

AN HISTORICAL INTRODUCTION TO MODERN PSYCHOLOGY



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INTRODUCTION TO MODERN
PSYCHOLOGY



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INTRODUCTION TO
MODERN PSYCHOLOGY

GARDNER MURPHY

With a Supplement by Heinrich Klüver



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TO MY MOTHER

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PREFACE

PSYCHOLOGY, in the sense of reflection upon the nature and activities of mind, is a very ancient discipline, one which reached great heights in ancient Greece and has continued (in intimate relation with philosophy) with every phase of European civilization. During the nineteenth century this literary and philosophic psychology underwent profound changes, chiefly as a result of the progress of biology, from which both concepts and methods were freely borrowed. Many of its greatest students began to rely upon experimental and mathematical method, believing that psychology could become a science akin to other biological sciences. It is the purpose of this volume to trace the course of those changes in the nineteenth and twentieth centuries which have thus tended to transform psychology and to give it its present character.

To see our contemporary psychology in perspective becomes each year more difficult. A sketch of the development of the science since the beginning of the nineteenth century should help to some extent to give such a perspective. No purpose would be served, however, in seeking to duplicate the existing historical studies of psychology. Brett's three-volume *History of Psychology* presents a comprehensive and eminently readable account of psychology from the time of the ancients through the nineteenth century; the third volume of this work has proved of immense value in the present study. But, simply because our purposes have been different, the duplication of material is not great. Brett's work shows the interconnections of nineteenth-century psychology with that of earlier periods, with emphasis upon many problems which have not as yet been found amenable to just that experimental approach which chiefly concerns the present work. Moreover, about half of the material in the present volume belongs to the twentieth century, material excluded by the chronological limits which Brett imposed on

his own work (Preface, vol. II, page 5). The nearer a decade is to our own time, the more attention I have given it; the plan might remind one of Mercator's Projection.

I have, indeed, attempted a brief account of certain phases of psychological history from the seventeenth century to the beginning of the nineteenth century, in order to make the psychology of the early nineteenth century intelligible. No one could be more keenly aware than I am of the complete inadequacy of this sketch. Its purpose is not to present a unified picture of psychology during the seventeenth and eighteenth centuries, but to throw into relief a few movements whose influence was still strong at the opening of the nineteenth century. With the nineteenth century, and especially with the beginnings of experimental psychology, the quantity of psychological writing becomes so vast that a panoramic survey rather than a minute inspection of individuals and movements is all that can well be attempted. Even so, I have doubtless failed at many points; I shall be very grateful to readers who will call my attention to errors, whether great or small.

The scope of "psychology" has enlarged so much in the past few generations, and the present usage of the term varies so much with individual points of view, that the limits of our present work need to be defined. The reader will find an apparent over-emphasis upon the results of research work as opposed to the progress of psychological theory. This is due, in part, to an attempt to reflect adequately the trend towards empirical, especially experimental, method. I have, however, another reason for the relative neglect of psychological theory within the period of contemporary psychology. A survey of psychological literature within any decade since the founding of Wundt's laboratory would show that very little of the speculative material has survived. Here and there a striking exception appears; a man of great magnitude impresses his outlook upon a whole generation, while some experimentalists weave their findings and their interpretations into a vital unity which stimulates and directs further research. But in general the framework of the science is constituted by its empirical methods and results; and though I trust I have not unduly neglected the thought of the builders, it is upon the character of the building that I would lay emphasis.

The central purpose which I have kept before me in the treatment of the more recent phases of psychology is to show the constantly widening range of experimental and quantitative method, to include ever more complicated problems. As each new field is conquered, and as methods become standardized and research titles numbered by the hundreds, it ceases to be capable of treatment in a general volume such as this. The reader will find, for example, practically nothing about studies of sensation since the work of Helmholtz ; nothing about psychophysics since Fullerton and Cattell ; nothing about association-tests since Jung's first work. In part I have imposed these limitations on the work because it was the only way in which justice could be done to the many fields of psychology ; in part I have done so simply because good historical treatment is already available for each thoroughly established special field.

My intention, then, is to present in rough chronological order the conquest by scientific method of one research field after another. In accordance with this line of attack it is quite impossible to afford any just treatment to the philosophical forms of psychology, or to the problems of epistemology and theory of value. Much significant work ordinarily regarded as psychological must quite arbitrarily be excluded, if any sort of unified purpose is to be achieved. A single illustration will show where I have tried to set the boundary. In *The Analysis of Mind* Russell clearly indicates his purpose : " I am interested in psychology not so much for its own sake, as for the light that it may throw on the problem of knowledge " (p. 15). This does not prevent his making valuable psychological observations ; but it is natural that a man's chief interest should determine the field of his chief contribution. This holds good of much contemporary philosophical work in which psychology is a tool rather than an end. And on the other hand, the *philosophy* of mind bears a relation to the history of psychology very similar to the relation which the philosophy of physical sciences bears to the history of these sciences ; *i.e.*, wherever such philosophical contributions *shape the course* of the science, they may be regarded as a part of its history. The line of exclusion is, of course, an arbitrary one ; some sort of line must nevertheless be drawn.

