

cleared of the joint septums, through which light darts feathered with a tuft of down, or pieces of pith, are propelled by the breath.

The blow-gun is used for killing birds and small mammals. Frequently the arrows are poisoned, rendering the light dart effective on larger game. The chief merit of the blow-gun is its accuracy and the silence with which it may be employed.

The penetration of the blow-gun dart is greater than would be imagined. At the distance of 50 feet I have driven a blunt dart one-quarter of an inch into a pine plank. It is stated that the range of the blow-gun among some tribes is from 80 to 100 yards.

Apropos to Professor Mason's paper connecting the Eastern Asiatics with the Americans along a great natural migration line, the distribution of the blow-gun may be interesting.

The blow-gun is a tropical or sub-tropical device, and may be looked for in regions where bamboo or cane grows. Nevertheless these tubes are often made of hard wood, single, or of two excavated pieces joined together, and frequently one tube is thrust inside of another to secure rigidity. The examination of many of these blow-guns inspires a great respect for the ingenuity and mechanical skill of the workers.

The curious fact of distribution, however, is that the Malays and American aborigines alone use the blow-gun. The Malay specimens of the blow-gun existing in the National Museum are from the Dyaks of Borneo, the Javanese, the Kyans of Burma and the Johore people from the Malay peninsula. The literature also supplies other Malay localities.

The North American specimens are from the Chetimachas of Louisiana, who frequently combine the tubes in series, forming a compound blow-gun and the Cherokees of the Carolinas. From Central America, the Indians of Honduras and Costa Rica; from South America, several Amazon tribes from

Ecuador east and from British Guiana employ the blow-gun. WALTER HOUGH.

PSYCHOLOGY.*

PSYCHOLOGY, as we all know, is the 'science of mind.' But such a definition does little more than raise the question, What is mind? We cannot take mind for granted, for it is the very thing that psychology has to investigate. And yet, although 'mind' is one of those words which it is impossible to define, everyone is able to attach some sort of meaning to it. What do you yourselves mean when you talk of your 'mind?' You mean, probably, some particular group or set of your internal experiences; some tangle or other of feelings, thoughts, desires, resolutions, ideas, wishes, hopes, actions, emotions, impulses, expectations, memories. There are plenty of words, expressing different 'sides' of mind, as they are called. Mind, then, is the sum total of all these experiences—of all these processes. There is no mind beyond them; the term is simply the collective name of all such processes as those which I have enumerated.

I said, however, that when you talk, in an everyday way, of your 'mind,' you probably refer to some special set or group of these experiences. When you say, "I cannot make up my mind whether to do it or not," you mean that you cannot make up your present mind. Now here the psychologist makes a distinction. We use the term 'consciousness' to express the mind of the present moment. Thus if I were to ask you to tell me something of your experiences just now, I should say to you: "Look into your consciousness, and see whether so-and-so is taking place or not." Or, again, if I were to analyze for you your present state of mind—to try and imagine what is going

* A lecture delivered to the Class in General Philosophy (Introductory) in Cornell University, December, 1894.

on inside of you as you listen to me—I should speak technically of analyzing your consciousness. Consciousness is the mind at any moment. Mind, therefore, is the sum-total of consciousnesses experienced in the lifetime of the individual. You have one mind, extending (I hope) over seventy full years; but the mind upon which you experiment at any given moment for psychological purposes—or the mind which you make up at a given moment—is called your consciousness. So that psychology, while it is the science of mind, in the sense that it deals with all the mental experiences of a man, from the time of his birth to the time of his death, deals in any special hour, during any special enquiry, with the phenomena of consciousness.

But consciousness—as the number of words in my catalogue of a moment ago sufficiently indicated—is a very intricate, complex and tangled matter. If we are to examine it at all carefully, we must try, first of all, to get some sort of order into its phenomena. Let us begin the attempt at once of describing our internal experiences, as accurately as possible.

We notice, at the outset, that we are to a large extent at the mercy of our surroundings, of things outside of us. We are not free to see what we like, to hear what we like, to touch what we like; what we see and hear and touch is all determined for us, by the physical nature of the bodies from which impressions come. You can understand, of course, that this is true in the simple instances that I have given; but I want to prove to you that it is true of a very large part, indeed, of our mental experience. Put down in the first place (1) sensations and perceptions. Every time that one of our sense-organs is excited, is put in action, that is done by means of something in the external world. An ether-vibration makes us see; an air-vibration makes us hear or smell, and so on.

