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DYNAMIC PSYCHOLOGY

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DYNAMIC PSYCHOLOGY

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To
G. M. W.

PREFACE

The Jesup Lectures for 1916-1917, given at the American Museum of Natural History with the cooperation of Columbia University, are here reproduced with some enlargements and modifications.

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DYNAMIC PSYCHOLOGY

I

THE MODERN MOVEMENT IN PSYCHOLOGY

Like other ancient branches of learning, psychology has undergone in the last hundred years a change and development amounting to a revolution. Not only has there been rapid growth in knowledge and in the number of persons devoting their time and ingenuity to the increase of knowledge in this field, but there has occurred a remarkable change in attitude, method, and standards. The change can be characterized, in a word, by saying that psychology has become an empirical science. It has ceased to be a chapter in general philosophy, and become one of the 'special sciences'. Leaving the parental roof, it has followed its older brothers, physics, chemistry, and biology, out into the world, and set up business for itself. The transformation of psychology is a phase of the general scientific movement properly to be called the great outstanding fact in the history of the nineteenth century. As the social movement of the past century was a result of the industrial development, and this in turn dependent on the progress of science, the latter may rightly be named the real fundamental movement of the century. It was the extension of scientific interest and method from the inorganic world to the realm of living creatures, and from life in general to the special forms of living activity which we call mental, that fructified the mental philos-

ophy of the older day, and gave us the psychology of the present.

At the opening of the nineteenth century, psychology, as we call it today, though the name was then little used, could already boast of a long history. It could scarcely have been true that the philosophic minds of early days should have omitted from their view the mental performances of mankind. Socrates, in fact, taught that to 'know thyself' was the prime factor in wisdom; and Aristotle, among the numerous writings in which he reduced to order the thought of the ancient Greeks, composed a treatise on psychology, the 'science of the soul', destined to remain for many centuries without a serious rival. In the early modern period, while 'natural philosophy', developing a technique of its own, split off from the parent stem and became the science of physics, 'mental philosophy' remained bound up with general philosophy to such a degree that now it is almost impossible, in reading the philosophers, to disentangle their psychology from their teachings on logic, ethics, and the criticism of knowledge.

Locke, the founder of the British empirical school in philosophy, wrote an *Essay Concerning Human Understanding*, a title appropriate, one would suppose, for a chapter in psychology. But Locke's dominant interest was not precisely psychological; he was less concerned with the actual process of knowing than with the validity of knowledge, and was therefore contented with a rather sketchy treatment of the processes themselves. Rejecting the view, strongly held in his day, that certain fundamental ideas were innate, he taught that all ideas are ultimately derived from the indi-

vidual's experience, and have accordingly no more validity than the experiences on which they are based. Simple ideas of color, form, solidity, number, etc., come to us through the senses from external objects, while simple ideas of remembering, thinking, and other mental operations come to us from the occurrence of these operations within us. These simple ideas we compound, compare, and abstract, and thus acquire the great variety of our complex ideas. Knowledge is the perception of the agreement or disagreement between two ideas; it is therefore limited to our ideas, as these are limited to our experience; and it is further limited by our inability to discover agreement or disagreement between many of the ideas which we possess. Further, accidental coupling of ideas in our experience may make it impossible for us to see disagreement and incoherence where such exists; and 'enthusiasm' may lead us to make assertions where we have no real perception. These excerpts from Locke illustrate the trend of his interest; his attention passes lightly over the actual processes of thought in its eagerness to evaluate their results; yet Locke is undoubtedly an important landmark in the progress towards psychology.

This absorption in the problem of the validity of knowledge dominated Hume, also, and the rest of Locke's successors, both British and continental, down to and into the nineteenth century. They had also an interest in human conduct, but it was rather an ethical interest, concerned with what man ought to do, than a psychological, concerned with what he does; or the latter, only as a basis for the former. True psychological knowledge was, however, slowly accumulating, and

the time seemed ripe for the splitting off from philosophy of a branch of study which, leaving aside the philosophical implications of the information gained, should set itself whole-heartedly to the task of examining the mental activities of men. One thing was necessary before such a splitting-off could occur—a recognition of the urgent need for more facts, and for fruitful and trustworthy methods of obtaining the facts. Many of these psychologists, or philosophers, of the pre-scientific age were distinctly empirical in tendency, and cannot fairly be accused of 'spinning their theories out of their own heads'. They endeavored to utilize such facts as they knew, and to base their conclusions on their experience; but they did not realize their great need for more facts and more experience. They followed the natural tendency to draw conclusions from past experience, while the modern scientific standard requires that not conclusions, but only hypotheses, should be drawn from past experience, the conclusion to follow upon the testing of the hypothesis by new facts. In other words, a scientific conclusion is a hypothesis that has proved successful in predicting hitherto unknown facts. This reserve in accepting the suggestions of past experience, and this zeal for new facts to test definite questions, psychology had to acquire before becoming a true science. The new attitude, however, did not arise within the ranks of the philosophical psychologists, but was imported from without.

