form of long dialogues and narrative without any prior convention. Of course it is assumed that there is a basis for mutual understanding in community of interest and experience.

§ 5. *Natural Signs as Instruments of Conceptual Thinking.* — Expression by natural signs fulfils the essential function of language as a means of conceptual analysis and synthesis; by it the content of concrete experience is resolved into relatively elementary constituents which are freely recombined in new ideal structures. That the signs of gesture-language bring with them an apprehension of the general or universal aspects as distinct from the particular and specific details of perceptual experience is plain from their very nature. An imitative gesture can only suggest general characters or features common to a class of objects or actions. The thought it expresses or evokes is only a fragment of a thought and demands completion. It is indeterminate and requires further definition from a context expressed or understood. The context itself consists of other imitative gestures, each expressing a relatively indeterminate universal. Each of these relatively indeterminate universals particularises and

defines the others, and is by them particularised and defined. Just as we can illustrate this process by taking at random any intelligible combination of conventional words, so we can illustrate it by taking at random any intelligible combination of imitative gestures. The analogy holds good in another respect also. The natural sign, like the conventional word, becomes modified in meaning in varying contexts and under varying circumstances.

We may illustrate both points simultaneously. An acquaintance of Colonel Mallery's once asked the same favour of two chiefs successively. Each in replying used the common sign for repletion after eating, — "*viz.* the index and thumb turned towards the body, passed up from the abdomen to the throat; but in the one case being made with a gentle motion and pleasant look, it meant 'I am satisfied,' and granted the request; in the other, made violently, with the accompaniment of a truculent frown, it read, 'I have had enough of that.'" Here the sign used for bodily repletion derives a metaphorical meaning from the context in both cases, and a different meaning in each.

§ 6. *Conventional Element in Gesture-Language.* — The theory that natural signs are psychologically the most primitive form of language has two advantages. The first of these is, that self-interpreting signs arise naturally and spontaneously wherever there is any need for them. The second is, that they rapidly tend to become more or less conventional between members of the same community so as to pave the way for a system of purely arbitrary signs. The imitative gesture tends to become more or less conventional inasmuch as the

understanding of it comes to depend, not merely on its own intrinsic value as a self-interpreting sign, but also on its having been employed and understood before. On a first occasion, the sign may occur in circumstances or in a context which leave no doubt as to the meaning; on a subsequent occasion these circumstances or this special context may be absent, so that if the sign were then made for the first time, it would not be understood; nevertheless, it may be understood on the second occasion just because it had been understood on the first occasion. "The deaf and dumb teacher in the Berlin institute was named among the children by the action of cutting off the left arm with the edge of the right hand; the reason of this sign was not that there was anything peculiar about his arms, but that he came from Spandau, and it so happened that one of the children had been at Spandau and had seen there a man with one arm."* It is evident that this sign might come to be understood and used by members of the institution who knew nothing of its derivation.

One highly important way in which natural signs tend to become relatively conventional is through abbreviation. There is a strong disposition to abbreviate familiar gestures. The mere hint of a movement comes to be substituted for the movement itself. Colonel Mallery observed a Cheyenne Indian attempting to convey the idea of *old-man*. "He held his right hand forward bent at elbow, fingers and thumbs closed sidewise. This not conveying any sense, he found a long stick, bent his back, and supported his frame in a

* Tylor, *Early History of Mankind*.

tottering step by the stick held as was before only imagined."*

By processes of this kind, those who employ gesture-language must become familiar with the possibility of a conventional arrangement for the expression of ideas. But the natural system never actually passes in this manner into a conventional system. Its formative principle remains all through essentially that of imitative representation. The deaf-mute and the Indian rarely lose sight altogether of the natural connexion between sign and signification. A bystander may be totally unable to detect the meaning of the signs used in conversation, owing to abridgment of natural pantomime. But the deaf-mute, or the savage, is able if required to act out in detail his abbreviated gesture. Natural signs may lead up to a conventional language, but they do not develop into one.

§ 7. *Origin of Conventional Language.* — The language of natural signs is pervaded by the systematic unity of a single formative principle — that of imitation. This gives it so strong and tenacious a hold upon the mind that it can only be displaced by a conventional language which has also a systematic unity of plan. It can never be displaced by a chaotic multiplicity of detached and disconnected signs, each of which has to be separately remembered by an independent mental effort. The human mind could not endure so burdensome a load. The conventional signs which are to displace imitative gestures must therefore form some kind of system, unified by general formative principles. Now visible gestures are theoretically and practically capable of form-

* Annual Report of Bureau of Ethnology, vol. i., *loc. cit.*

ing a conventional system. The deaf-mute is sometimes taught a finger-language which is purely conventional. He makes a limited number of easily remembered manual signs, each corresponding to a letter of the alphabet, and by successively combining these he spells out words and sentences. Such a language has a unity of composition which makes it manageable. There is in it a systematic correspondence between expression and meaning. Where meaning is partially similar, expression is partially similar; where meaning is modified, expression is modified in a corresponding manner and degree. But the important point is that the systematic unity of composition belongs in the first instance to articulate speech. The manual alphabet is merely a translation of the oral alphabet. Further, it could only have been devised after articulate utterance had been already analysed into its elementary constituents. Now a conventional system of manual or other visible movements analogous to the conventional finger-alphabet could not grow up spontaneously out of a previous system of imitative gestures. We might as well expect a deaf-mute or an untutored savage to invent the steam-engine or the electric light. A limited and easily manageable set of manual signs is required. But on what principle are the signs to be selected, and on what principle are they to be limited? Oral language had been in use for long ages before its alphabet was discovered. But the invention of a similar system of visible signs would have been incomparably harder than the discovery of the alphabet. The discovery of the alphabet was the discovery of unity of composition in a structure already existing and familiar to mankind. But the in-

dependent invention of a visible alphabet would have been not a discovery arising through reflective scrutiny of familiar experience, but a highly artificial creation.

On the other hand, articulate utterance is as a natural process characterised by unity of composition. This unity of composition is determined by the structure of the organs of speech. There is no need to invent an alphabet before combining elementary sounds in syllables and words. The alphabetical sounds which form the vital constituents of all speech were, as Ferrier says, "there from the beginning." Undetected, but yet present and operative, they made possible a systematic correspondence between meaning and expression. This correspondence is not indeed of the same kind as that which characterises the imitative gesture. Any isolated imitative gesture has a direct affinity with the thing it represents. The absence of this direct self-interpreting affinity is just what distinguishes the conventional from the natural sign. None the less, systematic correspondence is possible where there is no direct resemblance. The rise and fall of the mercury in the thermometer corresponds to the rise and fall of temperature, but it does not resemble it. So, apart from all similarity between sounds and what they signify, there may be a correspondence between the relations of sounds and relations of meaning. Where meaning is partially similar, its utterance may be partially similar; where meaning varies more or less in this or that special manner, expression may vary more or less in a corresponding manner. This we find to be the case in all known languages.

It is here that philological analysis becomes impor-

tant. In all languages there are traceable certain comparatively elementary phonetic components called roots, expressing primary universals or products of conceptual analysis; and these roots variously modified and entering into various combinations express conceptual synthesis or discursive thinking. They blend and combine in continuous speech just as the corresponding concepts blend and combine in continuous thought. This is possible because of the ultimate unity of composition of the phonetic material, which is resolvable into elementary alphabetic sounds which do not occur in isolation but as parts of an articulate complex.

§ 8. *Certain Other Theories of the Origin of Speech.* — Attempts have been made to explain the origin of language without emphasising the importance of the visible gesture as the starting-point. There are three main theories of this kind, which have been nicknamed by Max Müller the *pooh-pooh* theory, the *bow-wow* theory, and the *ding-dong* theory. Their more pretentious titles are the *Interjectional*, the *Onomatopœic*, and the *Pathognomic* theories. The principle involved in all these theories is essentially the same. They all attempt to trace back conventional signs to natural signs; but they exclude from consideration visible gestures, and confine attention only to vocal signs. It is evident that to mimic the mewing of a cat, in order to convey the idea of that animal, is as much an imitative gesture as going on all fours and humping the back for the same purpose. It is mimicry of this kind on which the *bow-wow* theory relies for explanation. The same holds good of imitating the cry of fear, in order either to convey the idea of the emotion or of the approach of

a dangerous object. This is the sort of expressive sign which is most primitive according to the *pooh-pooh* theory.

The *ding-dong* theory is more subtle, and it has the distinction of being advocated by Professor Steinthal. According to it specific kinds of objects so affected primitive man as to elicit from him, or to use Max Müller's metaphor, to *ring out* of him, correspondingly specific utterances. The most primitive words would therefore be phonetic types *rung out* from the organism of the first man or men when struck with an idea. There is a harmony of sound and sense which does not depend on the imitation of one sound by another. The charm of literary style and especially of poetry consists largely in the subtle affinity between vocal expression and the objects or activities expressed, which may exist apart from any resemblance of sounds to one another. The word *zigzag* is a good illustration. The *zig* goes this way, and the *zag* goes that way, thus describing a *zigzag* course. Again, take the line

"The vorpal blade went snicker snack."

The sound is expressive of the gleaming and rapid motion of the blade, rather than of the sound of it. What philologists call reduplication has often this intrinsic expressiveness, *e.g.* a "big big man"; a "wide wide sea"; "far far away." Among the Botocudos of Brazil *ouatou* stands for stream, *ouatou-ou-ou-ou* is the sea.

In this metaphorical expressiveness of vocal utterance we may detect under a somewhat deceptive disguise the essential principle of the imitative gesture.

Even the disguise is not present in the case of reduplication; here more of the same kind of sound represents more of the same kind of thing. Other instances may look more mysterious. But the mystery to a large extent disappears when we consider that articulate speech consists not merely in articulate sounds, but also and as well in the motor process of articulation. The tongue actually does go zigzag in uttering the word *zigzag*. *Tick-tack* imitates not only the sounds of the clock, but the rhythmic movement of the pendulum by a corresponding movement of the tongue. Even born deaf-mutes use the organs of articulation in this imitative way. Heinicke, as quoted by Tylor mentions a "deaf-mute, nineteen years old, who had invented many writeable words for things." Some of these were arbitrary; but at least two, *mumm* for eating, and *schupt* for drinking, were, as Tylor remarks, an imitation of the movements of the mouth in eating and drinking. In like manner *njan* means to eat in the Negro-English dialect of Surinan, and *njan njan* means food.* Thus the *ding-dong* theory is in its more obvious applications reducible to the general principle of the imitative gesture. That part of it which is not so reducible is of little value as an explanation of the origin of language. Vague and recondite affinities between sound and sense cannot in the first instance constitute a natural and spontaneous language, because they are not sufficient to make the vocal utterance self-significant or self-interpreting. For this it is not enough that a word should be dimly felt to be appropriate when its application is already known. It is necessary that the sign should be

* Tylor, *Early History of Mankind*, p. 73.

so stamped with the character of the thing signified as to make clear its application in a given context and under given circumstances. On the other hand, it must be admitted that when once the meaning of a word has become a matter of convention a general feeling of affinity between sound and sense may operate powerfully in determining the creation and selection of new words.

These and similar theories must all be regarded as part of the general doctrine that natural signs psychologically precede conventional signs. They are true and useful inasmuch as they emphasise the part played by phonetic elements in imitative expression. The imitative use of vocal utterance paves the way for the development of conventional speech. Why conventional language has come to consist almost entirely of phonetic elements we have attempted to explain in the last section. The reason why natural signs have to so large an extent been displaced by conventional signs lies in their superior convenience and power.

§ 9. *Advantages of Conventional Language.* — The primary and essential procedure of the language of natural signs is to represent things and processes by imitating the broad features of their sensible appearance and especially of their appearance to the eye. But the characters which are capable of being so imitated are of a comparatively low grade of generality or abstractness. They represent an analysis of perceptual experience into universals and its reconstruction out of these universals. But the universals themselves are very far from being simple and ultimate. They in their turn are intrinsically susceptible of analysis, and constituents thus revealed are again susceptible of further analysis,

and so on. Now the more advanced is this process of dissection, the more helpless is pictorial representation to express the result either within the individual consciousness or in the intercourse of different minds. But the power of mentally representing a universal is simply the power of conceiving it. Where the mental representation does not exist, the conception does not exist. Hence a mind whose discursive thinking could only find expression in self-interpreting signs, would be incapable of the higher reaches of abstraction. Broadly speaking, natural signs are capable of fixing attention on universals which are constitutive characters of particular objects as presented in perceptual experience; but they can only to a very limited extent fix attention on universals which are constitutive characters of other universals. The thinking which depends on the imitative gesture generates concepts; but it can hardly generate a conceptual system, in which there is an ascending scale of generalisation, passing from species to genus, and from genus to higher genus, and so on through a series of gradations till the highest genus is reached. It seems beyond the unaided powers of the thought which works through natural signs to frame a system of classification.

This impotence of the imitative gesture to express higher universals is easily illustrated. "To make," says Tylor, "is too abstract an idea for the deaf-mute; to show that the tailor makes the coat, or that the carpenter makes the table, he would represent the tailor sewing the coat, and the carpenter sawing and planing the table."* According to Schmalz, "The more general

* *Early History of Mankind.*

determinations of magnitude such as *broad, narrow; long, short; thick, thin; high, low;* cannot be accurately expressed; the most that can be done is to teach the deaf-mute signs which are suitable to the largest proportion of cases."* Often a general concept is capable of pictorial expression; but only in a way which is cumbrous and circuitous when compared to the conventional. A series of imitative gestures may be needed, where a single word would effect the same purpose with greater precision and certainty. Thus an Indian who wished to convey to a deaf-mute that he had travelled in the train, could only convey the idea of *train* by three successive bits of pantomime, one representing the conception of something covered in, another that of wheels, and the third that of smoke. Now this mode of expression may at first sight appear more analytic than the use of the single word *train*. It resolves into three universals and reconstructs out of them what the conventional language expresses in its totality by one sign. But we must remember that we could use many signs if there were need for them. If there were occasion to give an analytic description of a railway train, that description could be given with far more fineness, precision, and adequacy in words than in imitative gestures. The conventional language uses one word because one word is enough. The language of imitative gesture uses three separate bits of pantomime because it cannot do with less. It is forced to describe because it cannot directly designate. Now why is it unable to express by a single appropriate sign the general conception of a *railway train?* The reason

* *Ueber die Taubstummen*, p. 275.

is that the concept of a railway train possesses too high a degree of universality. It gathers up into unity a great multiplicity of special features, functions, and relations. Among these are included some which it would be difficult to express concisely, or even to express at all, in the gesture language, as for instance the principle or mechanism of its locomotion, its function as a means of communication and traffic, and so on. Now the comprehensive unity which embraces within itself all these particular determinations is not capable of being directly expressed in natural signs, without the aid of convention. Hence in a communication by imitative gestures, where there has been no previous convention, the only course possible is to select certain particular characteristics of the object, which are at once important and easily presented to the eye, and to exhibit as many of them as appear sufficient to enable the intended meaning to be divined. The same deficiency also makes it difficult to refer to an individual person by a self-expressive sign. The imitative gesture as such and apart from convention is incapable of directly expressing the universality which belongs to the individual and is associated with the Proper Name. The depiction of some special characteristic or peculiarity may or may not be successful in directing attention to the person intended. All depends on context and circumstances. If representation of this or that characteristic proves insufficient, others may be added until understanding is reached, as in the case of the railway train.

CHAPTER VI.

THE EXTERNAL WORLD AS IDEAL CONSTRUCTION.*

§ 1. *Unification of Perceptual Data.* — It is the function of ideational consciousness to connect in a continuous whole the detached data of sense-perception occurring in the course of individual experience. The isolated facts of sense-perception are made continuous with each other by interposing between them ideally represented links. The physical object reveals itself in actual perception as existing, persisting, and changing independently of the motor activity of the percipient. Its characteristic nature as physical object essentially involves this independence of the percipient subject and his changing position in relation to it. But the percipient may not only alter his relative position in regard to it, while he is actually perceiving it; he may also turn aside from it altogether, or remove himself to such a distance that it can no longer affect his senses. As change of position on his part makes no difference to the thing as physical object, so his presence or absence can make no difference to its nature and existence. When therefore he ideally represents it, he will represent it as existing, persisting, and changing, although it

* In connexion with this chapter, the student should recall and if necessary re-read ch. ii. of bk. iii., div. ii.

is no longer perceived. He will represent it as existing, persisting, and changing in the same manner as if he were in its presence and actually observing it. Herein lies the possibility of extending knowledge of material things and processes far beyond the limits of actual perception so as to construct an ideally represented world of which only detached fragments are actually perceived.

We have now to assign the motives which prompt and guide the process of ideal construction. The first of these is that which constitutes the impulse to all theoretical as distinguished from practical thinking. It is the endeavour to clear experience from incoherence, contradiction, and ambiguity. Incoherence, contradiction, and ambiguity obstruct the onward flow of ideas. Where they rise, therefore, the course of mental activity will direct itself to their removal. Now it is obvious that conflict must continually arise between an object as actually perceived and the same object as ideally represented on the basis of previous perception. A man leaves an object at rest in one place: he returns and finds it in another place: the discrepancy can only be removed by ideally connecting the two experiences by intermediate links representing some mode in which the transference from one place to another may or must have taken place. A fire is left burning brightly; after an interval nothing is found but grey embers. Percept and remembrance must be connected by ideal representation of a fire gradually decaying. Again, the fire which is left burning brightly may after a long interval of time be found still burning as brightly as ever. Here the representation of the fire as gradually decay-

ing collides with the actual percept. It has not gone out. The incoherence may be removed by representing some one as having interfered in the meantime to keep it alive. Apart from actual conflict between idea and perception, the mere strangeness of an object acts as a theoretical motive for ideal construction. The mere inability to fit it into the general scheme of things impels the subject to trains of thought directed to overcome the difficulty.

Merely theoretical interest however is on the whole a factor of secondary importance; and the more primitive the stage of mental development attained, the less important it is. The pursuit of knowledge for its own sake is a comparatively late outcome of mental evolution. In early stages of human development thinking is mainly subservient to practical ends, and its impelling motive lies in the pressure of practical needs. Thus the process of ideal interpretation was carried on only so far as it supplies a guide to action. Merely theoretical speculation might exist as a sort of amusement: but it was not followed out in a serious and strenuous manner.

§ 2. *Verification and Re-interpretation.* — The primary function of ideal construction is the framing of means for the attainment of practical ends. The ideal combinations which thus arise are of use only in so far as they are translated into action. The plan which is formed in the head must be put into execution. Now the course of events which takes place in the execution of the plan may or may not conform to the ideal prearrangement. When it does so conform, the ideal prearrangement is verified by the result. When events fall

out otherwise than was anticipated, the ideal pre-arrangement is contradicted by the result. In case of failure, there is a new impulse to thought. The ideal combinations must be modified until an effective plan is reached. In this way, the process of ideal construction is perpetually finding and utilising new data. In the original ideal train, there may be a sequence *a*, *b*, *c*, *d*, but the actual sequence of events when the plan is carried into execution, may be *a*, *b*, *c*, *q*. This provokes a new process of ideal construction, in which the represented order is *a*, *b*, *c*, *m*, *d*. On trial, this ideally represented sequence is verified. On subsequent occasions, whether the practical end is the same or different, the sequence *c*, *m*, *d* will be substituted for the sequence *c*, *d*, where other relevant conditions are similar. Thus ideal construction subserves practical activity, and in its turn practical activity yields fresh material for ideal construction. It may happen of course that a plan of action sometimes succeeds and sometimes fails, owing to conditions beyond the agent's control and possibly beyond his power to foresee. When this is the case, effective re-construction of his ideal scheme is not possible, and he must take his chance of success or failure in each particular instance. Again, it may happen that the result depends upon conditions entirely outside the range of his experience, so that his action is quite inefficient. Under such circumstances there will be no cessation of the activity of ideal combination or practical execution, if the interests involved are sufficiently strong. We have an instance of this in modern times in the widespread use of quack medicines. The patient is really helpless, but he tries every means that suggests

itself. In more primitive stages of mental development, whole systems of ideas arise in this way, which we from our superior point of view stigmatise as mythology or superstition.

Real insight into physical nature, and effective control over its processes, are acquired mainly by mechanical contrivance and mechanical execution. Weaving, basket-work, pottery, building, the construction of tools and weapons, yield in early stages of development a real knowledge of the nature of physical things and a real control over them. In such mechanical operations, ideal analysis and synthesis are accurately translated into real analysis and synthesis, a real separation and recombination of the parts of matter. Thus the constitution of the physical world is learnt by actually taking it to pieces and putting it together again. In general, insight into natural process is in proportion to the degree of development of the mechanical arts.