Those are sensations. And perceptions only differ from sensations in being more complicated. Thus in the sphere of sight, you perceive a house or a tree; in the sphere of hearing you perceive a musical harmony or a musical discord; in the sphere of touch you perceive that a complex of impressions is a piece of wood, or a piece of wire, or what not. The tree and the house are compound impressions, containing many colors and many shapes; the musical chord is a compound of three or four or more simple tones, and so on. All this, very obviously, comes from the outside world. So, too, does (2) memory. You cannot remember what has not happened. If you try to remember a name, you try to recover a lost perception—the perception of the spoken word. If you try to remember a picture, you are attempting to recover a lost visual perception. It is for this reason that the psychologist distinguishes kinds or types of memory—the visual, the auditory and the motor. People who can play chess blind-fold have the visual memory very highly developed. They do not, perhaps, see every piece in their mind's eye, but they see the board as a whole, and know where each piece upon it is. Most 'extempore' speakers, too, rely upon their visual memory. There is comparatively little true extempore speaking done. Of course, if a man is thoroughly familiar with his subject, or is speaking under the influence of strong emotion, he may be able to address an audience without preparation. But most of us who speak 'without notes' do so by the aid of our visual memory; we see what we have written, mentally, paragraph by paragraph, and when our eyes are on our hearers, are really reading from a memory manuscript. Instances of good auditory memory, again, are furnished by those fortunate persons who can recall accurately the airs of an opera that they have only once heard. And people who play the piano

'by ear' play by finger-memory; their memories are muscular or motor. All these memories, then, depend upon the external world. So (3) does imagination. Imagination can put perceptions together in new or unusual ways; but it can never make a new perception. Try to imagine a color which is different from all the colors that are known. You cannot do it. You may imagine mixtures of colors, hues and tints obtained from combinations of the known colors, which you have never actually seen; but you cannot imagine a new color. The same fact comes out in works of fiction. When Baron Munchausen takes you to the moon or the dog-star, and shows you their inhabitants; and when Peter Wilkins describes to you the population of the South Pole—these people are simply human beings, with their characters changed and modified in various ways. They can take their eyes out of their heads and pass them round to their neighbors, or they have wings which fold around them and serve as clothing; but there is nothing new in all this. It is only the putting of the perceptions together that is new, not the perceptions themselves. And the same is true of all the constructions of the imagination, as they are called, devils, centaurs, sea-serpents, dragons, hippogriffs, ghosts and the rest of them.

The world outside of us, then, is responsible for a good deal of our mental furniture. We can simplify matters, here, for purposes of classification, by grouping together sensation, perception, memory-image and imaginary representation, as 'ideas.' Sensation is the raw material from which ideas are built up. As for the other usages: if you cannot remember, you say 'I haven't any idea of what that man's name was;' and if you are endeavoring to imagine a circumstance, you say 'I haven't any idea of how that could have happened.'

So much for the first principal category

of mental experience. Now, in the second place, we are in some respects not at the mercy of the world outside, but the world is at our mercy. What is the great difference between the animal and the plant? Surely this, that the animal can move at will, while the plant is stationary. That seems to be a very simple matter; but just consider how much it means. If the plant is going to lead a stationary life, it can take advantage of the fact—I speak metaphorically, of course—to be careless of its shape and size; or rather, it must make itself as big and as complicated as it can, in order to secure all the nourishment possible from one settled spot. The result is that the plant carries its lungs and its digestive apparatus all over it, on the outside. You know the functions of leaves and roots. With the animal the reverse is the case. It is going to move about. It can seek food in different places. The best thing for it, therefore, is to have its lungs and digestive organs packed away inside of it; so that it can get about with as light a weight to carry, and as convenient a balance of that weight, as possible. There must be no loose ends left on the outside, injury to which would mean inefficiency or death. Well! You see that, by moving among things at its own will and pleasure the animal has a certain power over the external world. How is this power represented in consciousness? In two principal ways: (1) Whenever we move; or, to put the matter more technically, and more definitely with reference to ourselves as distinct from the lower animals, whenever we act, we have in consciousness the experience of effort, of endeavor. This is an experience quite different from the experience that comes to us as ideas. We can have, naturally, an idea of effort; that would be the idea of some person making the effort, or the idea of some obstacle to be overcome by effort, or what not. But