The push from outside that changed the course of psychology came from physiology, itself an ancient branch of medicine that had undergone a revolution at about the beginning of the nineteenth century, and had

split off from its parent stem, becoming distinctively and actively an experimental science. The idea that the functions of the bodily organs were to be learned by experiment took hold early in the century, and many experiments were tried on the muscles, glands, heart, nerves, and brain. Among the organs offering themselves for such study were the eye, ear, and other sense organs; and in fact they were attacked early rather than late by the physiologists, because their action could largely be studied in the human subject, without operations of a surgical nature such as are necessary in examining most of the organs. It was simply necessary, for example, to have a trustworthy observer tell what he saw when the physical conditions of vision were arranged in some definite way to test a particular question. Newton's decomposition of white light by use of the prism had been followed up by the students of natural philosophy, and about the year 1800 Thomas Young had described some very important experiments on the mechanism of the eye, and propounded a theory of color vision which still numbers many adherents. Other physicists, among whom may be mentioned Benjamin Franklin and Count Rumford, had incidentally made important observations on the eye and its sensations. In the early decades of the nineteenth century there was a great increase in the amount of work done upon the eye, and many new facts were added to the store of knowledge, while at the same time many fresh problems came into view. The invention, as the outcome of physiological experiments, of the stereoscope by Wheatstone in 1833, and of a rudimentary form of the moving picture machine by Plateau in 1832,

may be taken as illustrating the importance of the work done by the physicists and physiologists of this period in preparing the way for a science of psychology; since, evidently, the problems raised by the successful workings of these instruments—as to how, in the one case, two properly chosen flat pictures or diagrams, one placed before each eye, can create so strong an impression of solidity—and as to how, in the other case, a rapid sequence of pictures of an object in different positions can make us see the object in motion—evidently such problems are psychological. ✓

Similar, though less extensive work was being done on the sense of hearing; and Weber, about 1825, made a number of important discoveries regarding the sense of touch and the perception of distance, temperature, and weight upon the skin. Weber is an especially notable figure in the history of psychology for his experiments on the perception of differences and the generalization he drew from them. A small difference between two weights, he found, could be observed provided the weights themselves were small; but as they were made heavier, the difference between them had to be proportionately increased in order to remain perceptible. He concluded from this and similar facts that the perception of difference in magnitude is a perception of the ratio of the magnitudes, and not of the absolute amount of difference between them. This generalization, later named 'Weber's law', came to be regarded as one of the chief corner-stones of the edifice of experimental psychology.

In view of this large growth of what was really psychological information in the hands of the physiologists,

and in view, on the other side, of the increasing tendency within the ranks of the philosophers for some to specialize in the study of mental philosophy, we might have expected a union of these two tendencies before the middle of the century into a science of the modern type. As a matter of fact, probably because experimental methods were not yet ready for an attack on the problems most interesting to the mental philosophers, such a union did not occur for another generation, though meanwhile we find the mental philosophers becoming more empirical, as evidenced by the works of Bain, and a section of the physiologists becoming more psychological, as seen especially in the case of Helmholtz. The latter, a scientific student of the first rank, worked over the whole existing stock of knowledge on vision and hearing, testing everything for himself, and adding many fresh discoveries; and summed up the whole in two great books, one on vision and one on hearing, published about the year 1860. He also, in the course of an investigation into the speed of nerve transmission, gave the first measurement of the 'reaction time', a subject of study which was at once taken up with energy by the Dutch physiologist Donders.

Another name to be mentioned along with Helmholtz is that of Fechner, a professor of physics, with varied interests, which included a somewhat mystical vein of philosophy. While ruminating over the problem of the relation of the physical and psychical worlds, he came across the work of Weber, already mentioned, on the perception of small differences in weights and other physical stimuli, and conceived the idea that this type of experiment afforded a means of establishing definite

quantitative relations between the stimulus, representing the physical world, and the resulting sensation, representing the psychical. He accordingly began extensive experimentation along this line, devised appropriate methods for conducting such experiments and for treating their results, and after years of labor published in 1860 a book which he called *Psychophysics*. Although this work has not been generally accepted as possessing the philosophical significance which its author intended and indicated by its title, it proved to be of great importance on the psychological side, because it showed the way of accurate experiment on certain psychological problems. Ten or fifteen years later, the same author applied somewhat similar methods of experiment to questions of esthetics, and proposed that a science of esthetics should be developed 'from below up', by starting with experimental determinations of preferences for colors, shapes, and other simple objects, and working up towards the complex objects of art.

The situation in 1870, then, was about this. We have the mental philosophers, best represented by Bain or by the Herbartians in Germany, disposed to devote their attention to the senses and intellect, the emotions and will, as matters deserving of study for their own sakes without regard to ulterior philosophical considerations; and on the other side we have a large and growing fund of information on the senses and sense perception, the speed of simple mental operations, and related topics, and we have a number of experimental procedures well worked out and known to be usable. The man in whom these two streams most definitely came together was Wundt. $\sqrt{\text{Beginning as a physiologist,}}$

largely under the influence of Helmholtz and Fechner, but also of the philosopher Herbart, he soon switched to what he named 'physiological psychology', meaning by that term a psychology studied by the method of physiology, namely, by experiment, and taking full account of the relevant information to be had from physiology. He published a book with this title in 1874. Soon after that, he became professor of philosophy in the University of Leipzig, where he established in 1879 the first definitely recognized psychological laboratory, and began to send out pupils trained in experimental psychology to found laboratories in other universities. Many were founded in the next fifteen years, especially around 1890. It would, however, be a mistake to conclude that Wundt was the sole founder of experimental psychology; for similar beginnings were made almost simultaneously with his, at Berlin and Göttingen, and at Harvard and Johns Hopkins, by men not pupils of Wundt but influenced directly by Fechner, Helmholtz, and other physiologists.

The scope of experimental psychology in 1880 was not by any means as wide as that of mental philosophy. The physicists and physiologists had shown how to study the senses and certain sorts of sense perception and how to measure the time of simple mental operations; and there were Fechner's methods for studying esthetic preferences. There was little indication that experiment could be fruitfully applied to memory, thinking, will and emotion, or several other matters of great psychological interest; and experimental psychology accordingly appeared at first as a rather limited and technical part of the whole subject. It was not long,

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