The knowledge of nature which is embodied in modern science is essentially of the same type. There is however one important difference. We now artificially separate and re-combine physical conditions for the sake of obtaining knowledge, and not merely for practical purposes. Experiments are now made with a purely theoretical interest, because the love of knowledge for its own sake has become strongly developed.

§ 3. *Space as Ideal Construction.* — There are no perfectly straight lines in nature, but none the less we can conceive a line to be perfectly straight. This is possible, because in ideal construction we can by mental abstraction regard as irrelevant the physical condi-

tions which actually prevent perfect straightness. A drunken man tries to walk straight along a road; but in spite of his efforts his course is more or less conspicuously zigzag. In his own mind, the course he intends to pursue is contrasted with the course he is compelled to pursue against his will. The course he intends to pursue is that which he would pursue apart from certain interfering conditions. It is thus an ideal construction due to conceptual analysis. Now it is possible in this way to disregard and treat as irrelevant all properly physical conditions as contrasted with those conditions which are contained in the very nature of space, as such. A line, as straight as the nature of space will admit of apart from other interfering conditions, appears to ideal construction as a perfectly straight line. In a similar way the conception of a perfect circle and other perfect figures arises. It is possible to notice different degrees of roundness before attaining the concept of a perfect sphere or circle, just as we notice different degrees of bigness, although there neither is nor can be an ideal of perfect bigness. Having had experience of *b*, which is rounder than *a*, we may try to make *c*, which will differ from *b* in degree of roundness as *b* differs from *a*. The obstacles which hinder us in such an attempt are our own deficient skill or the nature of the material we have to deal with. If we abstract from such conditions and consider only the nature of space, we have a concept of perfect roundness. The starting-point of this development is probably to be found in the attempt to make things as round, as straight, or as square as possible in the process of mechanical construction. In this way there

will come to be an ideal of roundness, or straightness, or squareness, and these ideals, at first rude, will ultimately pass into the abstract mathematical conceptions with which Euclid has made us familiar.

The conception of the infinity of space has a like origin. Progress from place to place may be arrested by all kinds of physical conditions; but if these be disregarded, and the nature of space alone considered, no reason is discernible why movement from one position to another should have any limit. A spatial limit is the boundary line between one part of space and an adjoining part; it is a limit *in* space, and cannot therefore be a limit *of* space. It is by mental process of the kind described that the transition is made from space as perceived or imaged to space as conceived.

§ 4. *Time as Ideal Construction.* — The process of ideal construction makes a greater difference in the case of time than even in that of space. We have seen how in an ideally represented time-series the distinction between *now* and *then*, or between one *now* and another, becomes relative, so that according to the point of view we may regard any part of the series as a *now*, and what precedes or follows as relatively future or past. But besides this relative antecedence and subsequence, there is also what we may call an absolute *now*, — the moment of present sensation. Present time in this sense is not merely defined by its relations, but has a special stamp or mark upon it, constituted by its sensuous vividness and definiteness. It thus forms a fixed starting-point for ideal construction of time-order. What is prior to it is regarded not merely as relatively but as absolutely past; what is subsequent to it is re-

garded not merely as relatively but as absolutely future. Past and future are still defined only by their relations; but the starting-point from which we define them is not arbitrary but fixed, and fixed not by ideal construction but by actual sensation. As Dr. Ward says: "To a being whose presentations never passed through the transitions which ours undergo — first divested of the strength and vividness of impressions, again re-invested with them and brought back from the faint world of ideas — the sharp contrasts of 'now' and 'then,' and all the manifold emotions they occasion, would be quite unknown. . . . In the obligation to wait and work in hope or dread of what is 'still to come' there is much more than time-order."* The apprehension of past and future in this absolute sense pre-supposes a starting-point in the immediate sense experience of the moment; and an ideal construction in two directions, on the one hand, of what has preceded, on the other, of what is to follow, the actual *now*. On the whole, anticipation of the future must be regarded as prior in the order of development to reminiscence of the past. For the primary stimulus to ideational activity comes from practical needs; and these are in the first instance concerned with the future. Given a present urgency in the way of hunger or thirst, the primary demand made upon ideational activity is for the devising of means to procure food or drink. It is thus called on to follow out a train of ideas representing the successive links connecting the present state of need with a future state of satisfaction. Trains of ideas representing

* Article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 64.

previous sequences of events will at first be called into play mainly by the need for data derived from the past to use in providing for the future. But the grand stimulus to reminiscence is not to be found in dealings with the physical world, but in the personal and social interests which we shall have to discuss under the head of Self-Consciousness. There are two characteristics which distinguish the future from the past apart from abstract priority and subsequence. The future is uncertain, or in other words, its anticipation may take the form, not of one definitely fixed series of ideal representations, but of a number of alternative lines, which compete with each other for predominance in consciousness. But the past has already taken determinate form; in it one definite alternative has already been selected to the exclusion of others. Besides this, past and future have an altogether different relation to practical activity. The future is something which may be in a greater or less degree determined by the agency of the subject himself; and he must be continually adjusting his actions so as to modify it, if he is to survive and live a tolerable life in the world. But the past is beyond his control. Retrospection can only be of use in supplying data for pre-arranging the future.

So far we have considered only the lapse of time as it appears to the individual subject, or in other words what is sometimes called subjective time. But it is plain that this does not coincide with time as measured by the clock. Shakespeare tells us that time travels "in divers paces with divers persons"; Newton tells us that time moves at a constant rate. Shakespeare's time is evidently subjective time, and Newton's object-

ive time. In a position of great difficulty and danger minutes may appear like hours. Two lovers in the enjoyment of a lovers' conversation may find hours pass like minutes. The subjective estimate of time is different from time as measured by the clock. Objective time as distinguished from subjective is a product of ideal construction. The beginning of the process by which it comes to be conceived is found in the conditions of practical activity. Lapse of time is often an important factor in the attainment of practical ends. It takes a certain time, for instance, to travel from one given place to another, or to cook a piece of meat, or for water to boil, or for clay to harden in the sun. Now in practical calculations it will not do to leave the estimate of the lapse of time in such cases to the varying impressions of the individual. The only effective mode of procedure is to find some other process which coincides in its beginning and termination with the process of which the duration is to be measured. Thus, if the question be, how long it takes to get from one place to another, a sufficient answer may be found by reference to the course of the sun. It will take perhaps from sunrise to sunset of a summer's day; or from sunrise till noon. The efficiency of this mode of procedure depends upon the discovery of uniform standards of measurement. These are best supplied by rhythmic processes which repeat themselves at intervals. If it is found that the duration of events in general can for practical purposes be defined by saying that they take the same time as one or more repetitions of a certain rhythmic process, this process has proved its efficiency as a standard of meas-

urement. The process which we now most commonly use is the movement of the hands of a clock. The movement of the minute-hand, starting from one position and returning to it again, constitutes a fixed period which we call an hour. So the movement over a smaller interval on the dial constitutes another fixed period which we call a minute. Objective time is thus an ideal construction, and the principle on which it rests is that processes otherwise similar, and taking place under similar conditions, will occupy the same time. Thus if they start simultaneously, they will terminate simultaneously, and so on. Similarly, if two dissimilar processes are found to occupy the same time on one occasion, they will occupy the same time on another occasion, under like conditions.

§ 5. *Causality as Ideal Construction.* — On the purely perceptual level, there is a tendency to repeat modes of procedure which have proved successful in the past, and to discontinue modes of procedure which have proved unsuccessful. To this extent, the category of causality operates in perceptual consciousness. But for the merely perceptual consciousness the question why a given course produces a given effect has no existence. Ideal construction is continually asking this question. It is the very essence of the process by which means are devised for the attainment of practical ends to interpose between the starting-point and its termination a series of ideally represented links, each constituting an indispensable term in a train of causes leading up to the ultimate effect. These practical experiences yield material for interpreting events which take place apart from the agency of the subject. Thus

it becomes possible to ask why *A* produces *D*, and to answer by saying that *A* produces *B*, and that *B* produces *C*, and that *C* produces *D*. So far as this ideal construction is determined by more or less practical experiences such as those connected with mechanical contrivance, it yields a true insight into the nature of physical process. But strong interests of a practical or theoretical kind often create a need for explanation where data for explanation are either altogether insufficient or absent. In such cases the ideal construction will take a form which appears from a higher point of view fanciful and absurd. Why has the robin a red breast? Because cock-sparrow shot it with his bow and arrow. A good example of a simple causal series of this kind is the story of the old woman whose pig would not go over the stile. "As soon as the cat had lapped up the milk, the cat began to kill the rat, the rat began to gnaw the rope, the rope began to hang the butcher, the butcher began to kill the ox, the ox began to drink the water, the water began to quench the fire, the fire began to burn the stick, the stick began to beat the dog, the dog began to bite the pig, the pig in a fright jumped over the stile, and so the old woman got home that night." In savage thought, there are abundant examples of causal explanation which remind us of these nursery fables.

The word *why* may have another application. In asking why a given effect is produced, the interest may lie in discovering which of a given group of conditions are essential to the result, and which irrelevant. This inquiry naturally arises when the same result follows under circumstances apparently dissimilar on the

whole, or fails to appear under circumstances apparently similar on the whole. To find a cause is here to find points of identity in apparently dissimilar conditions, and of difference in apparently similar conditions. There is a West African story according to which a hunter took the first hint for weaving nets from contemplating the spider's web. His wife suggested that he might make mats and similar articles in like manner. He tried, but failed to give them shape. Accordingly, he went back to observe the procedure of the spider, so as to note the points of difference between the animal's method and his own. He discovered that the spider started always with a fixed framework and wove its web on that. Going back to his own task, he made for himself a framework by means of sticks and poles, and so succeeded in giving proper shape to the articles he made. He had compared the two modes of procedure, so as to distinguish the points of agreement from the points of difference, and in this way was able to explain why a certain result should follow in the one case, and a different result in the other. It is by such processes of analytic comparison that universal laws of nature are ultimately discovered, which laws may form the basis of such exact and complicated mechanical contrivances as the steam-engine or the electric telegraph. In early stages of development, the distinction of the essential part of a cause from the accidental is very crude and irrelevant, and is in the main proportioned to the degree of advancement in the mechanical arts. Arsenic and incantations, according to Voltaire, will kill a flock of sheep. The savage never thinks of using the arsenic without the incantations. The medicine man ac-

companies even surgical operations with all kinds of ceremonials having nothing to do with the result. In Charles Lamb's dissertation on roast pig, we have a fanciful exaggeration of this feature of savage thought. Bo-bo discovers the flavour of roast pig by accidentally setting fire to a house. The custom of firing houses in order to roast pigs continued "till in process of time . . . a sage arose, like our Locke, who made a discovery that the flesh of swine, or indeed of any other animal, might be cooked (*burnt*, as they called it) without the necessity of consuming a whole house to dress it."* The exaggeration in Lamb's story arises from his having chosen a case in which all essential conditions fall within the practical experience and control of the agents interested in the result, so that it would be easy for them to disengage the essential from the accidental. He would scarcely have exaggerated if he had chosen such natural phenomena as disease and death, in which the operative conditions are in the main beyond the control and even beyond the ken of the uncultured mind. Here ideal construction cannot fix upon what is essential; and since the strength of the practical interests concerned demands the discovery of some operative conditions to form a basis of practical procedure, causal efficacy is ascribed to all kinds of circumstances which are in reality totally irrelevant, such as the evil eye, the malignancy of departed spirits, the magical practices of witches, and the like. On these assumptions, elaborate methods of procedure are based. Such methods are often more or less intermingled with truly curative measures, which prevent the

* *Essays of Elia* (Ainger's edition), p. 168.

result being wholly a matter of accident. But on the whole, much more stress is laid on what is irrelevant and inefficient, than on what is relevant and efficient. In treating a disease, it is obvious that the cure does not depend merely on drugs, or the like; for the patient may either die or recover when the same drugs are used. Other conditions are therefore imagined which by their very nature cannot come except in a partial and uncertain way within the control of the medicine man.

§ 6. *Thinghood an Ideal Construction.* — We have seen that for perceptual consciousness whatever has unity and distinctness of interest is a separate thing. Since interest is primarily practical, whatever acts as a whole, and is capable of being acted on as a whole, is one thing. We have seen that conceptual analysis resolves the unity of the thing into its constituent parts, qualities and relations, and that conceptual synthesis re-constructs it by ideal combination of these constituent parts, qualities and relations.

Very important developments of the process of ideal construction arise out of the connexion of the category of *Thinghood* with that of causality. These assume two forms. The first line of thought endeavours to give a causal explanation of the nature and unity of the individual thing from the connexion and interaction of its parts. The other pre-supposes the unity and intrinsic nature of the thing as ultimate and, instead of explaining them, uses them as a basis of causal explanation.

The first of these lines of thought takes its point of departure in mechanical contrivance and execution. Inasmuch as a man has himself actually put a piece of

mechanism together, so that it may fulfil a certain function, he is able to explain why it fulfils this function, by showing how the parts are combined, and act on each other so as to work together in producing a certain result. The same kind of explanation may afterwards be applied to things which he cannot himself construct. He may ideally analyse and combine in a mechanical way what he cannot actually take to pieces and put together again. He may even assume constituent elements which are beyond the reach of actual perception, and by ascribing to these fixed modes of behaviour in relation to each other, he may explain the phenomena which he can observe as the products of their interaction. Modern theories of atoms and molecules and of the motions of the particles of ether are examples of the highest development attained in this direction. Atomic theories explain the nature and mode of behaviour of perceptible things, by assuming as elementary constituents of the physical world "countless atoms, invisible from their minuteness, persistent in their duration, and unchangeable in their properties. These atoms, now coalescing in most manifold fashion, now withdrawing unaltered from these fluctuating combinations, produce by the variety of their positions and motions the different kinds of natural products and their changeful development."* The essential presupposition of such theories is that the elements which they assume as ultimate shall always behave in identically the same way in the same circumstances. Their whole nature is supposed to be constituted by their mode of behaviour in relation to each other, and this is

* Lotze, *Microcosmus*, third edition, vol. i., pp. 31-32.

invariable. Explanation is more complete and satisfactory the less variety there is in the constitution of the ultimate atoms. It would be most perfect from a mechanical point of view if all natural processes could be explained by the combination and interaction of atoms in themselves homogeneous, so that the resulting variety of material products would be purely due to variety in the way in which identical elements are put together. This mechanical point of view has been applied, to a large extent with success, even to living organisms. The construction of self-acting machinery has had an important influence in suggesting this line of thought. "Our eyes," says Lotze, "cannot rest repeatedly and continuously on this remarkable borderland of self-acting instruments, which derive their material from Nature, but the form of their operation from human volition, without our whole mode of conceiving Nature being affected by these observations. . . . We know in fact that not from within, by a spontaneous effort at development, but under extraneous compulsion have the combined bodies acquired this admirable play of mutually adjusted states. Far simpler properties and effects belonged in themselves to the particular substances which we combined, varying according to universal laws with the alteration of definite conditions. These invisible forces our mechanical skill has compelled (by the cunning combinations into which it has beguiled that which holds them) to work, under such conditions that their conformity to universal laws must, without any purpose of their own, realise the ends that are our purposes."* Such human contri-

* *Op. cit.*, p. 18.

vances could not but suggest the question whether even animated organisms were not composed partly or wholly in a similar manner, having their origin in "the world's course, which combines the elements sometimes in one way, sometimes in another, and in each of these groups inexorably initiates the system of movements and operations that, according to general laws, corresponds to the actual mode of their connexion." * As a matter of fact, physiological explanation, so far as it goes, is based on this principle.

The mechanical point of view, which has received so vast a development in modern science, sprang from extremely meagre and rudimentary beginnings in primitive thought. The power of mechanical construction and analysis implied in the making of the simple instruments of savages seems almost infinitesimal, if we compare it with our elaborate machinery. It is utterly insufficient to suggest even the remotest possibility of a mechanical explanation of the complex processes and products of nature, and especially of living organisms and their behaviour. Yet the mind of the savage cannot remain at rest simply ignoring the play of the natural forces which surround him and continually influence his life and activity for good and evil, but above all for evil. In particular, disease and death are phenomena which he cannot neglect. The pressure of practical interests compels him to act and to contrive means of acting. Thus some kind of ideal construction is for him a necessity in order that he may not sit down helpless in face of a vast variety of phenomena which he cannot even think of explaining on mechanical prin-

* *Ibid.*

ciples. To him it is simply a familiar fact which requires no explanation, that individual things exist, having distinctive properties and modes of behaviour. It is a familiar fact that such things are composed of parts which act and are acted on together, so that change in one part is accompanied by changes in other parts. All this he does not think of explaining, but pre-supposes it without question as a basis of explanation. Hence he follows a line of thought which we may call the anti-mechanical. Instead of explaining the unity of the whole by the combination and interaction of the parts, he explains the combination and interaction of the parts by the unity of the whole. He knows that the sole of his foot is part of the same individual unity as the crown of his head; he knows that if a nail runs into the sole of his foot, his mouth utters a cry of pain. But the connexion of the two facts by a series of intermediate links of a mechanical kind lies entirely outside the circle of his ideas. He knows nothing of afferent and efferent nerves, or of molecular processes in brain and muscle. When the nail runs into his foot, his organs of speech emit a cry simply because he is one individual being of which both foot and organs of speech are part. The important point is that as this mode of explanation takes no account of mechanical conditions, it is not subject to mechanical limitations. The sympathetic communion between the parts of a whole is not supposed to be conditioned by those relations in space and time on which mechanical interaction depends. It is thus possible to represent the sympathetic communion as existing even when the supposed parts of the same individual whole are widely

separated in space, so that the conditions of mechanical interaction are absent. The ideas and the practices of primitive magic and witchcraft depend in a great degree on this enlargement of the conception of individual unity. Disease or death may be produced by operating on the cuttings of a person's hair, or the parings of his nails, or the remains of his food, when the person himself is far away. Hence it is a common custom with savages to bury their nail-parings, hair-cuttings, and so on, so that what happens to these may not by sympathetic communion cause misfortune to them. In like manner, the nature of a whole is often regarded as in some manner present and operative in the part, even when it has been dissevered from the whole, and acquires connexion with some other individual. In this way the nature of one thing may be in some measure transferred to another. By wearing a tiger's teeth, a man may make himself brave and fierce; by appropriating the belongings of a deceased person, he may share in that person's skill and good-fortune. Instances of this kind are innumerable, and we shall have to refer to them again in the next chapter.*

§ 7. *Ideal Construction as a Co-operative Process.* —Through language, ideal combination becomes a function not of the individual merely, but of society. It may be confidently asserted that the capacity for ideational thought would be of little use to a solitary

* It should be remarked that the savage view contains a great truth. Its error and crudity lie in *substituting* explanation of the parts by the whole instead of explanation of the whole by the parts. But it is equally one-sided to suppose that merely mechanical explanation can yield the whole truth. If this were so, there would be no place for philosophy as distinguished from science.

animal. Such thinking is essentially a social function. Other animals co-operate in work and play, but only men co-operate in thinking. Where many men are united in striving to realise a common end, each single mind is, so to speak, part of one great collective mind. The ideas occurring to each are communicated to all. What occurs to *A*, to *B*, or to *C* respectively may be valueless: but the ideas of *A*, *B*, *C*, taken in combination, may form a real advance: even in combination they may be futile, yet when they reach the mind of *D*, they may fall on fertile soil and suggest some feasible plan of action or plausible line of thought.