besides the idea of effort, we experience effort itself. That is one of the hardest points in psychology to have made clear to you, or to make clear to yourselves. This instance may help you: You know that we speak of one man as having more 'go' in him than his neighbor, without implying by the phrase that he has more ideas. There are many names for the effort-experience. Some psychologists speak of it as the experience of spontaneity, of one's own initiative; others of an activity in consciousness. 'Effort' is at once the most concrete and, I think, the most intelligible word. (2) Our power over the world outside, again, is manifested in another way—by the phenomena of attention. Not every process among our physical surroundings has us at its mercy in the same degree. We are exposed to all manner of impressions; but they are not all alike powerful to affect our consciousness. Think of your own state of mind now. You have presented to you a certain number of visual impressions—the room, its furniture, the people about you. You are subject to certain temperature sensations; to certain pressures, from your clothing; to certain organic sensations, hunger or satiety. Each of you has a large stock of memories, ready to crowd into consciousness if they are allowed to. Each of you, again, has the day's programme in his mind; he can imagine what will be done between now and bed-time; and this train of ideas of the imagination is ready to sweep across his mind, if free play is given to it. But all this medley of conflicting influences you are able, if you like, to neglect. You can just brush them aside, by attending to the single series of auditory impressions that is affecting you, to the succession of words which I am speaking. When the whole of your surroundings is pressing in upon you through the avenues of the sense-organs, clamoring for notice, you have the power

of choosing which shall be let in at the door of consciousness. Only those facts cross the threshold to which you desire to attend.

"But," you may say, "suppose that this is true, what has attention to do with movement? You told us that it was movement that distinguished the animal from the plant, and that along with movement went power over the external world. Now what has movement to do with attention?" That is a perfectly fair question, but one which I cannot here answer for you in detail. To understand the fact of the connection thoroughly—and the connection is a fact—you must have studied psychology. But I can give you a pair of statements which will be better than nothing. The first is this: Whenever we attend, we move. I do not mean that the whole body moves, that there is locomotion: but that there is movement,—movement in the eye, movement in the ear, movement in the scalp, movement somewhere. And the second is this: It is the moving thing that attracts the attention. You cannot attend to one single thing, one really single thing, for more than a few seconds together. Either you go to sleep, or you go into hysterics. On the other hand, one is almost constrained to attend to anything that moves. You can hear the single voice that carries the melody, when there is an orchestra of half-a-hundred instruments thundering on at the same time, because the melody changes, the tones move; while the accompaniment is relatively stationary. So that attention to the melody is easy. If any of you have been out shooting after dark, you will know that one tells the game by its movement. So long as it is still, it is safe. But let it move, and though the eyes have been looking in a quite wrong direction, the attention is drawn upon it by force, as it were; one cannot help seeing it.

Those, then, are two categories of mental

experience. There is one more to mention. This self of ours, this 'I,' which is exposed to the physical changes in the world in part, and in part helps to bring about physical changes in the world by moving to and fro in it, is not indifferent to what goes on in either case. It does not just have ideas, on the one hand; and attend to them or move in consequence of them, on the other. It does more; it feels. It feels when impressions come in; it feels when efforts go out. So that alongside of ideas and efforts must come a third category of mental experience—feelings. Feeling is of two kinds, pleasurable and painful. It is quite distinct in consciousness from ideation, and from effort and attention. That is another of the points which arise at the very beginnings of a study of psychology that it is extremely difficult to get clear about—that pleasure and pain, as such, belong to an entirely different order of processes from the processes which we call collectively ideas. But it is a fact, despite the intimate interconnection of the two in our concrete experience. Let me try to drive it home for you by two illustrations. You cannot remember a pleasure or pain. When you try to recall the pain of a flogging that you had at school, what you recall is really only the complex of perceptions, not the pain itself. You remember all the circumstances—your being sentenced, the people standing round you, the room in which the fatal event took place, the master who did the deed. All these are ideas. But so far are you from being able to remember the actual pain of the flogging that the memory of the circumstances to-day may be actually pleasant; you smile as you look back on them. That is the first illustration; the second is this: You cannot attend to a pleasure or pain as such. It is a common saying that if you attend to a toothache, for instance, you 'make it worse.' That is bad psychology.