The debt which the individual owes to social intercourse by means of language is two-fold. He is placed by it in possession of data which he could never have acquired by his own personal experience. His thinking is based not only on what he himself has seen, heard, and done, but also on what others have seen, heard, and done. In the second place, he receives from others not merely the results of their observations, but the results of their trains of thought. In both ways his debt to his social environment is immense. His debt is not merely confined to interchange of ideas by means of language. Imitation also plays a large part. In doing or attempting to do what others have done before him, he re-thinks the thoughts which have passed through their minds; and he also in the same process acquires novel ideas, inasmuch as imitation is rarely, if ever, exact reproduction of that which is imitated. The actions imitated are usually more or less modified and lead to new results in the case of each imitator. What has been said holds true for the rela-

tions of the men of the same generation to each other; but its application to successive generations is even more important. Every child in learning the language of its ancestors assimilates in outline the whole system of ideas, the whole system of conceptual analysis and synthesis, which has been acquired by the mental and bodily activity of past generations. It acquires knowledge by question and answer, and by a gradual divination of the meaning of words, as used in ordinary conversation, far more than by direct personal experience. "The words and sentences that fall upon" the "ear" of a child "and are soon upon his lips, express not so much his subjective experience, as the common experience of his kind which becomes, as it were, an objective rule or measure, to which his shall conform. Why, for example, does a child have no difficulty about the relation of substance and qualities that has given philosophers so much trouble? and why do all children understand or seem to understand it alike, whatever their experience may have been? Why? but because the language put into their mouths, and which they must e'en use, settles the point for them, one and all; involving, as it does, a metaphysical theory which, whether in itself unexceptionable or not, has been found serviceable through all the generations of men."* We use our own private experiences "mainly to decipher and verify the ready-made scheme of knowledge that is given to us *en bloc* with the words of our mother-tongue. This scheme is the result of the thinking, less or more conscious, and mainly practical, of all the gen-

* Croom Robertson, *Philosophical Remains*, p. 68.

erations of articulately speaking men, passed on with gradual increase from each to each."*

The educational influence of one human generation on another is by no means wholly dependent upon the use of language. The importance of the part played by imitation cannot be exaggerated. What men have learned to do in the past, the child has to learn to do over again in its own individual case. This is only possible in so far as it attends to the behaviour of its elders, and strives to imitate them. As a matter of fact, the period of childhood is mainly occupied in attempting to reproduce the modes of action current in the society to which the child belongs. Even the play of children is penetrated through and through by this imitative character. Children can take the place of their elders in the next generation only by learning from them those ways of acting which are necessary for the general scheme of social organisation. But in this process they acquire not only bodily dexterities, but also systematic combinations of ideas which they never could have attained by their own unassisted efforts. Besides this, the material environment of human beings is in a large measure a creation of human thought transmitted from one generation to another. Tools, weapons, utensils, buildings, gardens and cultivated fields, are all products of human intelligence. They are material arrangements embodying in outward and visible form trains of ideas which have passed through human minds. Flowing from human intelligence these objects appeal to human intelligence. The child, in learning their nature and use, re-thinks the thoughts which gave them

* *Op. cit.*, p. 69.

being. In this way, as much as by the help of language and direct imitation, the ideas of one generation are transmitted to the next to be by it further developed, so that from comparatively small beginnings human civilisation may grow like an avalanche ever accumulating and retaining new material as it advances. Now the lower animals do not in this manner create an environment for themselves by their own intelligence. Bees, ants, nest-building birds, beavers and other animals with definite constructive tendencies may be said in part to make their own environment. But they do not do so in execution of designs framed by themselves. Their constructions do not embody trains of ideas directed to the attainment of foreseen ends. As their work does not arise from trains of ideas in the first instance, so it does not awaken trains of ideas in the successive generations which repeat the same activities. Each new generation is born with the instinctive aptitudes and propensities of its progenitors and repeats their doings in the same undesigning way. On the other hand, the works of man, as they arise from ideational thought, so they arouse ideational thought. The same understanding which was needed for their production is needed for their reproduction. Hence the educational influence of an environment moulded by human hands to embody human designs does not affect the animals which dwell with man. The human intelligence incorporated in the products of human industry is intelligible only to a mind essentially akin to the human mind. The external world as an ideal construction is a social product. It must therefore be independent of the individual subject in the same

manner and degree as social organisation in general is independent of its individual members. There is thus introduced a new factor in the constitution of external reality, — the social factor. The ideal combinations which arise in the individual mind can only become permanent parts of the ideal structure representing the real world if they are entertained by other minds also, and so become current in the society to which the individual belongs. Besides the verification of ideal combinations by actual experience by means of corresponding perceptual experiences, another kind of verification is required. Social endorsement is necessary. On the other hand, ideal combinations which are generally current in society tend to maintain themselves in the mind of the individual, even though he has never himself verified them, and even though his own personal experience is unfavourable to them rather than otherwise. Now and then a person is met with who dares to deny that the earth is round; there is nothing in his direct personal experience to show the roundness; on the contrary, so far as he can observe it, it seems to be flat. Now such a person is generally regarded as a "crank"; he is generally spoken of as a harmless kind of lunatic; and what is more important, he is so spoken of by multitudes of persons who know much less about the matter than himself. The reason is that he is maintaining his own individual ideas against the vast work of ideal construction which has been built up by the co-operative thinking of many generations. It is true that this ideal structure is in process of constant development; and that as it grows it rectifies itself, excluding ideal combinations which

had previously formed integral parts of it, and receiving into itself others which it has previously rejected. But the earth-flattener does not appear as a representative of this advance: he puts himself forward, or is supposed to do so, merely as an individual setting up his own private thoughts in antagonism to the social product. The experts who are the accredited representatives of the development of the general system of ideas in this direction, scout his pretensions: he therefore figures as an isolated individual appearing in the strength of his own private judgment in opposition to the established social order, and he is therefore regarded by society much in the same way as a lunatic or criminal, the only difference being that he is considered to be harmless and amusing.

This is a case taken from our own complex society, in which ideal construction is so vast in its extent and so diversified that there is no single person who can hold more than a fragment of it, and its various branches are assigned to the keeping of special guardians. These complex conditions give a certain freedom of play to the individual, which is absent in more simple organisations. In more primitive communities, such as we find among savages, the general stock of ideas is assimilated by each individual, and all are equally its guardians. Thus the pressure of society upon the individual is incomparably more coercive. Any private rebellion against inherited and accepted tradition would be resented and suppressed with great speed and certainty. Thus primitive societies are intensely conservative and remarkably unanimous in their modes of thought. Each thinks as the rest think, and dares not persevere in any in-

novation which does not find general acceptance. Ideal activity is on the whole more occupied in finding reasons to justify tradition, or to explain its apparent inconsistency with actual experience, than in further developing and improving the ideal scheme which has been handed down from generation to generation.

CHAPTER VII.

SELF AS IDEAL CONSTRUCTION.

§ 1. *The Personal Series.* — On the perceptual level, there is a bi-partition of conscious experience into two parts, one belonging to the Self and the other to the Not-Self. To the Self belong all sensations like the pain of a wound, which exist or at least persist independently of external impressions; all organic sensations and appetites; all active impulses and experiences of free movement. To the Not-Self belong all those experiences to which the organism must adjust its movements in order to make them efficient in the attainment of practical ends. Now adjustment is possible only in so far as the experiences to which adjustment is made arise from conditions independent of the organism itself and its movements. Thus changes and differences in sense-experience, if and so far as they depend purely on free motor activities, belong to the Self. Only in so far as they are determined *for* and not *by* the percipient subject do they possess the independence which makes it possible to speak of motor activities being *adjusted* to them. Thus the physical object reveals itself in actual perception as existing, persisting, and changing in relative independence of the motor activity of the percipient. The case of ideal construction is analogous. This also

is an activity primarily directed to practical ends; and in order to be effective, it must adjust itself to conditions which it does not create. These conditions are physical objects and relations as ideally represented. On the other hand, the process of ideal construction is an activity of the Self, just as the motor activity involved in perception is. The ends pursued are dictated by the nature of the Self. So too the order and manner of devising means for the attainment of these ends is largely within subjective control. The order in which ideas occur is very far from corresponding with the order of objective facts. In ideal construction the mind starts with the idea of the end; in the order of nature the end comes last. In a train of thought objects and processes may be represented together and compared which in the order of nature are widely separated in space and time. The same holds true of perceptual process; the order in which the parts and qualities of an object are perceived in no way corresponds with their actual relations. The percipient may see a thing and touch it afterwards, or he may touch it first and see it afterwards. But this subjective order has nothing to do with the physical relation of tactile and visible qualities in the thing itself. We may look at the parts of a building successively, but they do not actually occur successively.

Now when ideal representation is concerned not with the physical world but with the Self, it follows and adjusts itself to what we have called the subjective order. It follows and adjusts itself to the order in which the experiences of an individual have actually occurred in the life-history of that individual. This may be illus-

trated by the distinction between order of exposition and order of discovery. If a man, after testing the qualities of a cigar, is asked what sort of cigar it is, he may say that it has an excellent flavour and is in good condition. His thoughts are concentrated merely on the nature of the cigar, without reference to himself. If he is asked how he has found out that it has these qualities, he may say that he began by looking at it, that he then felt it, that he put it to his nose and smelt it, that he put it to his ear and heard it crackle, and so on. His thoughts follow the subjective order, — the order in which his experiences had actually occurred.

The *material* for the ideal construction of the Self consists therefore in organic sensations and appetites, in motor impulses and activities, and in ideational impulses and activities. The *order* of construction is the order in which these experiences actually occur, as distinguished from the order of the objects with which they are concerned. Reference to these objects is involved, but only because we cannot think of a perception or idea without thinking of it as the perception or idea of something.

It is evident that the bodily organism must be a very prominent constituent of the Self as thus apprehended. The order in which sensations come to us depends on movements of the body and of the organs of sense which are under our control. Organic sensations, and those which persist after external impressions such as wounds and blows, are localised in the organism itself; and since these are subjective, the organism, being inseparably connected with them, must be regarded as belonging to the Self rather than the Not-Self. Even

when the mind is absorbed in its own train of ideas, the presence of its own body constitutes an important part of its experience. Whatever objects may be absent, the body itself is always present. We cannot move away from it and leave it behind. It constantly enters into actual experience; it is not an external condition to which motor activity must conform itself; it is the indispensable condition of there being any motor activity at all. At the same time, it does not belong purely to the Self. In some ways it is just like external objects. One part of the organism can perceive another, just as it can perceive anything else. This analogy between the body and other material things becomes more and more completely realised with the general development of knowledge; till in the end it becomes possible to conceive of the Self in abstraction from the material organism as such. But this is a very late result of intellectual development. It constitutes a point of view foreign to the ordinary thinking even of educated and civilised men. The word "I" in ordinary language as often as not refers directly to the body; as when we say "I took a walk," "I fell down a pit," "I swallowed a glass of wine."

§ 2. *The Social Factor in the Development of Self-Consciousness.* — We have so far only given an abstract account of what is meant by Self as ideal construction. We have said nothing of the motives which prompt it. These, as in the case of the external world, are primarily practical, and arise from the relation of different individuals to each other in the same community. In such a community each individual is even more dependent on his fellows and their conduct than

he is on his physical environment. We have seen that even for the power of thinking effectively, and so adjusting his actions to physical conditions, he is dependent on intercourse with others by means of language and otherwise. He must be continually adapting himself to his social environment; and to that end he must study the conditions which determine the conduct of his fellows towards himself and towards each other. He must strive to ideally represent their experiences, the impulses which determine their actions, their emotions, their trains of ideas, and so on. In this way he is led to the ideal construction of their subjective history. Now it is true that other Selves are not his own very Self, but they are none the less Selves, though they are other Selves.

Interpretation of the behaviour of others can only be founded on data derived from his own experience of the motives and ideas which prompt and guide his own actions. Thus in the very process of constructing a representation of the subjective experience of others, he must construct a representation of his own subjective experience. He is continually comparing others with himself, noting the points of agreement and difference. Every advance in his knowledge of them is also an advance in his knowledge of himself; and, conversely, every advance in his knowledge of himself is an advance in his knowledge of others. The same result may be reached in a somewhat different way. The individual has not only to consider the attitude of others towards himself, but his own attitude towards them. He must shape his own ways of thinking and acting so as to please them and secure their friendly behaviour

towards himself. Thus he is constantly urged to a comparison between what he is and does and what his fellows require of him. In this way he is forced to think about his own thoughts, actions, capabilities, and the like.

In this way the environment of social relationships supplies the prompting motives of an ideal construction, in which the present Self appears as a link in a series embracing the remembered past and the expected future. But this is only one part of the function of the social factor. It not only supplies motives for the ideal construction, it also supplies essential material entering into all developed human self-consciousness. The thought of Self always involves the thought of manifold and complex relations to other selves. A man's own ideal representation of himself includes the view which he thinks other take of him, the view which he wishes them to take of him, the view which he anticipates that they will take of him, or that they would take of him if he acted in certain ways, and so forth. "The characters, attributes, functions, or other organic constituents of the self commonly extend, from our own point of view, decidedly beyond anything that can be directly presented in any series of our isolated inner experiences, however extended. When one is vain, one's self-consciousness involves the notion that one's self really exists, in some way or other, for the thoughts and estimates of others, and is at least worthy, if not the possessor, of their praise or of their envy. When one feels guilty, one does not and cannot abstract from the conceived presence of one's self in and for the experience of a real or ideal judge of one's guilt. In all

such cases the self of self-consciousness thus appears as something that it would not and could not be were there not others in the world to behold, or to estimate it, to be led or otherwise influenced by it, or to appeal to it. It is now from such points of view that the self of self-consciousness comes, in the end, to get form as a being who takes himself to have a social position, an office, a profession, — in brief, a vast group of functions without which the self would appear to itself to be, relatively speaking, a mere cipher, while these functions are at once regarded as organically joined to the self, and centred in it, and, nevertheless, are unintelligible unless one goes beyond one's private consciousness, and takes account of the ideas and estimates of other people."*

As the idea of Self essentially involves the idea of varying relations to other selves, it will vary according as its relations vary. In relation to enemies it is a combative Self; in relation to superiors it is a submissive, receptive Self; in relation to inferiors it is a dominant, controlling Self. To again quote Royce: "If I strut about in fancied dignity, my non-Ego is the world of people who, as I fondly hope, are admiring me. Accordingly I then exist, for myself, as the beheld of all beholders, the model. If I sink in despair and self-abasement, my non-Ego is the world of the conceived real or ideal people whose imagined contempt interests, but overwhelms me, and I exist for myself as the despised Ego, worthy of their ill-will. When I speak, my non-Ego is the person or persons addressed, and my

* Prof. Royce, "Observations on Anomalies of Self-Consciousness," *Psychological Review*, vol. ii., No. 5, pp. 437–438.

Ego is the speaker. If I suddenly note that, though I talk, nobody marks me, both the non-Ego and my Ego dramatically change together in my consciousness."*

The influence of the social factor in determining self-consciousness is largely bound up with the process of imitation. It is a conspicuous merit of Professor Baldwin that he has brought this point into full prominence. He distinguishes two phases of imitation — the *projective* and the *ejective*. In the projective stage, imitation is as yet relatively unsuccessful; the mode of activity imitated and the experiences connected with its exercise are as yet more or less beyond the reach of the imitator; they have not yet become part of his existence. The conception of himself involves a contrast between what he actually is or does, and what he is trying to be or do; and this coincides with the contrast between himself and the person imitated. In so far as this is the case, his conception of the other person is *projected;* it contains elements which do not enter into the conception of his own present self, elements which he is only trying to assimilate and incorporate in the conception of himself. On the other hand, when and so far as his imitative efforts have succeeded, this contrast ceases. His conception of himself coincides with his conception of the other person. In thinking of the other person, he simply ascribes his own experiences to the other person, — he *ejects*, or throws them out into the other person, instead of *projecting*, or regarding them as something beyond what he has himself actually attained. "For example, last year I thought of my friend W. as a man who had great skill

* *Op. cit.*, p. 443.

on the bicycle and who wrote readily on the typewriter; my sense of his personality included these accomplishments, in what I have called a 'projective' way. My sense of myself did not have these elements, except as my thought of my normal capacity to acquire delicate movements was comprehensive. But now, this year, I have learned to do both these things. I have taken the elements formerly recognised in W.'s personality, and by imitative learning brought them over to myself. I now think of myself as one who rides a 'wheel' and writes on a 'machine.' But I am able to think of myself thus only as my thought includes the personal accomplishments of W. . . . So the truth we now learn is this: that very many of the particular marks which I now call mine, when I think of myself, have had just this origin. I have first found them in my social environment, and by reason of my social and imitative disposition, have transferred them to myself by trying to act as if they were true of me, and so coming to find out that they are true of me. And further, all the things I hope to learn, to acquire, to become, all — if I think of them in a way to have any clear thought of my possible future — are now, before I acquire them, possible elements of my thought of others, of the social 'alter,' or of what, considered generally, we may call the 'socius.'" *

To see the full importance of imitation in the development of the idea of Self, we must especially consider the case of children. Children have to learn from their social environment all that is necessary to make them

* Prof. Baldwin, *Social and Ethical Interpretations in Mental Development*, pp. 10-11.

members of the society into which they are born. Unless they are born with the connate aptitudes and impulses for acquiring the ideas and the ways of acting current in the community to which they belong, their existence is resented by the community. They have little chance of survival in savage communities, and even in the more civilised their position is a very uncomfortable one. They are for the most part locked up in prisons or lunatic asylums. The normal child is perpetually engaged in acquiring the habits of thought and action of its elders, and in doing so is constantly developing the idea of Self by a process of imitation. Baldwin notes that the child has two characteristic mental attitudes, corresponding respectively to the "projective" and "ejective" phases of imitation. In the first, he is receptive, submissive, and respectful. In the second, he is aggressive, self-complacent, and disdainful or patronising. The two attitudes correspond to different social relations. "The child's sense of himself is . . . one pole of a relation; and which pole it is to be, depends on the particular relation which the other pole, over which the child has no control, calls on it to be. If the other person involved presents uncertain, ominous, dominating, instructive features, or novel imitative features, then the self is 'subject' over against what is 'projective.' He recognises new elements of personal suggestion not yet accommodated to. His consciousness is in the learning attitude; he imitates, he serves, he trembles, he is a slave. But on the other hand, there are persons to whom his attitude has a right to be different. In the case of these the dialectic has gone further. He has mastered all their fea-

tures, he can do himself what they do, he anticipates no new developments in his intercourse with them; so he 'ejects' them, as the psychological expression is; for an 'eject' is a person whose consciousness has only those elements in it which the individual who thinks of that consciousness is able, out of his own store of experience, to read into it. It is ejective to him, for he makes it what he will, in a sense. Now that is what the brothers and sisters, notably the younger ones, are to our youthful hero. They are his 'ejects'; he knows them by heart, they have no thoughts, they do no deeds, which he could not have read into them by anticipation. So he despises them, practises his superior activities on them, and tramples them under foot." *

§ 3. *The One Self and the Many Selves.* — All self-consciousness implies a division of the total Self. When I think about myself, the *I* and the *myself* are never quite identical. The Self of which I have an idea is always distinguished from the Self which has the idea. As Professor Royce observes, "I can question myself, and wait for an answer; can reflect upon my own meaning; can admire myself, love myself, hate myself, laugh at myself; in short, do or suffer in presence of my own states and processes whatever social life has taught me to do or suffer in presence of the states and processes of others." † My total Self includes the whole succession of my personal experiences; and it therefore includes that special phase of conscious life in which I think of myself. But this special phase at the moment of its existence cannot itself be part of the object of

* *Op. cit.*, pp. 18-19.

† *Psychological Review*, vol. ii., No. 5, pp. 454-455.

which it is aware. Of course, even the present moment of self-consciousness is usually identified as part of the total series of personal experiences; but the identification involves a distinct phase of conscious process, and includes as part of its object both the *I* and the *myself* involved in the primary self-consciousness.

There is yet another way in which the total Self is necessarily broken up into a number of partial selves. The life-history of the individual consciousness embraces a multitude of very diverse and often incongruous states and tendencies. At any moment of self-conscious reflexion, attention is usually fixed on one or other of these special modes of experience. In so far as they differ from each other, and from the present Self which is thinking about them, there is a tendency to regard them as if they were relatively distinct selves. Thus a man, when sober, reflecting on his conduct and on his mental attitude when drunk, can hardly recognise himself as the same person. In fact, he is apt to say, "I was not myself," or, "I was not quite myself at the time." The Self of our dreams is usually sharply distinguished from the Self of waking life. The waking Self generally refuses responsibility for the thoughts and actions of the dreaming Self. In such instances, the person feels that there is more difference between himself and these special phases of his life-history, than there is between himself and other persons. These are extreme cases, but the principle has a wide application. There is always a tendency to refuse to recognise the Self which is overcome by some sudden or exceptional impulse, or transformed by peculiar conditions, as one and the same with the normal Self.

The same antithesis is found not only in reflecting on past states, but also in the moment of present consciousness. When the mind is divided by conflicting impulses, it often appears as if there were two *quasi*-persons in the same individual consciousness, and as if the one were criticising the other, contending or expostulating with it. The analogy of the relations between ourselves and other persons is transferred to the relation between conflicting groups of tendencies within our own consciousness. The best example, perhaps, is the conflict between moral principle and temptation. In such cases one of the two conflicting tendencies is often identified with our true Self, *i.e.* with the normal flow of thought and action; and the other tendency is regarded as something relatively foreign and intrusive. "If the tendency to the estimated act is a passionate tendency, a vigorous temptation, and if the conscientious judgment is a coldly intellectual affair, then the situation dimly reminds me of cases where other people, authoritative and dignified rather than pleasing, have reproved my wishes. . . . But if, on the other hand, the conceived act is less keenly desired, and if my conscientious plans are just now either fervently enthusiastic or sternly resolute in my mind, then . . . I myself am now, in presence of the conceived act, as if judging another."* We must add to the actual past and present selves those which may exist or might exist in the future, or might have existed in the past. There is always an antithesis between ourselves as we are or have been, and ourselves as we wish to be or wish that we had been. It is always possible in reviewing the

* Royce, *op. cit.*, p. 454.

past to transform the picture of it so as to represent ourselves as thinking, feeling, and acting, not as we have actually thought, felt, and acted, but as, from our present point of view, we should wish to have thought, felt, and acted. We can disregard actual conditions and limitations, and mentally endow ourselves with powers and qualities which we neither possess nor have possessed, and we can imagine situations especially fitted to call them into play, and evoke the admiration of our social environment. Without going to such extremes as this, a man may simply say to himself, "Oh! what a fool I have been! Why did I not work instead of play?" and the like; and he may allow his mind to follow out, by a train of ideal construction, representations of what he would have been in the past, present, and future, if he had acted otherwise. Such ideal constructions are most common in reference to the future, especially in the young. There is a tendency to represent what the Self of the future is to be and do, and what is to happen to it, in its social and other relationships, in accordance with present desires. This is sometimes mere day-dreaming; but it may also be of the greatest practical importance; for a man's future, unlike his past, is to a large extent under his own control. By dwelling on the representation of himself as he would wish to be, instead of as he is, a direction is given to his activity, which actually tends to realise his ideal. When the ethical end is said to be self-realisation, what is meant must be the realisation of a future Self constructed by abstracting from the imperfections and limitations of the present Self.

§ 4. *Pathology of Self-Consciousness.* — Under normal conditions, the tendency to regard various actual or possible phases of the Self as if they were more or less distinct persons is not carried so far as to mistake metaphor for literal fact. The man still knows or can always remind himself that he is not in reality split up into a plurality of personalities, distinguished from each other in the same way as one person in society is distinguished from another person. But in many cases of insanity, the analogy is no longer mere analogy for the patient. So great a transformation is brought about in the train of his experiences, that the present phase of his life-history is altogether discontinuous and discordant with his past. At the same time, the present phase is so persistent and engrossing, and the idea of the past relatively so feeble, that his whole actual bygone history is either partially ignored and partially re-constructed or is ascribed to some other person. Cases are extremely common in which insane patients believe themselves to be such great personages as Napoleon, the Messiah, or even God the Father, and act accordingly as far as lies in their power. "A soldier whose skin had become insensible, believed himself to have been dead since the battle of Austerlitz, where he received a wound. When he was asked as to his health, he said: 'You want to know how Father Lambert is? But there is no Father Lambert, a cannon ball killed him at Austerlitz; what you see here is not him; it is a wretched machine made to look like him; you ought to ask them to make a better one.' In speaking of himself he never said *me*, but always *it*."*

* Taine, *On Intelligence*, p. 377.

Such delusions as this depend on a profound change in the nature of personal experience, which makes the present discontinuous with the past. Nervous disorders tend to bring about such breaches of continuity. In general, a change in the experiences connected with the body, and especially with organic sensation, seems to be an essential factor in the process. Sometimes the resulting illusion relates specially to the bodily Self, and does not profoundly affect the continuity of personal existence in other respects. Thus a patient whose bodily sensations have become abnormal will feel as if he were made of glass or butter, and come to suppose that he actually is composed of such materials. But when the illusion is not limited to the bodily Self, but involves a transformation of the individual's whole idea of his life-history, the reason probably lies in profound alteration of emotional tone. Organic sensation is a highly important factor in emotional states; alteration in it may either produce or be attended by a general change of emotional attitude. But emotions are not merely specific modes of feeling: they also involve characteristic conative tendencies, either in the way of expansive and aggressive activity, or of shrinking and aversion. Now we have seen that these conative tendencies may be initially vague and undirected to specific objects, and that, so far as this is the case, they fasten on any object they can find. When they have not an object, they make one for themselves. Thus a herd of cattle, enraged by the sufferings of one of their number, will vent their fury on the innocent victim, if no enemy or other object of resentment obtrudes itself on their attention. Thus emotions, in so far as they are

initially vague, tend to define themselves. On the ideational plane, the process of definition takes the form of ideal construction. If the emotional moods due to pathological conditions are sufficiently profound, intense, and persistent, whole systems of ideas will arise in this way which may be quite discontinuous and discordant with the actual past experience of the subject. Now emotional moods in human life commonly arise in connexion with certain social situations. These same moods when they arise pathologically may define and explain themselves by the ideal representation of corresponding relations between the patient and his social environment. "Suppose that one's depressed emotional condition, as in melancholia, or at the outset of a delirium of suspicion or of persecution, contains emotions resembling the normal emotions of conscientious guilt, or the feeling of social dread. Then these feelings tend to assimilate in one's actual surroundings, or in one's memories, data which suggest, to one patient an actually believed social condemnation of his deeds, or an actual judgment of his inner conscience passed upon his sinfulness, while to another patient his own sorts of emotion suggest an especially hostile scrutiny of his appearance by the passers-by, or an inner sense that he must hide from possible scrutiny. On the other hand, feelings quite the reverse of these suggest to the exalted general paralytic whatever remembered or fancied social relations, expressing his vast powers, the fragments of left-over social habits which still survive in his chaos permit him, in passing, to express."*

* Prof. Royce, *Psychological Review*, vol. ii., No. 5, pp. 456–457.

Now the idea of Self is so bound up with the idea of social relations, that an ideal re-construction of these involves an ideal re-construction of the Self also, and in extreme cases this amounts to a breach of continuity between the past and present Self, so that they appear to be separate persons.

In other cases, the two Selves appear to be simultaneously present and at strife with one another. Sometimes the subject identifies himself with one of them, and sometimes he is perplexed as to which of the two he really is. It very often happens that this division of the Self into two, one of which appears as a foreign person, is determined by hallucinations. Thus in some cases a man's thoughts appear to be stolen from him because, independently of his own volition, the words which he uses within his own mind to express his ideas utter themselves either in the form of auditory hallucinations or at least hallucinations of the muscular sense. "The thoughts are his own. The sounding of them forth, in this way, is not his. His thoughts run off his tongue, get spoken in his stomach, creak out in his shoes as he walks, are mockingly echoed or in the end commented upon by another power."* He explains the mocking repetition by ascribing it to another person who is hostile and contemptuous, and he fills out the idea of this other person in various ways, attributing motives to him and supplying him with words appropriate to his character.

§ 5. *The External and the Internal Self.* — The idea of the Self includes in all but its latest and most abstract developments the idea of the body as the ve-

* *Ibid.*, pp. 455–456.

hicle of perception and motor activity. There is also another powerful reason why the body should be regarded as part and parcel of the Self. The idea of the Self essentially includes the idea of its relation to other selves. But it can only exist for other selves in so far as it appears to them in bodily form.

But however important the body may be, it can never be regarded as the whole Self or even as the most essential part of the Self. Its attitudes and movements, so far as they differ from those of other material things, appear to be initiated by something inside the organism. They follow on volitions, emotions, painful and pleasant sensations, and the like. These experiences constitute the inner Self, and the body as it presents itself to the external observer is their instrument used in a way more or less analogous to that in which other material instruments are used. The contrast between inner and outer Self is emphasised by the process of ideational thinking, in which the body may be apparently quiescent, while the mind is active. The same is true of dreams. Thus even in the most primitive stages of human development, we find an antithesis recognised between the body as outer husk and the soul as inner kernel. But we find that the more primitive modes of representing the existence of the inner Self differ essentially from our own. Modern theories regard the soul as simply an immaterial substance, or identify it with the brain, or say that it is just the continuous series of conscious states themselves. All these views are very remote from those which are naturally and inevitably taken in earlier stages of mental development. The savage cannot find out what

the inner Self is by exploring the inside of the body, for this is possible only after death; and after death the inner Self no longer manifests its local presence. Thus *post mortem* examination can only show that the inner Self is not an internal organ of the body; that it is not the brain or heart or lungs. On the other hand, the conception of a simple immaterial substance, or of a mere series of conscious states, pre-supposes a development of the power of conceptual abstraction entirely beyond the reach of the savage. In all his practical dealings with the world, he has to do with things extended in space and appreciable by his senses. Even in his social relations, other persons only exist for him in their bodily presentment. Now we have seen how very slow and gradual a process it is by which the primitive mind disengages what is essential in a conception from the irrelevant material in which it is imbedded. This makes it impossible for the savage to disengage in its abstract unity the conception of a purely immaterial existence. Hence, in ideally representing the internal Self, he follows the analogy of his general experience of personal beings. The internal Self is for him more or less a repetition of the external Self. "If a man lives and moves, it can only be because he has a little man inside who moves him."* This mode of thinking is perhaps partly originated and in any case it is strongly confirmed by certain special experiences. Among these dreams play a prominent part. A man who is absent or dead appears to another in his dreams. The impression of the actual presence of the person dreamt of is often extremely strong, and

* Fraser, *The Golden Bough*, vol. i., p. 121.

easily suggests the theory that though the ordinary external body is lying in the grave or at a distance, the inner counterpart of this body, the soul, has actually appeared to the dreamer. But such apparitions are not confined to dreams. All pathological conditions of body and mind, due to disease, drugs, hunger, exhaustion, and so on, tend to produce hallucinations of this kind; and these conditions are very common among savages, much more so than among ourselves. Add to this the extreme difficulty which the human mind finds in realising the termination of personal existence after death. The difficulty is not merely that of realising annihilation in the abstract, but of realising that the dead person has ceased to play his habitual part in the ordinary life of the living. The habits of thinking and acting of his surviving friends and relatives have grown up and become fixed on the assumption of his presence among them. There is always a conflict between these pre-formed habits and the new conditions introduced by his decease, and the conflict is often intense and distressing. The survivor feels a shock of surprise, often painful, when he misses his intimate friend from his usual place. His rooted habits of thought lead him to ideally represent the dead as still having an existence analogous to his existence when alive. He is thus prepared to meet illusions, hallucinations, and dreams, in which the dead appear once more with the personal appearance and garments of the living, with no incredulity. On the contrary, the natural and necessary explanation for his mind is that what he sees is actually present. We must remember that physiological and psychological theories of the origin of dreams and hal-

lucinations are utterly beyond the range of savage conception.

The relation between the ordinary body and the internal impersonation is not conceived in a mechanical way. The unity of the whole individual is not accounted for by the interaction between the internal Self and the external Self. On the contrary, the reason why body and soul are in sympathetic communion lies ultimately in the bare fact that they form part of the same individual. In ordinary waking life, the soul is supposed to be locally present in the body. But it may depart from the body without severing the connexion between them. At least a modified form of sympathetic communion may still continue between them. The final departure of the soul means the death of the body; but a temporary departure is often supposed to involve only illness, or trance, or dreams. The sympathetic communion which is independent of local presence is well brought out in the case of dreams. The savage will ascribe the soreness and fatigue of his body to the painful struggles which his soul has undergone in dream wrestlings with other souls during its temporary migrations. So presents and sacrifices to the departed are usually offered at the tomb as if to the body; the benefit goes to the soul. It is very commonly believed that the burying of the body with appropriate rites is an indispensable condition of the soul's welfare. Thus the Greeks supposed that the shades of the dead must haunt the banks of Styx or wander about the earth, until their bodies received the rites of sepulture. After these, they could pass to the under world and mix with their own kind. It is instructive that the regions to

which departed spirits are supposed to go are in primitive thought generally represented as faint reproductions of the actual world, and the society of ghosts as analogous to the society of the living, retaining such relations as that of master and slave, rich and poor, and the like.

Since the spirit is only occasionally visible and still more rarely tangible, and since in general the relations of the living to it are somewhat vague and dim, there is a tendency to regard it as being itself shadowy and unsubstantial. But on this point primitive thought vacillates a great deal. We often find the spiritual body represented as existing and behaving in much the same manner as an ordinary body. It is sometimes represented as eating and drinking, wrestling and fighting, and sometimes intermarrying with the living. Marriage between a living person and a disembodied spirit is not uncommon in Chinese folk-lore. But these are exceptional cases. Familiar dealings with spirits are most often supposed to be the privilege of magicians and medicine-men, who often make it a regular part of their profession to catch departed souls in snares, and either detain them in custody, or bring them back to the body to which they belong.

If there are two material impersonations of one individual, there is no reason in the nature of the case why there should not be more. As a matter of fact we find that primitive thought often recognises the existence of several. The explanation of shadows and reflexions by optical laws is beyond the range of the savage mind; they are accordingly interpreted in accordance with the system of ideas familiar to primitive

thought. They are impersonations of the whole individual, much as the soul is; sometimes they seem to be identified with the soul, but they are often regarded as distinct. There is a Polynesian story of a girl who stole a young man's shadow and imprisoned it in a bottle; she then set it free and projected it upon a pool of water. "As the man moved about in his own land, so the shadow moved on the water."

Sometimes different impersonations are supposed to have different functions. Thus the Tshi-speaking people of the Gold Coast ascribe to each individual two impersonations besides his body, — the *srahman*, or soul, and the *kra*. The *kra* is especially connected with the phenomena of dreaming, and of birth and heredity. In dreams and visions it passes out of the body; after death it acquires connexion with some other body, so that each man's *kra* has passed through a long series of distinct embodiments. The *srahman*, or soul, cannot leave the body without suspension of obvious vital functions. After death, it passes to dead-land, which in its social and other arrangements is a counterpart of the world in which it has previously lived. If the man has died before completing the proper term of life, the *srahman* lingers about its former habitation. During life, body, *srahman*, and *kra* are regarded as different impersonations of the same individual, so that what happens to any of them may affect the whole. The incidents in a dream are believed to be adventures of the *kra*. "If a native, having taken a chill overnight, awakes in the morning with stiff and aching muscles, and the usual symptoms of muscular rheumatism, he at once concludes that during the night

his *kra* has been engaged in some toilsome pursuit, or in a conflict with another *kra*, and he attributes the pain he feels to the exertions made or the blows inflicted." * Here the locally separate experience of the *kra* is the experience of the whole man, including the soul and body.

The primitive view of the internal Self as a counterpart of the external body has only been very gradually displaced by the growth of civilisation. Even among ourselves at the present day it is very far from being extinct. People still believe in ghosts which appear under the form and even in the clothes of the living person. It is true that these ghosts are for the most part regarded as very attenuated forms of matter, and there is a popular impression that they are impalpable, although visible. But they are sometimes represented as being very palpable indeed. There is one described in a popular monthly magazine which "twisted up gunbarrels like so much soft paper." †

The first clear conception of a purely immaterial principle is probably to be ascribed to Plato. But long after Plato the old notion of spirit as an attenuated form of matter survived even in scientific thinking. As the progress of thought and knowledge brought into clearer light the unity and continuity of nature, the conception of the material soul became modified. There was a tendency to explain its origin as part of the general course of physical nature, and its resemblance to the external body was no longer insisted on. The view taken was that life and thought were properties of a

* Ellis, *The Tshi-speaking Peoples of the Gold Coast of Africa*, p. 151.
† *Pearson's Magazine*, March, 1898, p. 255.

certain form of matter diffused throughout the physical universe. The cue to this theory was given by the phenomena of breathing and of vital heat. The general soul-substance from which individual souls were supposed to be derived was air rarefied by heat. The best examples of doctrines of this kind are to be found among the pre-Socratic philosophers. Anaximenes regards the soul as being essentially air, and air as being essentially of the nature of soul. Air in general is to the universe what our own soul is to us. Heracleitus regards breathing as a connexion between the internal soul and the surrounding air from which it is originally derived.

In later times, when the doctrine of an immaterial soul became generally accepted, the old material soul was still very commonly assumed to exist together with it, and to constitute a link between it and the body. We often find a division of psychical functions between the material and immaterial souls. Ethical and religious functions were often ascribed to the immaterial principle, while all lower functions, such as sensation, perception, appetite, and the like, were ascribed to the material principle. Even in comparatively recent times, we sometimes find the immaterial soul recognised only by way of submission to theological dogma, all ordinary conscious functions being ascribed to material soul. Thus Bacon says: "The sensible soul — the soul of brutes — must clearly be regarded as a corporeal substance, attenuated and made invisible by heat; a breath (I say) compounded of the natures of flame and air, having the softness of air to receive impressions, and the vigour of fire to propagate its action."* To this

* *Works* (Spedding and Ellis), vol. iv., p. 398.

sensible soul he appears to ascribe such faculties as "understanding, reason, imagination, memory, appetite, will." He demands that "the origin of these faculties" should be "handled physically as they are innate and inherent in the [sensible] soul."* The uncreated and immortal immaterial principle cannot be investigated in this way; it is a topic for theologians, and it is very difficult to see what Bacon has left for it to do.

The last important survival of the doctrine of the material soul in scientific thought is contained in the doctrine of "animal spirits," as held, for example, by Descartes. The animal spirits consist of a fine form of matter constituting a connecting link between the body and the soul, but they are no longer regarded as themselves capable of any kind of conscious experience. They are merely part of the mechanism by which the immaterial principle acts on the body and is acted on by it. Thus the material soul for Descartes is a soul no longer; it is merely a mode of matter, and like all other matter sharply and rigidly distinguished from all conscious existence. With the advance of modern physiology, it became displaced even from this position, and was recognised as a figment.

* *Ibid.*

CHAPTER VIII.

BELIEF AND IMAGINATION.

§ 1. *Distinction between Belief and Imagination.* —A man sitting in his arm-chair can easily imagine himself killing a lion by a blow of his fist. But suppose that he meets an actual lion, and has to look to his own safety. This ideal combination is no longer possible for him; the idea of the lion pouncing on him and tearing him to pieces takes possession of his mind, and excludes the fanciful picture of his own powers. The same may happen without his actually encountering the lion. If in his arm-chair he is planning a hunting expedition to take place the next day, such ideas as that of killing lions with a blow of the fist will be excluded, and they will be the more completely excluded the more strenuous he is in the pursuit of the practical end in view.

This example brings out the essential distinction between Belief and Imagination. All belief involves objective control of subjective activity. The nature of the object thought about enforces certain ideal combinations to the exclusion of others. But this objective control is not absolute; it is conditional. It depends upon the end towards which mental activity is directed. So long as the subject is strenuously aiming at the

achievement of practical ends, only certain combinations of ideas are possible for him, but if his mind is not bent on the achievement of practical results or on the attainment of new knowledge, almost any ideal combination may be possible for him which does not involve an explicit contradiction. He cannot imagine a thing as being at once round and square, black and white; he cannot mentally make two straight lines include a space, without destroying their straightness; but apart from such limitations, he can ideally construct all manner of relations; he can combine horse and man so as to form an image of a centaur; he can picture a giant with a hundred heads, and so on. There is always some restriction on the play of ideal construction, besides that due to overt contradiction; but the restriction in each case depends on the general direction of mental activity at the time. So far as the restriction exists at all, his mental attitude is one of belief; the flow of ideas being restricted by the nature of the object. Thus if he is thinking of normal men and women, he may mentally frame a narrative about them which has no reference to any actual man or woman whom he has seen or heard of. So far, the play of his ideas will be relatively free; it will not be bound down by conditions of date and place; none the less, it will be tied, inasmuch as he is not at liberty to introduce into his mental construction features at variance with the normal nature of human beings. He must not make them breathe fire, or have their heads beneath their shoulders. So far he is bound by the distinction between the credible and the incredible. There is no belief in the narrative as historical fact; but belief

about human nature in general is involved in it through and through On the other hand, suppose that the play of his imagination does not refer to actual human beings, but to certain creatures of its own; it will then have much wider range, but it will still be more or less guided by initial assumptions. The subsequent flow of ideas will be restricted by the anterior flow of ideas; if a man has started by imagining fairies inhabiting flowers, he cannot think of them as giants inhabiting castles; so that even in this case there is a certain amount of objective restriction and consequently of belief.