You attend, in reality, to the tooth. That means that you perceive the tooth more clearly than anything else for the time being; your idea of the tooth is the very strongest in consciousness. But by attending to the idea and so making it clearer, the feeling that goes along with the idea is made clearer, too. So the pain 'gets worse,' not because you attended to it, but because you attended to the group of perceptions with which it was connected.

Now, then, we have got our raw material into something like order. Consciousness, instead of being a shapeless tangle and maze of various intertwined and interwoven processes—as it appeared to us to be when we started out on our enquiry—has proved to be capable of arrangement and simplification. You may, it is true, raise the objection that our table of contents is, perhaps, not inclusive of every known mental state. Where, you may ask, is emotion; where is expectation; where are all the rest of the familiar terms for mental experiences? Well, you must take my word for it, that all these other states of mind or mental experiences can be derived from the three simple processes which I have named to you. If you were to work through a psychology, you would find that there was nothing treated of, in any chapter of it, which was not a compound of these three sets of elements—ideas, feelings and efforts—mixed in different proportions. And that being the case, it is these three elements with which psychology begins. She first of all describes them, as minutely and accurately as possible; and then furnishes a theory or an explanation of them, in the sense that she gives the conditions, bodily and mental, of their appearance in consciousness. Under what conditions do we have this and this perception? Under what conditions do we remember and imagine? Under what conditions do we feel so and so, attend

to this and that? These are the questions that come up for answer.

Into those questions we cannot here enter. Let it be sufficient for you, in this lecture, to have learned the names and characters of the simplest items of mental experience—of those items which are always and invariably present in our concrete, every-day experiences. Draw for yourselves an outline map of mind. You must make three countries, as it were, within that map. Ideas must go in in one color to the right; efforts in another to the left; and feelings will lie in the middle between the two. And you must suppose that each of these three territories has an independent government; but that their governments are very friendly, and often take joint action—indeed, that they hardly ever think of taking action of themselves. Especially must you conceive that both idea and effort have right of way through any part of the dominion of feeling; and that the communications are so open, and the relations so close, that scarcely anything can affect idea or effort, from the outside or from the inside, that does not also exert an effect upon feeling. The detailed survey of the three territories, and the laying down of roads through them for the student to follow—that is the further business of Psychology.

E. B. TITCHENER.

LOSS OF PROFESSOR MILNE'S SEISMOLOGICAL APPARATUS, LIBRARY AND COLLECTION.

EVERY one interested in Seismology knows of the great work done by Professor John Milne, F. R. S., during a residence of nearly a quarter of a century in Japan, which country became, a decade ago, the earthquake laboratory of the world. Through his interest, and that which he kindled in other foreign residents, the Seismological Society of Japan was organized about fifteen years ago. During its active existence its Annual Reports contained the

most important contributions to Seismology anywhere published, and it is not too much to say that the work of this Society amounted to a revolution in the methods of observation and research. To its Transactions, Professor Milne was by far the largest contributor. When the rapid decrease of the number of foreign scientific men resident in Japan threatened the life of the Society, he tactfully enlisted the support and co-operation of the Japanese. The issue, by the University, of an extensive and valuable series of scientific memoirs, tended, naturally, to divert much of the active interest which they for a time manifested, and a few years ago the publication of the Transactions of the Seismological Society ceased. Professor Milne was not discouraged however, and at his own risk and expense at once substituted a periodical which he called the 'Seismological Journal,' which he has continued to issue at great pecuniary loss and which contains many valuable and important contributions to the science.

During all of these years, with a tireless and inexhaustible industry and a rare ingenuity of design and wealth of mechanical resource, he had invented, constructed and put into use a variety of earthquake detectors, recorders, measurers, wave and tremor registers and even earthquake 'avoiders' or 'nullifiers,' which, with the numerous devices and inventions of other foreign students of Seismology in Japan, the value of which he was quick to recognize and utilize, constituted a collection the like of which never existed before. Besides these instrumental appliances Professor Milne had accumulated an extensive and valuable library of Seismology, including many early and rare pamphlets and volumes and almost everything published on the subject during the past fifteen years.

His connection with the Japanese Government is shortly to terminate, and he had