Now objective restriction is at its maximum in the pursuit of practical ends, and in the pursuit of knowledge. It is therefore only in these cases that we find full belief, — belief which is not blended with imagination, but contrasted with it. For a moment we may confine our attention to practical activity. The primary motives of ideal construction lie in practical needs. Ideal combinations are first framed with a view to efficient action. Only those therefore are sought for which will make action efficient. By ideal representation a man builds a bridge across a stream before he comes to it; but the one thing important to him is that the bridge shall not give way when he comes to use it. Hence the flow of ideal construction is strictly limited. Only such ideal combinations are of use as can be translated into corresponding perceptual experience; others, therefore, are as far as possible excluded. In so far as ideal constructions break down on being translated into terms of perceptual activity, the attitude of disbelief arises. What has happened is the actual fact; what was anticipated is contrasted with it as a false

opinion. In this way the antithesis between the true and the false, between the credible and the incredible, becomes widened and deepened.

It appears from this that the attitude of belief and disbelief is prior to the free play of imagination. But even the savage is by no means always in a strenuously practical mood. He has his time for play as well as for work; and among other forms of play, he indulges in the play of ideas. When he is comfortable and idle, it gives him pleasure to represent things not as they are, have been, or will be, but as he would like them to be, or in any way which may happen to interest him. He may communicate his imaginings to his comrades, and they may be handed down from generation to generation. Such works as the plays of Shakespeare, or the novels of Thackeray, are examples of the most advanced development of this mode of mental activity.

§ 2. *General Conditions of Belief.* — There are two main points of view from which the problem of belief must be approached. It is at once a condition of activity, and conditioned by activity.

"The relation of belief to activity," says Bain, "is expressed by saying that 'what we believe we act on.'"* This may seem to be a statement rather of a consequence than of a condition of belief. But a closer scrutiny will show that the criticism is superficial. Just because belief is a condition of activity, activity must be a condition of belief. To strive after an end is to strive after the means necessary for its attainment. Hence in striving after an end, we strive after the belief which alone makes action with a view to that

* *Mental and Moral Science* (1872), p. 372.

end a psychological possibility. Thus practical and theoretical needs play an essential part in determining what we shall and shall not believe. This holds good in the pursuit of theoretical as well as of practical ends. The man of science, eager to advance knowledge, for the sake of advancing knowledge, clings to *working* hypotheses; he clings to them because they are useful to him. He is apt to meet criticism by urging that no one ought to pull down a man's house until he has himself constructed a better. Whether the end aimed at be a practical result or an increase of knowledge, in both cases the mind presses forward towards its mark as best it may, shaping those beliefs, and clinging to those beliefs, which are most helpful to it, and passing by those alternatives which would hamper and paralyse its activity.

The activity which is concerned with the increase of knowledge is in order of development subsequent to the activity which directly pursues practical ends. The ideal construction which is directly subservient to action brings into being a connected system of ideas concerning the world and the Self. Theoretical activity consists in further development of this same system of ideas without direct reference to practical results. It is no free play of the imagination, but consists in the formation of beliefs, just because it is the further development of a pre-formed system of beliefs. The conditions and limitations of this system as a whole apply to all enlargements of it. It excludes or refuses to include all merely imaginary combinations.

Let us now turn to the other side of the question. Belief is not only conditioned by mental activity, but

also involves restriction of mental activity. Objective coercion is of the very essence of belief. Whatever influence subjective needs as such may have in determining belief, they can never be the sole factor. In framing a belief, we endeavour to represent real existence as it is in its own nature, independently of our own individual consciousness. Where we feel that it is purely a matter of our own arbitrary choice whether we shall think of *A* as *B* or as *not-B*, there is no belief or disbelief. There is a state of doubt when this freedom of choice is accompanied by an effort to find something not ourselves which shall determine us one way or the other, so that we shall be able to arrive at a belief. There is a mere play of imagination when this endeavour to arrive at a belief is absent. For actual belief or disbelief, some restriction of subjective freedom is necessary. Thus belief is at once dependent on activity and on limitation of activity. There is no contradiction; on the contrary, the two points of view ultimately coincide. Belief depends on subjective tendencies, just because these tendencies cannot work themselves out without it. Ends can only be realised by the use of means; but in order to use means, we must have some belief in their efficacy; hence the impulse to pursue an end is also an impulse to form beliefs which will make action for the attainment of the end possible. But it is not within the range of our arbitrary selection to determine *what* means will lead up to a given end, and what will not. This depends on the nature of the real world in which we live. There must therefore in the framing of a belief be always some endeavour to conform to conditions other than, and independent of, our own sub-

this end is of itself a tendency to believe in the ideally represented combination. If denial of this is tantamount to sacrificing a cherished aim, the whole strength of desire helps to enforce the affirmative side. Thus persons of vigorous and courageous temperament are apt to believe what they wish to believe. Indeed this is sometimes stated as a maxim holding good of human beings in general. *Tarde creduntur, quae credita laedunt*, says Ovid; but we must not push this view too far. Where the general mental attitude is one of fear, or timidity, or gloomy suspicion, it does not hold good. Fear or timidity or gloomy suspicion favours belief in disagreeable alternatives. Where the tendency is not to face and fight difficulties and dangers, but to evade and escape them, action will be most effectively guided by taking the most unfavourable view of the circumstances. Even if an alarm is false, it is better to be on the safe side. There is much in the religious superstitions of savages which shows manifest traces of this influence of fear upon belief.

It should be clearly understood that the distinction between the subjective and the objective co-efficients of belief is not a logical but a purely psychological distinction. Whatever condition controls and limits subjective activity, so as to enforce one way of thinking, and to make other ways difficult or impossible, is from the psychological point of view an objective coercion. It may be that the control thus exercised does not really proceed from the nature of the object as known to more highly developed minds. Logical analysis from the point of view of higher knowledge may show that what is operative is some association of ideas, which,

though it may be vivid and insistent, is none the less casual and irrelevant. But for a mind which is unable to recognise it as casual and irrelevant, the coercive power of the association must appear as if it proceeded from the nature of the object represented. The words "casual" and "irrelevant" imply that a systematic view of objective relations has already been formed, and that this system excludes the connexion of things or events suggested by the association which is called irrelevant and casual. But a mind which has not attained to this systematic view cannot distinguish between control really proceeding from the nature of the object, and control proceeding from what is recognised at a higher standpoint as a merely subjective connexion of ideas. Hence savages appear to us to confuse objective with subjective necessity. Any association between *A* and *B* through which the idea of *A* vividly and insistently calls up the idea of *B* may lead to a belief in a real connexion between them. If in a fit of anger we trample on a man's portrait, it is difficult for the moment to avoid believing that we are by the act doing the man himself a direct injury. The savage has a real and permanent belief that men can be injured in such ways. He thinks, for instance, that by destroying a man's footprints he can spoil his journey or make him lame. So the Chinese believes that by hanging up in his house ancient coins he secures for himself the protective influence of the spirits of the emperors under whom the coins were issued. Such instances are innumerable. There is nothing in the beliefs thus formed which is at variance with the preformed system of beliefs. On the contrary they are in full harmony with

this. Hence subjective interests together with vivid and insistent associations of ideas exercise unresisted control.

One main reason why the subjective factor is more dominant in primitive thought is that the preformed body of belief is comparatively small in extent and imperfectly organised. A body of belief is more fully organised in proportion as the denial of this or that combination of ideas which enters into its composition involves a greater and more destructive alteration in the whole system. Savage beliefs are not woven into a unified whole to nearly the same extent as civilised beliefs; hence the influence of the objective factor is smaller. For the influence of pre-established convictions in determining the credibility or incredibility of new suggestions is in its nature objective. However the old beliefs have been formed, and whether they are true or false, they are affirmations or denials of real existence. Whatever is rejected because of its inconsistency with them, and whatever is accepted because its denial would be inconsistent with them, is accepted or rejected because it is felt to be implied in or excluded by the constitution of the real world. Thus the influence of the objective factor develops as the general body of belief grows in extent and becomes more highly systematised.

In this process, when it is carried far enough, truth must be the gainer; for error cannot ultimately be made self-consistent. But in relatively early stages of the process the result is to a large extent of an opposite kind. Beliefs shaped in ignorance under the pressing urgency of practical needs help to produce new beliefs,

and give rise to an organised system of error, so that the united force of the whole resists interference with any part of it.

§ 4. *Influence of the Social Factor.* — Ideal construction is, as we have seen, a social product. Hence the beliefs of the individual are to an immense extent shaped and determined by the beliefs current in the community in which he lives. This is an objective factor of paramount importance. But its logical value of course depends on the process by which current beliefs at first came into being. When these have no adequate basis in fact, their social endorsement simply serves to safeguard them against doubts to which the experience of individuals might otherwise give rise. If a belief in witchcraft, for instance, is already established in a community, those persons who think they have in their own experience evidence for its reality will have an immense advantage over any individuals who may venture to oppose them. The most acute reasoning and exhaustive research will have little chance against the most flimsy and prejudiced tale of old women causing sickness in children or preventing the cows from yielding milk. It must seem futile and perverse to put forward other explanations of these phenomena when there already exists an established explanation which, so to speak, forms part of the social order.

The adverse critic is an eccentric person who sets his individual fancy in opposition to the whole community. He is promptly suppressed. It is however a very rare thing that such a critic should arise within the community itself apart from the intrusion of foreign influences.

The people of a community often maintain their beliefs by trusting each other, as the inhabitants of the Scilly Islands are said to have eked out a precarious livelihood by taking in each other's washing.

§ 5. *Some Features of Primitive Belief.* — We have seen that the formation of new beliefs depends at every step on the nature of the beliefs which are established. Thus, in reviewing the history of human thought, we have to take account of two points. On the negative side we have to remember that complex systems of ideas which are familiar to us have not yet come into being in earlier stages of development. In particular, the power of mechanical construction, and the mechanical understanding of natural process was in the beginning extremely rudimentary and limited in the range of its application. Hence there are certain general conditions of interaction between material things constantly recognised by modern culture which are not present to the mind of the savage, or even to the ignorant members of civilised society. For early thought, it is abstractly conceivable that anything should act on anything else. The unity of the individual thing determines the connexion of its parts; it is not the connexion of the parts which produces the unity of the thing. Hence there is no reason why the component parts of the individual whole should not interact even when they are separated from each other in space. Besides this, the primitive view of what is and is not part of an individual whole differs from ours. The savage is in this respect powerfully influenced by associations which we should call casual and irrelevant. Whatever he has habitually connected in thought with a person

or thing, he is disposed to regard as part of that person or thing, and as having sympathetic communion with it. He continues to associate vividly the dead body with the ghost, the amputated limb with the man who has lost it, and he cannot help feeling that what is done to the body makes a difference to the ghost, or that what is done to the amputated limb makes a difference to the man who has lost it. Similarly, he habitually associates a man's clothes, or his tools and weapons, or his other belongings, with the man himself; in thinking of the personal belongings, he is impelled to think of the person, and he is led to regard them as part and parcel of the total personality. Hence these external appendages are for him no mere external appendages; the unity of the individual is present and operative in them. By appropriating a dead man's spear, he may appropriate his skill and good-fortune, and the like. The unity of the world in general is vaguely conceived after the analogy of the unity of the individual thing. The unity of the world is not explained according to a system of uniform and abstract laws regulating the connexion of its parts. On the contrary, things and events are supposed to be capable of sympathetic communion just because they form part of the same world. Anything from this point of view may be really connected in determinate ways with anything else. Specific characteristics, powers, and modes of behaviour, will appear as ultimate and inexplicable. They will appear as what we should call occult qualities intrinsic to the things themselves, and not as admitting or requiring further analysis or explanation. Any interaction or real connexion may be accepted as a fact, if it be vividly im-

pressed on the mind in relation to some strong practical interest. For example, there is no keener or more widespread practical interest than that which is felt in the course of future events. Hence we find all over the world a belief in signs and omens, and methods of divination. Often appeal is made in various ways to a superhuman being supposed to possess prescience. But in the most simple cases, anything which is found suggestive to the persons interested may be regarded as a sign. Among the Tshi-speaking tribes of the Gold Coast, divination is practised by the priests in a variety of ways as they are guided by the caprice of the moment. In time of war, a method of ascertaining which party will get the better, is to haul on a rope fastened to a tree till it breaks. While it is being pulled, the names of the combating parties are called out alternately, and the name which is called out at the moment when the rope breaks is that of the party which will gain the advantage. We may compare the belief in fortune-telling by cards, which is sometimes found among ourselves.

This then is the first point to be emphasised in contrasting cultured with savage thought. The limitations imposed on our ideal construction by our pre-existing knowledge, and especially by our mechanical view of nature, are non-existent for the savage mind. But besides considering the ideas which are absent from the savage mind, we must also consider the positive nature of the ideas which are most predominant in his thinking. We have seen that the conception of individual unity is familiar to him and constantly utilised by him; but among all individuals those which are most famil-

iar, interesting, and best known, are human beings, — himself and the members of the society in which he lives. Hence the constant and prevailing tendency which we find in primitive thought to interpret all things in terms of personal life and personal relations. Whatever arrests his attention and fixes his interest as a source of good and evil to himself, is regarded by him as having some sort of conscious existence more or less analogous to his own. This is possible because of his failure to understand the mechanical explanation of natural events and processes. When the structure and operation of a piece of mechanism is fully understood, it can no longer be regarded as a separate and independent agency prompted by internal impulses, analogous to the will of personal beings. But where the principle of action is regarded as something ultimate and independent, intrinsic to the nature of the individual thing, there is nothing to prevent the mind from treating the agency as personal or quasi-personal. The cataract or the whirlpool appears a living thing to the poet in his poetic moods; for in these moods he ignores the fact that the water is simply behaving in accordance with certain abstract laws under certain given conditions. This fact is not *ignored* by the savage; it has never been realised by him. Hence what may be a transient play of imagination in the civilised mind, is the permanent and serious attitude of the savage mind. It is permanent and serious because it is prompted and upheld by practical needs. In presence of personal agencies, he can never feel himself utterly helpless. He can always attempt to influence them as he influences his own fellows in society. He can propitiate

them by offerings, by prayers, by self-humiliation, by flattery, and even by threats and punishments. Of course, these means often fail; but they fail frequently in the case of human beings. Personal caprice and perverseness introduce incalculable elements into the problem. But this only serves to make possible the survival of the anthropomorphic point of view. Failure can always be explained, and apparent success can always be regarded as convincing evidence. Continued malignancy on the part of the supposed personal agency can always be ascribed to deep resentment of neglect shown to it, or of injury done to it, consciously or unconsciously. Besides it is always possible to say that things would have been still worse if proper methods had not been taken.

It has been shown that the primitive conception of personal existence differs in many points from our own; and this difference appears in the mode of personifying natural objects and agencies. Just as the human person has an internal and external self, personified things have also an internal and external self; and as the internal self in the case of human beings is a sort of duplicate of the body, so all things which are regarded as separate agencies are supposed to have spirits of a similar kind. Hence the widespread savage doctrine that everything has its "double." The ghost of a spear may exist and kill people after the spear itself has been destroyed. When sacrifices of food, clothes, and utensils are made to the dead body, their spiritual counterparts are appropriated by the soul. We saw that the same individual may have not only two but many impersonations of this kind, all in sympathetic communion

with each other, so that the unity of the whole is present and operative in all of them. This is even more true of natural agencies personified, when they are powerful and important. Savage deities often originate and are conceived in this way. To select an instance at random, there is a god called Behnya worshipped by the Tshi-speaking tribes of the Gold Coast. Behnya is primarily a river; he has also a human shape, with whip and sword. He has an image and stool, which used to be washed with the blood of human victims offered to him. The body of the human victim was cut into small pieces, and distributed round the outskirts of the town, rendering it impossible for a hostile force to make an entrance. There was also a certain rock in which his influence was present and operative. Thus the river itself, the human shape, the image and stool, the pieces of the body of the human victims, and the rock, were all separate vehicles of the influence of Behnya. He was impersonated in all of them.*

* Ellis, *The Tshi-speaking People of the Gold Coast*, chap. v.

CHAPTER IX.

FEELING-TONE OF IDEAS.

§ 1. *Introductory.* — The pleasures and pains of ideational process have two sources. They are either due to a remnant of the feeling-tone of an actual sensation or perception persisting in ideal revival, or they arise independently in and through the ideational process itself as an activity directed toward an end. It must also be borne in mind that trains of ideational thought always have an accompaniment of organic sensation faint or intense. They occasion changes in the common sensibility, which have often a conspicuous feeling-tone.

§ 2. *Revived Conditions of Feeling-Tone.* — Feeling-tone cannot be directly revived. Its recurrence depends on the re-instatement of the original conditions of production. Now the reproduction of the percept in the ideal image is at the best only partial, and we should therefore expect the revival of feeling-tone to be partial also. Much allowance must of course be made for differences between individuals; but it may be said generally that the pleasures and pains of actual sensation are very faintly echoed in the corresponding ideal images. Some apparent cases of intense revival are illusory, being really due to concomitant organic sensations. Thus the idea of undergoing a sur-

gical operation may produce a widespread and intensely disagreeable disturbance of common sensibility; but the feeling-tone does not belong to the mere idea of being cut, etc. Excluding such cases, it would seem that strictly sensational pleasures and pains occur only to a very limited extent in ideal revival. We must however guard against making too absolute a statement. Probably persons who can visualise colours with great vividness can also enjoy them in their ideal re-instatement, in a way approaching more nearly the actual sense experience than persons who visualise poorly can readily comprehend.

The pleasures and pains due to perceptual combination in space and time are in general more perfectly recoverable by those who have a sufficient power of ideal imagery. The man who can visualise distinctly and vividly, may, in recalling before his mental eye a picture or a landscape, renew to a large extent his original enjoyment of it. There are some few persons gifted with an exceptional power of auditory revival who can enjoy music almost as well in reminiscence as in actual hearing. The main drawback they find is the effort which it costs them. Actual hearing is very much easier.

In actual perception an object may be pleasing or displeasing, not through the immediate feeling-tone of the sensations which it produces or their grouping in space and time, but through the previous experiences with which it has been connected. The sight of a bunch of grapes may give pleasure in part because we have had the experience of eating grapes. The feeling-tone is due to the re-excitement of the cumulative dis-

position left behind by previous experiences of the object. Now this cumulative disposition is also re-excited in ideal revival, and with it the feeling-tone. In general, the agreeableness or disagreeableness of the ideal revival is not so intense; but apart from interfering conditions, it is generally present in some degree. Poets often produce their best effects by accumulating references to objects round which pleasing associations cling. Tennyson's *Brook* is a good example.

> I wind about, and in and out,
> With here a blossom sailing,
> And here and there a lusty trout,
> And here and there a grayling,
>
> And here and there a foamy flake
> Upon me, as I travel
> With many a silvery waterbreak
> Above the golden gravel.

In this and similar poems, a number of objects pleasantly toned by the cumulative effect of past experiences are referred to in succession, and the total result is extremely agreeable.

A very important source of ideal pleasures and pains lies in the reminiscent revival of past activities in which we have been triumphant or defeated. The greater the difficulties overcome, the greater in general is the pleasure of reminiscence. Where we have been successful after a struggle, the pleasure of ideal revival is often much more unmixed than the pleasure of the original experience. In recalling past obstacles and difficulties, we have always the consciousness that they have been overcome, and this reduces to a minimum the disagreeableness of the original struggle. We are not bound to

dwell on the unpleasant parts of the experience at more length or in more detail than is required to enhance the pleasures of success. Even where we have been defeated, reminiscence is often more pleasing than displeasing. The reason is that the mere lapse of time has raised us to a point of view from which we can regard past success or failure as a matter of indifference. This in itself is a kind of victory. If the reminiscence of our past struggles continues on any ground to be interesting, it gives us pleasure rather than pain.* Besides this we can always skip more or less lightly over occurrences which would be disagreeable even in their ideal revival.

All that we have said about revival of feeling-tone must be understood with one important qualification. It is necessary to distinguish between the attitude of imagination and the attitude of belief. The mere ideal representation of an object may in itself give pleasure or pain; but this must not be confused with the pleasure or pain arising from our belief in the existence or non-existence of the object under given conditions. Doubtless the pleasure of ideal revival is at its maximum when it takes the form of the pleasure of anticipation. A person living in a crowded city may take pleasure in ideally recalling trees and woods and mountains as a mere play of imagination. But a new source of intenser pleasure arises when he finds that he can take a holiday and actually visit the scenery of Scotland or Switzerland. The reverse occurs when his mind is disagreeably disturbed by the thought that

* Of course this is not the case when the consequences of past defeat continue to affect unfavourably our present position.

these things are beyond his reach. "A busy man reads a novel at the close of the day, and finds himself led off by a reference to angling or tropical scenery to picture himself with his rods packed *en route* for Scotland, or booked by the next steamer for the fairyland of the West Indies. Presently, while the ideas of Jamaica or fishing are at least as vividly imagined as before, the fancied preparations receive a rude shock as the thought of his work recurs."* The "rude shock" is due to the direction of attention to the actual existence or non-existence of what has been previously merely imagined. This brings with it a desire for the actual experiences themselves. The belief that they are out of reach thwarts this desire and produces pain which displaces, often though not always completely, the pleasures of imagination. In general, the thought of a pleasing object which is recognised as beyond our reach gives pain rather than pleasure when there is a desire for its actual possession. To enjoy the pleasure of ideal revival in the case of unattainable objects, we must be able to adopt the attitude of imagination or make-believe, and this is very often impossible.

§ 3. *Feeling-Tone of Ideational Activity itself. Belief.* — Ideational activity may assume two forms. On the one hand, it may be directed to the production of some new result in the real world, or to the increase of our knowledge of the real world; on the other hand, it may be a mere play of the imagination. The conditions of pleasure and pain in the two cases are not quite the same, and it will be well to treat them sepa-

* Ward's article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 74.

rately. In both cases whatever furthers activity so as to make it more efficient, conduces to pleasure; and whatever obstructs it and makes it inefficient, conduces to pain.

We shall consider first those trains of ideas which are directed towards the production of real results or the increase of knowledge. Two modes of furtherance and obstruction may be distinguished, — the material and the formal.

Material obstacles consist in ideally foreseen circumstances which would actually bar the way to the execution of a plan or to the occurrence of a desired event. As Spinoza says, whatever hinders the body's power of acting hinders the mind's power of thinking; whatever would, in fact, obstruct the execution of a plan, obstructs the formation of the plan, when it is ideally foreseen. If I am planning an excursion and discover that the railway arrangements at a certain place are fatal to its execution, this circumstance arrests the flow of my ideas just as it would arrest their realisation. The belief that a certain event will occur interferes with the ideal train of thought, just as the event itself would interfere with the actual train of occurrences. What has been said of obstacles is equally true of furtherances. The prevision of circumstances which would facilitate the execution of an ideal scheme facilitates its formation.

Formal obstacles and furtherances are those which depend on the form of the flow of ideas and not on the ideas themselves. They are due rather to error, ignorance, misapprehension or confusion on our part, than to the actual circumstances of the case. Doubt

and contradiction arising at a critical point arrest the flow of ideas, just as the positive prevision of an external obstacle does. If in laying our plans for an excursion we discover, not that the train arrangements at a certain place are unfavourable, but that we have no means of finding out what they are, the flow of mental activity is held in suspense. The belief that there will, and the belief that there will not, be a train fit for our purpose are equally justified and unjustified, so that their conflict blocks the onward progress of thought. Suppose now that one authority, *A*, says that there will be a train, and another, *B*, that there will be no train, the state of suspense is intensified. The doubt arising from ignorance passes into the doubt arising from positive contradiction. The statement of the one person furthers and stimulates activity, while the statement of the other suppresses it. If in the long run we come upon evidence which proves that a train runs just at the time we want it, there is a release from tension and an onward bound in the flow of thought which constitutes a highly pleasurable furtherance of activity. Similarly, apart from any previous doubt or contradiction, the mere fact that we find ourselves able to arrange the details of a complex plan so that they fit into each other without hitch or hindrance, is a source of pleasure. Another formal condition of pain is the struggle to find connexion between data which in spite of our efforts continue to appear detached and isolated. This is perhaps best illustrated when we are attempting to follow the train of thought in another person's mind, either by reading or listening. We are looking for a logical connexion between the statements

which follow each other; but if the exposition be bad, or the subject-matter too hard for us, we find incoherence instead of coherence, and the greater our mental effort the more painful it is. A corresponding pleasure is felt when facts which have been previously disjointed and detached in our minds are brought under one point of view, and shown to be exemplifications of the same principle working under different conditions. Here the efficiency of mental activity is increased. "When we discern a common principle among diverse and apparently disconnected particulars, instead of all the attention we can command being taxed in the separate apprehension of these 'disjecta membra,' they become as one, and we seem at once to have at our disposal resources for the command of an enlarged field and the detection of new resemblances."*

We have laid down the general principle that obstruction of mental activity is painful, and its furtherance pleasant. This is true, if properly understood; but there are complications which are apt to cause confusion if they are not carefully explained. Above all, it must be noted that an obstacle to the attainment of an end does not necessarily bring mental activity to a standstill. What is really painful is dead strain comparable to pushing against an unyielding wall. But an obstacle, whether formal or material, to the attainment of an end, may heighten instead of arresting, the flow of ideas, just as the dangers of mountaineering call into play the resources of the climber, thereby increasing his bodily and mental activity, and contributing to his

* Ward's article "Psychology," *Encyclopaedia Britannica*, ninth edition, xx., p. 70.

pleasure. A difficulty in face of which a man feels himself helpless, is painful in proportion to the strength of the conative tendency which it thwarts. On the other hand, a difficulty which calls his powers into fuller and more varied play, may be a source of pleasure. Whether it will be actually so or not, depends upon the special conditions of the case. It is necessary to distinguish between two kinds of end: in the one, it is part and parcel of the end that it should be attained in a certain way by our own activity; in the other, it is a matter of indifference whether it occurs with or without our co-operation. If we are trying to hit a mark with a stone, it will give us no satisfaction for somebody else to hit the mark; it will give us no satisfaction to walk up to the mark and place the stone on it. So in guessing a riddle it gives us comparatively little satisfaction to be told the solution; the pleasure lies in finding it out for ourselves. On the other hand, if we are hungry and desire food, we are perfectly content to have it placed on the table for us. Our satisfaction is not at all diminished by the fact that we did not prepare it ourselves; on the contrary, the necessity of preparing it ourselves would in most cases be an actual drawback. We have stated the contrast between these two kinds of ends, so as to bring out the antithesis between them as sharply as possible. But as a matter of fact, they are for the most part blended with each other, satisfaction lying partly in the attainment of the final result, which we may call the material end, and partly in the process of attaining it, which we may call the formal end. We may suppose that Œdipus was a man who delighted in guessing riddles; and ordinarily

his satisfaction would lie in finding out the answer for himself. But when he had to deal with the Sphinx, his satisfaction would mainly consist in the deliverance of Thebes and in his own escape from being eaten. Now in the case of an ordinary riddle, difficulty would be mainly a source of pleasure, — because it would give scope for the fuller exercise of his mental powers. But in guessing the riddle of the Sphinx, the conditions are essentially altered; for here the welfare of Thebes and his own life were at stake, and these interests had a much greater relative importance than the exercise of his ingenuity in guessing riddles. Thus inasmuch as the difficulty threw doubt on the attainment of the material end, it would bring unmixed pain, which would probably overwhelm and overbear the ordinary pleasure of Œdipus in overcoming intellectual obstacles.

We may sum up as follows. The continuance of a conation in face of an obstacle gives rise to mere dead strain, and is therefore painful, in so far as the subject feels himself powerless to deal with the obstacle. On the other hand, so far as the obstacle calls into play the resources of the subject to overcome it, it heightens free mental activity, and to that extent gives rise to pleasure. But even in this case a condition of pain is introduced if and so far as the presence of the obstacle makes doubtful the attainment of that final result of activity which we have called the material end. The pain is the greater, the stronger the doubt is, and the greater the importance of the material end.

We must carefully distinguish between obstructed activity and diminished activity. An obstacle blocking the onward progress of a train of thought has for its

first effect an intensification of the conative tendency which it renders ineffective. It is only in a gradual way that the conation diminishes in intensity, until it is displaced by some other activity. This takes a longer time the stronger the interest involved.

The removal of an obstacle, either by our own activity or by external circumstances, is a source of pleasure. The resulting pleasure is by no means a mere equivalent of the pain of previous obstruction. Sometimes it is less, and very often it is greater. When the preceding tension is not too prolonged and intense, the pleasure of relief for the most part exceeds the pain which is its pre-condition. Thus such an activity as solving a chess-problem is predominantly pleasing, in spite of periods of dead strain, in which there appears no hope of solution. So a novel with a good plot creates pleasure by a series of alternating checks and releases of mental activity. The extreme case is found in certain forms of the ludicrous. A pun impels the mind to identify objects utterly disconnected with each other. This of course involves a conflict, and an obstruction of the flow of thought. But the obstruction is so transient that it scarcely gives rise to anything that can be called pain at all. On the other hand the relief which comes with insight into the true state of the case may be a source of keen pleasure. Mental activity suddenly obstructed and so heightened is immediately set free, and is so much greater than the situation demands that it has nothing to do but enjoy itself.

It should be noted that the same conditions which increase or further mental activity may also be the conditions which initially excite it. Let us take the case

of a man who finds, either that he has come into a fortune, or that he has lost one. Consider first the sudden transition from poverty to riches. One effect may be the opening of the field for the satisfaction of conative tendencies which actually played a large part in his conscious life in the period of poverty. But besides this there will be many tendencies which were comparatively latent while he remained poor, partly because they were displaced by more pressing needs and partly because of the hopelessness of attempting to satisfy them. The sudden accession of wealth will open a free field for the satisfaction of these previously latent tendencies, and it will at the same time transform them into conscious conations. In the opposite case of the rich man becoming poor, many conscious ambitions and projects will be crushed; but besides this there is much in his mode of life as a rich man to which he has paid no attention because it has been a mere matter of course and of routine. But his routine habits, so soon as they are obstructed by poverty, become changed into conscious conations; the same condition which denies these conations satisfaction, calls them into being.

§ 4. *Feeling-Tone of Ideational Activity itself. Imagination.* — One grand characteristic of the play of imagination is the absence of what we have called the material end. The end is simply the working-out of the ideational process itself, apart from any special result to be produced in the real world or in the advancement of our knowledge of it. This gives imagination a great advantage as a pleasure-yielding activity. In pursuing material ends, we are subject to the real conditions on which their attainment depends. We are

thus compelled to face all the obstructions and difficulties which the constitution of the real world imposes. In imagination, on the other hand, limiting conditions are imposed by ourselves. If we begin by fancying that we are as strong as Samson, and proceed to fancy that we meet a lion, this is only a favourable opportunity for rending the lion like a kid. If on the other hand we actually anticipate meeting a lion, the problem is how to avoid being rent ourselves. We need introduce no obstacles into the flow of imaginative activity, except such as can easily be overcome by imaginary conditions and so serve to enhance our pleasure on the whole. Take for example such an imaginary narrative as Dumas' *Monte Christo* or *The Three Musketeers*.

Of course there must be a certain internal coherence in the play of imagination. Explicit contradictions give rise to the pains of obstruction as they do in the pursuit of practical ends or of knowledge.

Besides the logical incoherence arising from explicit doubt or contradiction, there is also a kind of incoherence affecting the formation of the idea of an object, apart from reference to its existence or non-existence. Under this head comes incongruity between the structure of an object and its function. The function of a pavement is to be trodden on, and for this purpose the more level it is the better; if it is worked in mosaic, so that its parts appear in relief, the effect on the eye is unpleasing. We may know quite well that it is even; but its apparent unevenness interferes with our idea of a pavement. The same kind of unpleasantness is produced by the sight of a key so elaborately decorated that it appears unfit for its proper function. Similarly

the lover of books feels discomforted if he sees a favourite volume upside down on the shelves. Unpleasantness may be due to mere violation of habit. Most people who have been accustomed to the ordinary English mode of spelling, are annoyed when they see words like *honour* and *colour* spelt *honor* and *color*. This effect is intensified in so-called "phonetic spelling." If in a picture shadows do not fall as the direction of the light requires, the result is unpleasing even before the incongruity is explicitly detected and formulated. Similarly, incongruities in the development of character in a novel obstruct the flow of ideas and create the impression of unnaturalness, even though no contradiction is explicitly recognised. This kind of incoherence may attach to all forms of ideational activity. It is here brought under the head of imagination, because it affects the flow of ideas as such in distinction from beliefs concerning existence and non-existence.

§ 5. *Sentiment and Emotion.* — After the full treatment of emotion in bk. iii., div. i., ch. iv., it is not necessary to say much more about it at this point. What is true of perceptual process, holds, *mutatis mutandis*, of ideational. On the perceptual plane, the actual presence of a dangerous situation excites fear; on the ideational, the ideal prevision of a similar situation has a similar effect. All the general characteristics of emotion which we enumerated in bk. iii., div. i., ch. iv., § 1, apply equally to perceptual and ideational process.

There is only one point which appears to require more extended treatment at this stage. We noted that emotions, so far as they had not their primary origin in organic change, usually exhibit a parasitical character.

They are in the main secondary phenomena, and pre-suppose the existence of more specific tendencies. The anger, for instance, produced in a dog by taking away its bone pre-supposes the specific appetite for food.

Now on the ideational plane the specific tendencies which condition the occurrence of emotion are incomparably more varied and complex than the primary perceptual tendencies. All the various systems of ideas which grow up in the process of ideal construction of the world and of the Self, have their conative aspect. Each system of ideas is a general tendency to feel and act in certain ways under certain circumstances. It is convenient to have a general name for ideal systems, considered from this point of view. It does not appear that any better word can be selected for the purpose than *sentiment*, though in so employing it we extend its application beyond the range of ordinary usage. If we give this extended application to the word, we may regard emotions which pre-suppose mental dispositions organised through previous trains of ideational activity, as episodes in the life-history of sentiment.

The credit of first drawing attention to this distinction between emotion and sentiment belongs to Mr. Shand, and we cannot do better than quote his words. Emotions "are in a sense adjectival and qualify a more stable feeling. Whereas the specific organisation of our sentiments, — affection for our friends, the home-sentiment, and every sentiment that we can use the term 'love' to express, as love of knowledge, art, goodness, love of comfort, and all our interests, as interest in our health, fortune and profession, interest in books, collections, self-interest, — these, so far from being

mere adjectives and qualifying other feelings, are the relatively stable centres to which the first attach themselves, the substantives of these adjectives, the complex wholes which contain in their possible life-history the entire gamut of the emotions.

In the love of an object . . . , there is pleasure in presence and desire in absence, hope or despondency in anticipation, fear in the expectation of its loss, injury, or destruction, surprise or astonishment in its unexpected changes, anger when the course of our interest is opposed or frustrated, elation when we triumph over obstacles, satisfaction or disappointment in attaining our desire, regret in the loss, injury, or destruction of the object, joy in its restoration or improvement, and admiration for its superior quality or excellence. And this series of emotions occurs, now in one order, now in another, in every sentiment of love or interest, when the appropriate conditions are present.

Now consider how these same emotions repeat themselves, often with opposite objects, in the life-history of every sentiment which we name dislike or hatred. There is pain instead of pleasure in the presence of the object, desire to be rid of it, to escape from its presence, except we can injure it or lower its quality, hope or despondency according to the chances of accomplishing this desire, elation or disappointment with success or failure, anger or fear when it is thrust upon us and persists, surprise when the unexpected occurs, regret or grief, not in its loss or injury, but in its presence and prosperous state."*

* "Character and the Emotions," *Mind*, N.S., No. 18 (April, 1896), pp. 217-218.

The distinction between emotion and sentiment is to a large extent a distinction between dispositions and actual states of consciousness. Such a sentiment as friendship cannot be experienced in its totality at any one moment. It is felt only in the special phase which is determined by the circumstances of the moment. If we are parting from our friend, we feel sorrow; if we are about to meet him after long absence, we feel joy. The joy and the sorrow are actual experiences; but the sentiment which includes the susceptibility to either according to circumstances, cannot in its totality be an actual experience. It is a complex emotional disposition * which manifests itself variously under varying conditions. These varying manifestations are the actual experiences which we call emotions. Thus we may say that so far as actual experience is concerned the sentiment is constituted by the manifold emotions in which it manifests itself. But this must be understood with an important qualification. We must not suppose that all sentiments are capable of manifesting themselves in the same emotions. On the contrary, the character of the emotion is specifically different according to the nature of the sentiment on which it depends; and the difference may be important enough to justify a different name for the emotion. This is specially exemplified in the distinction between the emotions which have reference to personal and to impersonal objects respectively. The "emotions common to our love of whatever object become complicated with new differentiations in the love or hatred of a human being. Pleasure in the presence of the object, desire for it in absence, for the

* See bk. ii., ch. iv., § 5.

preservation of its existence, for its superior quality, anger or fear when it is threatened, hope, admiration, disappointment, regret, recur, and constitute the love of the object, of its well-being; but the specific emotion of sympathy is differentiated. The nearest approach to this in our love of inanimate things, or those great constructions of our thought, business, knowledge, art, morality, is the interest we take in the continuance of the object, in its improvement, or heightened quality, and, conversely, in the pain which any loss of quality, injury, or destruction occasions. Now if we supposed the object were self-conscious and took pleasure in its own continuance and improvement, and felt pain in its injury or lowered quality, there would then occur a sympathy or identical feeling excited in two conscious beings in reference to the same object. Thus where human beings are concerned, there necessarily arise coincidences of this sort which, multiplying in those common situations where danger or injury is present, develop the emotion of sympathy as a new component of the love of the object. And in the process of development, pity acquires a qualitative flavour distinguishing it from the pain felt in the injury or destruction of inanimate objects.

In the next place, the pleasure felt for the excellence or superiority of an object that we love, develops into the new emotions of respect and reverence: respect where there is a superior power or quality which fails to win admiration, reverence where this superior quality is recognised as moral. And both admiration and something of fear blend in this emotion and give to it a flavour and specific quality of its own.

Lastly, consider how the regret or sorrow that we feel when we have injured any object that we are interested in or love, where human beings are concerned, and our action is not accidental but the outcome of anger, or the change from love to hatred, differentiates the new emotions of remorse and repentance. Repentance is no mere revival of this same universal sorrow or regret; it has acquired a character of its own with the blame that we pass on ourselves, the futile effort to recall and undo the past, the hope and desire and resolution to make the future different. And remorse too has a character of its own, with the fear and even horror that blend with it, the regret for what has been done, without the hope and resolution of repentance, but rather with a deep despondency or despair which sees no possible escape."*

* *Op. cit.*, pp. 218-219.

CHAPTER X.

VOLUNTARY DECISION.

§ 1. *Ascending Levels of Conative Development.* — Conative development is inseparably connected with cognitive development. If we consider conation in the abstract, we can distinguish its positive from its negative phase, — appetition from aversion. We can also distinguish its varying degrees of intensity and persistence and its feeling-tone. But beyond this all differentiation of conative consciousness is differentiation of cognitive consciousness. This does not imply that conation is secondary to and dependent upon cognition. The whole course of exposition in this work refutes such an assumption. What is meant is rather that conation and cognition are different aspects of one and the same process. Cognition gives the process its determinate character: without conation there would be no process at all to have a character.

From this point of view, we may distinguish different levels of conative process as connected with different levels of general mental development. On the plane of perception we have the perceptual impulse; this includes instinctive impulses. Its general characteristic is that the activity involved in it finds immediate ex-

pression in bodily movement guided by external impressions.

The perceptual impulse without losing its essential character may involve a certain amount of ideal anticipation. But we reach a distinctly higher plane when ideas become "sufficiently self-sustaining to form trains that are not wholly shaped by the circumstances of the present." "We can desire to live again through experiences of which there is nothing actually present to remind us."* The mere ideal representation of an end may be the primary starting-point of an activity directed to its realisation; and this activity may itself partly or wholly take the form of trains of ideas. It is at this stage that the word *desire* has its most appropriate application. Perceptual conations are better described as impulses.

With the development of ideational thought, higher forms of desire arise. The process of generalisation brings with it generalised conative tendencies. We aim at the fulfilment of rules of conduct instead of the production of this or that special result in this or that particular case. Ideal construction sets before us ends which have never been previously realised. These ends may be so complex that they can only be realised gradually by activities persistently renewed as opportunity allows. The writing of a book and sometimes the reading of it, may serve as an example. Sometimes the ideally constructed ends are such as the individual recognises to be unattainable in his own lifetime. He can only contribute his share towards bringing them to pass. Sometimes there is a doubt whether they can be com-

* Ward, *op. cit.*, p. 74.

pletely attained, or even a certainty that they cannot be completely attained. Ends of this last kind are the highest, and are generally called "ideals."

§ 2. *Conative Aspect of the Conception of the Self.* — Under the concept of the Self as expressed in the word "I" is included in systematic unity the life-history of the individual, past, present, and future, as it appears to himself and to others; together with all its possible or imaginary developments. We have already described the way in which this complex ideal construction grows up. We have now to point out that its evolution accounts for the origin of Will in the strict sense of the word, as implying deliberation and choice.

Voluntary action is to be sharply discriminated from impulsive action, and deliberation from conflict of impulsive tendencies. The difference is, that in impulse action follows the isolated conative tendency; whereas in voluntary decision special conations and their ends are first considered in their relation to the total system of tendencies included in the conception of the Self. When two disconnected impulses simultaneously prompt to incompatible courses of action, if the conception of Self does not come into play, one interferes with the other in a quasi-mechanical way. There is merely a trial of brute strength between them. Instances are sometimes found in young children and animals. The characteristic expression of their mental state is a sort of oscillation between two modes of action, each of which is begun in turn and then gives place to the other. "When a young child suddenly comes face to face with a strange dog, the impulse towards . . . and the im-

pulse away from . . . are realised in quick succession. The child goes up to the dog, runs back to its father, approaches the dog again, and so on."* Professor Titchener tells us that "in face of the two impulses, (1) to shut a door on the right hand, and (2) to seat himself at his typewriter-table on the left," he actually began "a right-hand movement towards the door and then all at once" slued round "to the typewriter, without having closed it."† All of us can no doubt recall similar experiences.

Deliberation in no way resembles this alternate jerking in opposite directions, as if pulled by a string, and the decision which follows it is not a mere triumph in strength of one isolated impulse over another. Voluntary action does not follow either of the conflicting tendencies, as such; it follows our preference of the one to the other. It is the conception of the Self as agent which makes the difference. The alternative is not "this" or "that," but "shall *I* do this" or "shall *I* do that?" Each line of action with its results is considered not in isolation but as part of the ideally constructed whole for which the word "I" stands. The impulse of the present moment belongs to the Self of the present moment; but this is only a transient phase of the total Self. If the impulse is realised the completed action will take its place as a component part of the life-history of the individual. He may live to regret it. In his present mood, with bottle and glass before him, he may desire to get drunk; but sobriety may have been the habit and principle of a lifetime.

* Titchener, *Primer of Psychology*, p. 246.
† *Ibid.*, p. 247.

If he yields to temptation, the remembrance of the act will stand out in painful conflict with his normal tendencies. He will be unable to think of it without a pang. This incompatibility between the normal Self and the present impulse, if vividly enough realised at the moment of temptation, will restrain him from drinking. If it is not sufficient, further developments of the conception of Self may be more efficacious. He may think of himself as churchwarden or elder; he may think of the ideal aspirations of his better moments; he may call to mind the thought of himself as reflected in other minds, — the dead friend who expected so much from him, and who would be so shocked at his lapse, — the talk of the general public conceived as pitying, contemptuous, or malicious. He may even consider how he would like to look back to such an episode on his death-bed. Obviously, this detailed development of what is included in the man's conception of himself as a whole, might go on interminably. As a matter of fact, it is possible that it would not be needed at all. He might simply say, "What! *I* do such a thing? How could the thought ever have occurred to *me?*" In this case the mere concept of the Self in its vague totality without detailed development would be sufficient to produce a decision. The thought of *getting drunk* attracts the man; but the thought of *his* getting drunk repels, so as to give rise to instant rejection of the suggested course of action.

§ 3. *Deliberation.* — Very often, however, the thought of the Self does not at once give rise to a decision, positive or negative, but only to arrest of action, so as to give time for deliberation. It may be that the way in

which this or that line of conduct, if realised, would affect the Self as a whole, past, present, future, and ideal, can only be brought before consciousness with sufficient fulness to determine action by a more or less prolonged train of thought. When this is so, the concept of the Self as a whole will not directly tend to reinforce or suppress a desire; it will rather tend to postponement of action, until the concept of Self and of the action and its consequences are developed in such detail in relation to each other that a decision becomes possible. In this way arises Deliberation. The alternatives before the mind in deliberating may be simply doing a thing or leaving it undone; or they may include two or more definite and incompatible lines of action. In principle, there is no essential difference between the two cases. When two or more definite lines of action are considered, each of them has to be brought into relation with the general concept of Self, and from this point of view they have to be compared with each other.

The general point of view in deliberation may be described as follows. A certain line of action being suggested as possible, I contemplate myself as I shall be if I put it in execution, so as to make it part of my actual life-history, and on the other hand I contemplate myself as I shall be if I leave it undone. I follow out this representation of a hypothetical Self in more or less detail until that turning-point in the process which is called Voluntary Decision emerges.

In the more developed forms of deliberation there is a kind of mental see-saw. Now one alternative, and now another, comes predominantly before consciousness, and

the mind is variously attracted and repelled by each in turn. The desires and aversions which arise in this way are called Motives. Hence the process of deliberation is often called a Conflict of Motives. Motives are not mere impulses. They come before consciousness as reasons why *I* should act in this or that way. They are not independent forces fighting out a battle among themselves, while the Ego remains a mere spectator. On the contrary, the motives are motives only in so far as they arise from the nature of the Self, and presuppose the conception of the Self as a determining factor. From this it follows that the recognised reasons for a decision can never constitute the entire cause of decision. Behind them there always lies the Self as a whole, and what this involves can never be completely analysed or stated in the form of definite reasons or special motives.

While the process of deliberation is going on, the motives are motives for deciding: when the decision is made, the triumphant motives become motives for action. Or, to put the case in another way, while the process of deliberation is going on, the competing desires are regarded as possible motives for action: when the decision is formed, they become actual motives for action.

§ 4. *Voluntary Decision.* — The phrase *voluntary decision* is ambiguous. It may mean the transition from the state of suspense to the state of resolution; or it may mean the state of resolution when it has once been attained. It will be simplest to treat first the decision as already formed, the state of being resolved. The most obvious difference between the state of inde-

cision and that of decision is that in the first we do not know what we are going to do, and that in the second we do know what we are going to do. While deliberating, we are making up our mind, and we do not know what our mind is going to be. When we have formed a decision, we have come to know our own minds. The conception of the Self has become fixed where it was previously indeterminate. The realisation of one line of conative tendency is now definitely anticipated as part of our future life-history, so far at least as external conditions will allow of its execution. Opposing conative tendencies either cease to operate, or they appear only as difficulties or obstacles in the way of carrying out our decision. They are no longer regarded as possible motives of action. We have come to the settled belief that, so far as we are concerned in our present state of mind, the lines of action to which they prompt will not be carried out. They are thus placed outside the sphere of deliberation, and in consequence cease to be motives. If they persist at all, they merely serve to make the execution of our voluntary decision more painful and difficult. But they do not on that account impair the strength of this decision; on the contrary, they may only give an opportunity for exhibiting the strength of the decision. With the full emergence of the decision, the conflict of motives, as such, ceases. "This termination of the struggle does not merely mean that one impulse or group of impulses has turned out to be stronger than its opponents. It might conceivably manifest its superior strength without a cessation of conflict. When two unequal and opposite forces are applied to a particle, the particle will move

in the direction of the stronger force; but the action of the weaker force still continues to manifest itself in a diminution of velocity. The triumph of the voluntary impulse is not of this kind. In a perfect volition, opposing impulses are not merely held in check; they are driven out of the field. If they continue to exist, they do so as external obstacles to a volition already formed. They are no longer motives; they are on the same footing with any other difficulty in the way of attainment."*

On the other hand, the motives which in the process of deliberation arrayed themselves on the side of the course of action that actually comes to be adopted, persist after deliberation is over, as the recognised motives of the voluntary decision. We will the act, because we desire it, or at least have an aversion to omitting it, or to its alternatives. Thus, the state of voluntary decision may be analysed as follows: (1) there is the belief that so far as in us lies we are going to carry out a certain course of action; (2) this belief is founded on that kind of reason which we call a motive. It is recognised as having ground in our present conative tendencies. Thus we may define a Volition as a desire qualified and defined by the judgment that so far as in us lies we shall bring about the attainment of the desired end because we desire it.

§ 5. *The Forming of a Decision.* — We have yet to examine how the state of decision supervenes on that of deliberation. At this point the vexed question of *free-will*, as it is called, arises. According to the liber-

* Article by author on "Voluntary Action," *Mind*, N.S., vol. v., No. 19, p. 357.

tarians, the decision, at least in some cases, involves the intervention of a new factor, not present in the previous process of deliberation, and not traceable to the constitution of the individual as determined by heredity and past experience. The opponents of the libertarians say that the decision is the natural outcome of conditions operating in the process of deliberation itself. There is according to them no new factor which abruptly emerges like a Jack-in-the-box in the moment of deciding.

Now it must be admitted that the transition from the state of indecision to that of decision is often obscure, and that it frequently appears to be unaccountably abrupt. This makes it difficult or impossible to give a definite disproof of the libertarian hypothesis on psychological grounds. But certainly the *onus probandi* rests with those who maintain the intervention of a new factor which is not a development or outcome of previous conditions. If we cannot definitely disprove the presence of such a factor, we can at least say that the facts are far from compelling us to assume its existence.

Deliberation may be regarded as a state of unstable equilibrium. The mind oscillates between alternatives. First one conative tendency becomes relatively dominant, and then another. The play of motives passes through all kinds of vicissitudes, as the alternative courses of action and their consequences are more fully apprehended in relation to the Self. As the process advances, equilibrium tends to be restored. New developments of conative tendency cease to take place; deliberation comes to a standstill because it has done

its work. In this relatively stationary condition, it may be that one of the alternatives, with the motives for it, has a decided and persistent predominance in consciousness, so that the mind no longer tends to revert to the others. At this point the mind is made up, and the result is formulated in the judgment, "I will do this rather than that."

But there are other cases which present more difficulty. It may happen that deliberation comes to a standstill without any one alternative acquiring a definite predominance. The mind tends first to one and then to the other without result. No new developments occur which tend to give a superiority to either, and the result is hopeless suspense. It would seem that under these conditions no voluntary decision ought to supervene, or if it does supervene, it must be due to the intervention of a new factor and is not merely the outcome of the deliberative process. Now as a matter of fact we find that under such conditions voluntary decisions frequently do come into existence. They may even be of wide-reaching importance like Caesar's determination to cross the Rubicon. But probably in all such instances one or both of two traceable and recognisable conditions of a psychological kind are operative. These are (1) aversion to the continuance of painful suspense, and (2) the necessity for action of some kind. "It may be that though we are at a loss to decide between two courses of action, we are none the less fully determined not to remain inactive. Inaction may be obviously worse than either of the alternative lines of conduct. We may then choose one of them much in the same way as we take a cigar out of a box,

when it is no matter which we select."* In view of the necessity for action, a comparatively slight predominance of the motives for one alternative may be sufficient to determine decision, though it would have been ineffective under other conditions. Or again, being pressed to decide, either by aversion to the state of irresolution, or by the necessity for doing something, we may simply adopt the course which seems to be uppermost in our minds at the moment, although we have no confidence that it would remain uppermost if we continued to deliberate. Or we may mentally consent to allow the decision to be determined by some irrelevant circumstance such as the fall of a penny. We determine that if heads turn up we shall do *A*, and that if tails turn up we shall do *B*. Curiously enough, the reverse frequently happens. If heads turn up we do *B*, and if tails turn up we do *A*. This is due in part to an aversion to having one's conduct determined in such an arbitrary and irrelevant way. But it often happens that immediately after the appeal to chance has been made, and has issued in favour of one alternative, the motives for the other alternative are mentally set in contrast, not with the opposing motives present in preceding deliberation, but with the trivial result of the appeal to chance. They thus acquire a momentary predominance which determines voluntary decision.

Sometimes volition takes place before the process of deliberation has fully worked itself out. In this way, acts come to be decided on which would have been suppressed if they had been more fully considered. Here again, the necessity for acting in some way, and im-

* *Op. cit.*, p. 364.

patience of the state of indecision, are operative factors. But the reason often lies in the intensity of some impulse of the present Self which derives its strength, not from its relation to the total system of conduct, but from the circumstances of the moment.

In the vicissitudes through which the process of deliberation passes, it will often happen that this isolated impulse through its momentary intensity will acquire such a predominance as to arrest the full development of other motives, which, if they had come into play, would have given rise to a different decision. The decision which thus takes place after imperfect deliberation is generally called impulsive. It is not supposed to be voluntary in the same degree as that which takes place after fuller deliberation. The agent often commits the act knowing that he will live to repent it. Most cases of yielding to temptation are cases of deliberation arrested and cut short by the transient strength of a present impulse. It is in such instances that the agent is most keenly aware in retrospect that he might have acted otherwise than he actually did. He feels that the act does not fully represent his true self. If he had fully developed all the motives which were inoperative owing to imperfect deliberation, the momentary impulse might have been suppressed instead of realised.

§ 6. *Fixity of Voluntary Decision.* — The persistence with which a voluntary decision, when once formed, maintains itself against obstacles, is often much greater than can be accounted for by the strength of the desire which was its motive at the outset. There are many reasons for this. One is that the line of conduct determined on is identified with the conception of Self.

"When I judge that in so far as in me lies I shall realise a certain end, the endeavour to realise that end becomes *ipso facto* an integral part of the conception of myself. Failure to realise it is regarded as *my* failure, *my* defeat. Thus volition becomes strengthened in the face of obstacles by all the combative emotions. These are of varying kinds and of varying degrees of strength in different individuals; but all tendencies to hold out or struggle against opposition, merely because it *is* opposition, are enlisted in the service of the will, inasmuch as the idea of the line of conduct willed is an integral part of the idea of Self."*

"The fixity of will is also strengthened, often in a very high degree, by aversion to the state of irresolution. Suspense is in itself disagreeable; and when we have emerged from it by a voluntary decision, we shrink from lapsing into it once more. Besides this, prolonged and repeated indecision is highly detrimental in the general conduct of life. The man who knows his own mind is far more efficient than the man who is always wavering. Hence in most persons there is a strong tendency to abide by a resolution, just because it is a resolution. This tendency is greatly strengthened by social relations. If we are weak and vacillating, no one will depend upon us; we shall be viewed with a kind of contempt. Mere vanity may go far to give fixity to the will."†

Volition also becomes fixed by the action which follows on it. So soon as we have attained the settled belief that we are going to follow out a certain line of conduct, we immediately begin to adapt our thoughts

* *Op. cit.*, p. 358. † *Ibid.*, p. 359.

and deeds to this belief. We thus come to be more and more *committed* to the course determined on. To withdraw from it would be to disturb our arrangements; to baulk expectations raised in others; and to arrest the general flow of our own mental activity. The more the mind has become set on one thing, the more it would be upset by being diverted to another. If I have once decided on going to New Guinea to investigate the manners and customs of savages, instead of staying at home to lecture on psychology, the whole direction of my mental activity flows into channels corresponding with my preformed resolution. I begin to read up books about savage tribes and about New Guinea in particular. The arrangements for my outfit and voyage, the kind of work I am going to do, the kind of adventures I shall meet with, the men I am to co-operate with, and other topics such as these, engross my mind. The more advanced this process is the greater fixity does my volition acquire. "To disturb it is to disturb the whole system of tendencies with which it has become interwoven. In this way I commit myself to such an extent that it becomes impossible to draw back."*

Perhaps the fixity of volition is not adequately accounted for by reasons such as these. There appear to be individual differences in this respect which depend upon inherited constitution, so that they cannot be explained by psychological generalities. In some men infirmity of purpose appears to be innate. They change like a weathercock, and can never be relied on. Others follow up their voluntary resolutions with a

* *Op. cit.*, p. 358.

dogged persistence which is often utterly unreasonable. Some men are born obstinate, and others vacillating.

§ 7. "*Action in the Line of Greatest Resistance.*" — Some volitions take place and are maintained only by an effort. This is especially the case when voluntary decision follows some general principle of conduct or some ideal aim, in opposition to an intense impulse of the present Self which is excited and maintained by the actual conditions existing at the time. Professor James has laid great emphasis on this experience. "We *feel*, in all hard cases of volition, as if the line taken, when the rarer and more ideal motives prevail, were the line of greater resistance, and as if the line of coarser motivation were the more pervious and easy one, even at the very moment when we refuse to follow it. He who under the surgeon's knife represses cries of pain, or he who exposes himself to social obloquy for duty's sake, feels as if he were following the line of greatest temporary resistance. He speaks of conquering and overcoming his impulses and temptations. But the sluggard, the drunkard, the coward, never talk of their conduct in that way or say they resist their energy, overcome their sobriety, conquer their courage, and so forth."*

There can be no doubt that Professor James here describes the facts accurately. But he proceeds to interpret them as evidence in favour of the libertarian view. If volition is merely the outcome of preceding psychological conditions, it must follow the line of least resistance, but in the cases described it follows the line of the greatest resistance. This would seem to imply

* *Principles of Psychology*, vol. ii., p. 548.

the intervention of a new factor. Before admitting this conclusion, we must analyse more carefully the experience on which it is based.

We said in § 4 that when a voluntary decision was once formed, "opposing conative tendencies either cease to operate, or they appear only as difficulties or obstacles in the way of carrying out our decision."* The disappearance of opposing tendencies, on the one hand, or their persistence as obstacles, on the other, are the two alternatives which correspond to action in the line of least resistance and in the line of greatest resistance. Now whether they persist or disappear, depends upon the presence or absence of circumstances over which we have no control. The simplest case is that in which we voluntarily decide in opposition to some present organic craving, such as the craving for drink. The craving itself is maintained by organic conditions which continue to operate both in the very moment of decision and after the decision is made. Thus, to use the phraseology of Professor James, the volition is "hard" because it is both formed and carried out against a persistent obstacle. On the other hand, if the decision is in favour of indulging the animal appetite, counter motives tend to disappear altogether, instead of persisting as obstacles. They are not maintained by organic conditions, nor are they obtruded on the mind by any other circumstances. As soon as the man has given way to temptation and begins to drink, he loses sight of the considerations which had previously tended to restrain him. Besides this, the drink itself, if he takes enough of it, soon obliterates

* See above, p. 606.

any lingering traces of reluctance. Thus in resolving to drink the man certainly decides in the direction of least resistance; indeed, there may be virtually no resistance at all. On the other hand, in deciding to restrain his appetite, he decides in the direction of greatest resistance, because the appetite itself still persists after his decision.

The case is not essentially dissimilar when the persistence of motives as obstacles is due to other circumstances. The interests opposed to the course of action adopted may be so complex, they may play such a large part in our life, that they continue to obtrude themselves upon us even when we are deciding or have decided that their realisation is not to be identified with our conception of the future Self. They thus persist as obstacles in the moment of resolution, and after resolution. Regulus, in determining to return to Carthage, could hardly dismiss from his thoughts all that he was giving up and the violent death which awaited him. Perhaps if he had decided to remain at Rome, his mental conflict would have been much less acute. Surrounded by family and friends, and with all kinds of congenial channels open for his activity, he would probably have been able to a large extent to avoid dwelling on the thought of his violated promise.

If this analysis be correct, cases of "hard" volition do not show that in the process which leads up to a decision, the weaker motives triumph. We must carefully separate two questions. The first is, How does the voluntary decision issue out of the previous process of deliberation? The other is, How far do opposing tendencies become inoperative when the voluntary decision is

made? In proportion as they remain operative, they constitute obstacles and render volition "hard." But this has nothing to do with the psychological conditions which determine the volition. It in no way proves that these conditions are not adequate, and that a new factor such as the libertarians assume is required to account for the result.

§ 8. *Volition and Bodily Activity.* — A voluntary decision is normally followed by action which carries or tends to carry it into effect. Setting aside for the present the case of voluntary attention, where the will merely determines the direction of thought, we have here to consider the relation between volition and bodily movement.

Motor efficacy is not essential to the state of voluntary decision as a psychical fact. "The question as to the nature of a certain mode of consciousness, is quite independent of the question whether or not this mode of consciousness will be followed by a certain train of occurrences in the organism and in the environment. If I will to produce an explosion by applying a lighted match to gunpowder, my volition is none the less a volition because in the course of its execution the match goes out or the powder proves to be damp. Similarly the volition is none the less a volition if it turns out that my muscular apparatus refuses to act, or acts in a way contrary to my intention. The connexion between certain modes of consciousness and corresponding movements of the limbs is necessary to the maintenance of our existence; but it does not enter into the constitution of the conscious state which precedes the executive series of occurrences. When the conscious

state is one of volition, it is necessary that the subject should look forward to the bodily movements, either as practically certain or at least as possible. A belief of this kind is an essential ingredient of the voluntary attitude. But the existence of the belief is in itself sufficient. Its truth or falsehood is a matter of indifference. In a precisely analogous way we must, in determining to produce a gunpowder explosion, assume that the powder is or may be dry enough to take fire. But it is by no means necessary that the gunpowder in point of fact should be dry." *

Normally, however, volition is followed by corresponding movements. How does this take place? Professor James has supplied what appears to be a satisfactory answer to this question. The passage of volition into movement is according to him a special case of the general tendency of ideas to act themselves out. The mere representation of an action tends to give rise to the action itself, and will do so in the absence of interfering conditions. "Try to feel as if you were crooking your finger, whilst keeping it straight. In a minute it will fairly tingle with the imaginary change of position; yet it will not sensibly move, because *its not really moving* is also a part of what you have in mind. Drop *this* idea, think of the movement purely and simply, with all brakes off, and, presto! it takes place with no effort at all." †

It very frequently happens that ideas pass into action without preceding volition. "Whilst talking I become

* Article by author on "Voluntary Action," *Mind*, N.S., vol. v., No. 19, p. 355.

† *Principles of Psychology*, vol. ii., p. 527.

conscious of a pin on the floor or of some dust on my sleeve. Without interrupting the conversation I brush away the dust or pick up the pin. I make no express resolve, but the mere perception of the object and the fleeting notion of the act seem of themselves to bring the latter about."* Experiences of this kind are very common. We have already had occasion to dwell on the tendency of ideas to express themselves in imitative gestures; and in that connexion we adduced other evidence to show that ideas tend to act themselves out in proportion to their vividness and dominance in consciousness.

We now turn to the special case of volition. Volition is normally followed by movement, because the voluntary decision gives to the representation of the act decided on a settled predominance in consciousness as against the representations of alternative courses. This is Professor James's account of the matter, but it seems possible to push analysis somewhat further, so as to show how the predominance arises. During the process of deliberation, the subject is as yet uncertain what he is going to do. Incompatible courses of action are ideally represented as possible alternatives. With the voluntary decision comes the belief that one of them is to be carried out to the exclusion of the others. It is this belief which gives to the idea of the action the predominance leading to its execution. This is perhaps best illustrated by what takes place in the hypnotic state. It is well known that the hypnotised subject responds passively to all kinds of suggestions from the hypnotiser. Within certain limits it is only necessary

* *Ibid.*, p. 522.

to suggest the idea of an action or group of actions to bring about performance. "Tell the patient that he cannot open his eyes or his mouth, cannot unclasp his hands . . . and he will immediately be smitten with absolute impotence in these regards."* Tell him that he is a pig or a lion or a baby or Julius Caesar, and he will proceed to enact the part. "Subjects in this condition will receive and execute suggestions of crime, and act out a theft, forgery, arson, or murder."† Now though the suggestion of the mere idea tends to have this effect more or less, yet the result can be produced with far more certainty and conspicuousness, when the operator imposes on his patient a *belief* that he is such and such a person, or that he is going to do such and such a thing. Hence suggestions mainly take the form of assertions, such as, You will do this, You will not do that. When the patient has once adopted the belief that he is going to act in a certain manner, the ideas of alternative courses are suppressed, and the action follows.

It seems probable that the predominance which voluntary decision gives to the idea of a line of action is essentially connected with the belief that this is the line which we are going to follow out, to the exclusion of other alternatives.

§ 9. *Involuntary Action. Fixed Ideas.* — In the strictest sense an involuntary action is one which takes place in opposition to a voluntary resolution. Thus if determined to make a certain stroke at billiards, and if in the moment of action the muscular apparatus fails me, so as to give rise to an unintended jerky movement,

* *Op. cit.*, vol. ii., p. 603. † *Ibid.*, p. 605.

my action is strictly involuntary. But cases like this do not interest us here. What we are concerned with is the defeat of the will, not by an accidental circumstance interfering with its execution, but by an antagonistic conation. We have an example of this in the unsuccessful effort to restrain a reflex movement over which we have normally sufficient control. Suppose a party of soldiers to be climbing a crag in the dark so as to surprise a castle. Noiselessness is a condition of success. A sneeze or a cough probably means defeat and loss of life. Now it is possible to a large extent to restrain the actions of sneezing and coughing; but if the irritation of the mucous membrane is sufficiently intense and persistent temporary repression only makes the ultimate outburst more violent. One of the soldiers may be determined not to sneeze, although the impulse is so strong as to give him great uneasiness. The tendency to sneeze is a conation; to restrain it is painful, and to indulge it would be a relief. None the less, if the impulse prove irresistible, the sneeze is involuntary.

In this instance the involuntary act follows on organic sensation and not on an idea. It does not take place because the ideal representation of the act of sneezing has become predominant, but merely because of the intense irritation of the mucous membrane.

There is however a wide class of instances in which the will is defeated by the obtrusive intensity of an ideal representation. In spite of the mental assertion that we are not going to perform a certain action, the idea of that action, owing to other conditions, acquires and maintains a dominance in consciousness which ultimately leads to its realisation.

This may happen even when the ideally represented object is not desired, and even when the only feeling towards it is that of intense aversion. A man standing on an eminence, such as the top of a cathedral tower, and looking down into the vast depth beneath him, thinks of what it would be like to throw himself down. Owing to the fascinating interest of the thought the idea of the action and its consequences obtrudes itself upon him with intense vividness, and he feels himself impelled to carry it into execution. He may have a very distinct and clear volition to the contrary; he may utterly refuse to identify the idea of the action with the idea of Self. He mentally asserts, I shall not, or, I will not; and as a rule this voluntary decision triumphs over the "fixed idea," as it is called. But it still remains true that the fixed idea derives its vivacity from conditions independent of the will; and it is always possible that the impulse to realise it may acquire sufficient strength to overcome a contrary volition. Some people actually do throw themselves down precipices in this way.

This result however is not common under normal conditions. It is in pathological cases that the fixed idea becomes really formidable. This is partly due to imperfect powers of deliberation. The conative tendencies which would have restrained the act lie in abeyance; the concept of the Ego in its unity and totality can only be very inadequately developed in relation to the act contemplated. But there are instances in which this explanation does not apply. In such instances it is not the absence of inhibiting tendencies, but the positive strength of the impulsive idea

which leads to action. Ribot gives a case of a man who was possessed by the idea of killing his mother. "'To you,' said he, 'I owe everything; I love you with all my soul; yet for some time past an incessant idea drives me to kill you.'" Tormented by this temptation, he leaves his home, and becomes a soldier. "Still a secret impulse stimulated him without cessation to desert in order to come home and kill his mother." In time, the thought of killing his mother gives place to that of killing his sister-in-law. Some one tells him that his sister-in-law is dead, and he accordingly returns home. "But as he arrives he sees his sister-in-law living. He gives a cry, and the terrible impulse seizes him again as a prey. That very evening he makes his brother tie him fast. 'Take a solid rope, bind me like a wolf in the barn, and go and tell Dr. Calmeil . . .' From him he got admission to an insane asylum. The evening before his entrance he wrote to the director of the establishment: 'Sir, I am to become an inmate of your house. I shall behave there as if I were in the regiment. You will think me cured. At moments perhaps I shall pretend to be so. Never believe me. Never let me out on any pretext; the only use I shall make of my liberty will be to commit a crime which I abhor.'" *

This is a case in which the fixed idea was not executed; but it easily might have taken effect, and many similar cases could be adduced in which it actually did so. What it is important to note is the conflict between the Self as a whole arranged on the side of the

* Ribot, *Maladies de la Volonté*, p. 77, quoted by James, *Principles of Psychology*, vol. ii., p. 542.

volition, and the isolated impulse to action which derives its strength merely from the fixation of an idea by pathological conditions. In these cases the conation which resists the will arises primarily from the fixation of the idea in consciousness. The fixation of the idea itself does not arise from any desire for its object. But under normal as opposed to pathological conditions, the commonest cases of involuntary action are those in which an idea becomes fixed through intense appetite or craving arising from organic conditions. To take an example given by Mr. Shand, a man may have a morbid craving for drink or opium, and the ideas which move to its satisfaction may at last become irresistible. Now here there are four possible alternatives. In the first place, indulgence in the drink or opium may be contrary to the man's express volition at the moment when he drinks. This is probably a very rare occurrence. As a rule, when the impulse is strong enough to produce action, it is also strong enough to prevent or displace an opposing volition. In the second place, there may have been a preformed resolution to refrain from the action; but at the moment at which it takes place, the contrary impulse acquires such intensity as to pre-occupy the field of consciousness, so that the volition is temporarily in abeyance. Here action at the moment is non-voluntary rather than involuntary; but taking a broader view we may call it involuntary, because it runs counter to a volition which has only lapsed for the time being, and recurs in consciousness immediately after the act is over, in the form of remorse. In the third place, the action may take effect before a voluntary decision has been arrived at. In the midst of the conflict of motives, the

idea corresponding to the animal appetite may become so vivified as to pass into action while the process of deliberation is still working itself out. We may act before we know our own minds. A man while still mentally hesitating whether he is to drink a glass of spirits or not, will find that the organic craving has so vivified the idea of drinking that he is swallowing the spirits before he has determined whether to do so or not. The action is then involuntary, because it interrupts the process of forming a volition. It may also be involuntary in a deeper sense; it may be that from the constitution of the man's whole nature, he would certainly have willed otherwise if full deliberation had been possible before acting. In the fourth place, the organic craving may be the motive of a genuine volition, and the action may therefore be voluntary at the time at which it takes place. None the less, there is a sense in which the action may be regarded as involuntary. A comparison may be made between the totality of interests defeated by indulging in the drink or opium, and the animal craving itself considered as a relatively isolated impulse. If the craving were taken away the Self would still be left. If on the other hand all the interests which are opposed to the indulgence were taken away, there would be little left but the morbid appetite itself. Thus the denial that the act is voluntary may have a good meaning. It may mean that the volition of the moment is discordant with the general volition of a lifetime, so that the intervals between the periods of indulgence are embittered by remorse. It is supposed that the morbid craving by its isolated intensity prevents full deliberation. There is,

it is assumed, in the man's nature a vast system of conative tendencies which, if they had found fair play, and developed themselves in consciousness, would have determined volition even if they did not determine action. Of course, when we regard the question in this way, the voluntariness or involuntariness of an action is a matter of degree. We tend to think of the opium-eating of a man like Coleridge as a kind of external misfortune, because it is alien from the ideal aspirations which we regard as constituting his true Self. To this extent, we do not hold Coleridge responsible so much as the unfortunate craving which possessed and mastered him. In the case of a man of meaner nature, our judgment would be very different.

§ 10. *Self-Control.* — All the cases of involuntary action which we have discussed in the last section, are cases of deficiency of self-control. Self-control is control proceeding from the Self as a whole and determining the Self as a whole. The degree in which it exists depends upon the degree in which this or that special tendency can be brought into relation with the concept of the Self and the system of conative tendencies which it includes. Failure in self-control may arise from one or both of two conditions. On the one hand, the overpowering intensity of a relatively isolated impulse may prevent the due evolution of the concept of Self even when this is fully formed and organised. On the other hand, the defect may lie in the degree of development which self-consciousness has attained, or in organic conditions, mostly of a pathological kind, which disorganise the Self, and prevent the full development of its normal contents. To quote Dr. Clouston: "The driver may

be so weak that he cannot control well-broken horses, or the horses may be so hard-mouthed that no driver can pull them up. Both conditions may arise from purely cerebral disorder. . . . An imbecile or dement, seeing something glittering, appropriates it to himself. . . . The motives that would lead other persons not to do such acts do not operate in such persons. I have known a man steal who said he had no intense longing for the article he appropriated at all, at least consciously, but his will was in abeyance, and he could not resist the ordinary desire of possession common to all human nature."* On this Professor James remarks: "It is not only those technically classed imbeciles and dements who exhibit this promptitude of impulse and tardiness of inhibition. Ask half the common drunkards you know why it is that they fall so often a prey to temptation, and they will say that most of the time they cannot tell. It is a sort of vertigo with them. Their nervous centres have become a sluice-way pathologically unlocked by every passing conception of a bottle and a glass. They do not thirst for the beverage; the taste of it may even appear repugnant; and they perfectly foresee the morrow's remorse. But when they think of the liquor or see it, they find themselves preparing to drink, and do not stop themselves; and more than this they cannot say."† We have a good example of the inverse case in which the concept of Self is fully organised and easily developed, but finds itself impotent in the face of an abnor-

* *Clinical Lectures on Mental Diseases*, quoted by James, *Principles of Psychology*, vol. ii., pp. 540–541.

† *Ibid.*, p. 541.

mally intense impulse, in the case of the man who was possessed by the fixed idea of murdering his mother.

The process of ideal construction through which the concept of Self grows, is gradual, and reaches different degrees of perfection in different persons. The more highly systematised and organised it becomes, the more effective it is. Self-control is greatest in the man whose life is dominated by ideals and general principles of conduct; but this involves a development of conceptual consciousness which is absent in children and savages. We accordingly find that children and savages are to a great extent creatures of impulse; they have comparatively little power of deliberation, so that action tends to follow the conative tendency which is excited and supported by the circumstances of the moment. Remoter considerations are comparatively inoperative. The Self which determines action is predominantly the present Self, not the total Self as ideally represented. Thus the savage wastefully exhausts his present store in riotous indulgence, and is improvident of the future. He cannot be brought to work in a regular and persistent manner. He may be industrious enough for a time in order to gain a little money, or some other object which he happens to covet at the moment; but so soon as his immediate end is attained, he thinks no longer of working, but only of enjoying his gains. He is scarcely capable of pursuing a distant aim, which requires persistent and repeated activity continued for a long time without obvious result. Ends which are at least in part immediately attainable seem to be the only ends which effectively determine his action. For this reason he does not appreciate the

value of time. The end he is pursuing at the moment has for him an absolute rather than a relative importance. He does not regard it merely as part of the great business of life which must be subordinated to the whole. He does not feel the necessity of completing the transaction in which he is interested in time to proceed to other matters. Hence he often sorely tries the patience of the civilised European by spending altogether disproportionate time and energy on relatively trivial bargains, etc. Such mottoes as "time is money" do not appeal to the savage mind. The same holds of young children, as we all know. The bird in the hand is to them worth a thousand in the bush.

§ 11. *Voluntary Attention.* — A voluntary determination may be either a determination to perform certain bodily movements or a determination to attend to certain objects. Attention, so far as it follows upon an express volition to attend, is called *voluntary attention.* All attention which is not so initiated is *non-voluntary* or spontaneous. When we attend not merely without an express volition to attend, but in opposition to such a volition, attention is in the strictest sense *involuntary*, and not merely non-voluntary. A good illustration of voluntary attention is to be found in "certain psychological experiments, in which the experimenter fixes his attention on an uninteresting object, in order to observe phenomena attending the process of fixation. He determines to attend to the object for the sake of observing what takes place when he attends to it. The spontaneous and the voluntary direction of attention are not merely distinct: they are also antagonistic. Everyone desires

to avoid futile worry and fret; but no one has a mind so well regulated as to be able to divert his thoughts at will from irremediable misfortune, and unavoidable sources of anxiety. When, owing to overwork, our minds are besieged at night by a subject which has occupied us during the day, we vainly endeavour to compose ourselves to rest. We *will* to expel the intrusive thoughts; but we cannot keep up the effort persistently; and so soon as it is relaxed, the spontaneous movement of attention recurs, and murders sleep."* "All mental training and discipline depend on the victory" of voluntary attention. "This usually takes time. The resolution to devote attention to an unattractive subject can only succeed after repeated effort followed by repeated failure. The mind wanders at first, and requires to be again and again recalled to its task. We form a design to occupy ourselves with a certain topic. So soon as this design is being carried out, we cease to think of it and of the motives which prompted it. We think instead of the subject-matter which we had resolved to study. But this subject-matter is, *ex hypothesi*, uninteresting. It cannot, therefore, command attention. Accordingly our thoughts wander from the point, and have to be recalled by a renewed effort of will. This fitful alternation of attentiveness and inattentiveness may continue until fatigue and tedium cause the task to be abandoned. On the other hand, interest may grow up as the subject of study becomes better known. When this happens, the periods of concentration become gradually prolonged, until the necessity for deliberate effort

* Author's *Analytic Psychology*, vol. i., p. 241.

ceases to exist. Thus the function of voluntary attention in such cases is to create spontaneous attention. When it fails in this, it produces only exhaustion and disgust. A person condemned to spend his whole life in constantly reiterated efforts to fix his mind on a hopelessly uninteresting topic, would go mad, commit suicide, or sink into a state of coma. Voluntary attention belongs coincidently to the province of intellect and to that of practical volition. It is the '*conduct* of the understanding,' and, like external conduct, is subject to moral law. In intellectual morality the fundamental virtue is patience."*

The voluntary determination to attend plays a large and important part in the more complex forms of deliberation. We may compare the value of conflicting motives in relation to the total system of our lives; and we may find that considered from this point of view a certain motive or group of motives has not the strength and prominence which it ought to have. We may then attempt to give it this strength and prominence by voluntarily turning our attention in a certain direction. Thus a candidate preparing for an examination may find in himself a strong disposition to laziness, tempting him to spend a day in idleness. He may at the outset very faintly realise the special considerations which make such a course inadvisable: but he may at the same time know that these considerations are important, and that if he neglects them he will bitterly regret doing so. This at the outset may not constitute a motive sufficient to lead to a definite decision to apply himself to work instead of play; but

* Author's *Analytic Psychology*, vol. i., p. 242.

it may be sufficient to give rise to the voluntary decision to fix attention on the reasons for working, and so to give to these reasons the strength and liveliness which they initially lack. In this indirect way he may reach a distinct and effective decision to go to work with steadiness and energy. It is in such cases as these that the consciousness of freedom is most conspicuous. For in such cases we not only will our act, but in a manner we will our volition. The voluntary determination to act issues out of the voluntary determination to attend; and the voluntary determination to attend directly and obviously depends on the controlling influence of the concept of the Self as a whole.

§ 12. *True Freedom.* — It must not be supposed that anything we have said in this chapter implies a denial of the freedom of the will in the sense in which such freedom is claimed by the ordinary consciousness of humanity. We have only thrown doubt on a certain theory of the nature of such freedom, — the theory which goes by the name of *libertarianism*, or of *contingent choice*. By *contingent choice* is meant a choice which does not issue out of the total process of mental life in accordance with psychological laws, but springs into being of itself as if it were fired out of a pistol. This theory makes free decision arise by a kind of spontaneous generation. Those who oppose libertarianism sometimes call themselves Determinists. Some determinists agree with the libertarians in identifying freedom with contingent choice; they only disagree in denying the existence of such choice. As against both these, we maintain that freedom consists in self-determination, and that self-determination means self-con-

trol. Self-control, as we have defined it in § 10, consists in "control proceeding from the Self as a whole and determining the Self as a whole. The degree in which it exists depends upon the degree in which this or that special tendency can be brought into relation with the concept of the Self and the system of conative tendencies which it includes."* Another way of putting this is to say that acts are free in so far as they flow from the character of the agent; for character is just the constitution of the Self as a whole. Character exists only in so far as unity and continuity of conscious life exists and manifests itself in systematic consistency of conduct. Animals can scarcely be said to have a character, because their actions flow from disconnected impulse. "If an animal could be supposed to think and speak, it could not refer its actions to itself, but only to its impulse at this or that moment."† Character is little developed in savages as compared with civilised men; for they have relatively little power of considering particular actions in relation to an organised system of conduct. Now the development of character and the development of freedom are two aspects of the same process. A man's acts "are his own only when he *is himself* in doing them,"‡ — when they express his total character rather than his momentary impulse.

It follows from this account that freedom is an ideal which can never be completely realised, and this ideal coincides with that of self-realisation, as expounded in Professor J. S. Mackenzie's *Manual of Ethics*.§ But

* P. 626.

† J. S. Mackenzie, *Manual of Ethics*, third edition, p. 95.

‡ *Ibid.*, p. 96.

§ See especially bk. ii., ch. v., § 12, "The True Self."

the last word about freedom lies neither with Psychology nor with Ethics. Its full discussion involves an examination of the relation between the thought and will of the individual mind, and the reality of the universe. This relation from the point of view of any finite science such as Psychology is utterly inexplicable. The more closely and conscientiously we endeavour to explain it by the ordinary categories of any special science, the more plain it becomes that so regarded it is a miracle, — indeed the miracle of miracles. Psychology cannot explain how it is possible that an individual can consciously mean or intend something. To say that he has a present modification of consciousness which resembles an object is very far from being the same thing as saying that he has a thought of this object, — that he means or intends it. I may now have a toothache, and you may have a toothache exactly like it, but my toothache is not the thought of your toothache. Will and thought are not explicable by such categories as causality, substance, resemblance, or correspondence. Hence, truth and freedom are ultimately topics for the metaphysician. As psychologists, we deal not with the ultimate possibility of will and thought, but only with their mode of occurrence as time-processes taking place in the individual mind.

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