But whereas contemporary British, French, and American

psychology can be portrayed in some degree of detachment from prevalent philosophic systems, no such separation is possible in relation to contemporary German psychology. Germany is witnessing in many quarters a widespread revolt against experimentalism, and a recourse to methods which are as fully philosophical as they are psychological. In the two concluding chapters, Dr. Heinrich Klüver describes the outlook and methods of a number of schools of contemporary German psychology, which are more or less interwoven with contemporary philosophy.

It will not be possible to treat of the *applications* of psychology. Such applications do, of course, yield at times new psychological principles. It is only when they do so that they can be considered here.

Some years ago, I was puzzled by the reflection that there existed no historical approach to that contemporary psychology which arose in the nineteenth century as a result of the interaction of experimental physiology, psychiatry, the theory of evolution, and the social sciences, constantly working upon certain materials from the history of philosophy, and guided by progress in the physical sciences and statistical method. Now, having made the attempt, I am no longer puzzled. Probably no one who had mastered the vast materials necessary for such an undertaking would have the courage to make a beginning. Perhaps it is just as well that the first venture in this direction should be made by one who, because he sees but few paths, trudges the more cheerfully on the way. For the strange silences and vast lacunæ which mark these pages I may therefore make no apology. For the sins of deliberate omission, however, I cannot so easily be comforted. The sins become more and more grievous as the work approaches present-day psychology. When one considers that the *Psychological Index* carries thousands of titles annually, one may well ask by what right a mere handful of these are mentioned. I can but mention three factors influencing my decisions. First, where a movement is represented by many titles I have preferred to quote one individual's research, making his methods and results clear, rather than to indulge in generalizations which the reader would find difficult to verify. Secondly, I have chosen as best I could in terms of the importance which attaches to each problem ; an elaborate investigation extending a known principle might well be

omitted, while a brief and inadequate treatment of a significant new problem might receive attention. Thirdly, and perhaps most important of all, I have chosen in accordance with my own conception of psychology and my own personal interests. When beginning to prepare the volume I fondly dreamed of an absolutely impersonal and objective record of modern psychological history. Fairness in presenting the work and opinions of others I have hoped to attain ; but I am convinced that the tasks of selection and emphasis make a purely objective record, at least for the present author, quite impossible.

Much as I am indebted to Brett's volumes, I am even more deeply grateful for his generous aid in reading the present volume in manuscript, in rectifying errors and in giving valuable suggestions. The same generous gift of time and counsel has been given by Professors Margaret Floy Washburn, K. S. Lashley, Horace B. English, Harry L. Hollingworth, Albert T. Poffenberger, and Robert S. Woodworth. I cannot adequately express the degree of my indebtedness to each of them. To my students for whom this material was first prepared I owe constant inspiration ; especially to Shailer Lawton and George Schoonhoven. For assistance in preparing the manuscript I wish to thank Dr. Georgene Hoffman Seward, Miss H. A. Dandy, Miss Louise Soby, and Mrs. Enrica Tunnell ; Harvey W. Culp, Donald W. Eckley, Walter A. Hall, and Sam Robinson ; and, most of all, my wife and my mother.

G.M.

October, 1928.

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PREFACE TO THE THIRD EDITION

THE principal changes made in the Second Edition (April, 1929) and in the present edition consist in corrections of errors and in additional references to recent work. The chapters most affected are those on "Child Psychology" and on "Psychoanalysis." Among the many regrets relating to the book's limitations, perhaps the most disturbing lies in the impossibility of doing justice, in limited space, to contemporary psychoanalysis; the reader will find a more adequate account in R. S. Woodworth's *Contemporary Schools of Psychology* (1931).

Since the First Edition of this book, the task of the historian has been completely altered by the appearance of E. G. Boring's *History of Experimental Psychology* (1929). A host of important subjects which I have either left untouched or handled only in the most sketchy fashion are treated by Boring with vigour, clarity, and completeness. I therefore see no sound reason why I should struggle to round out my book at these points; it is sufficient to refer the reader to Boring.

It appears that my earlier preface has not made entirely clear the reasons underlying the order of the chapters in Part III. The order is roughly chronological, each chapter being "identified" by an event (or a movement) which occurs a little after the event which marks the beginning of the preceding chapter. Thus, William James is wedged in between Ebbinghaus and Titchener for no subtle reason, but simply because 1890 is between 1885 and 1892. Each chapter, however, has to go on until it makes a whole or until it has prepared the reader for the next one. I hold no brief for this plan as against others; I merely wish to explain a point which seems to have been obscure to many readers.

My failure to give initials of authors seems to have caused

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confusion in some cases. Initials are now added in the name index.

For helpful suggestions I am indebted to many, especially to G. S. Brett and Hulsey Cason.

I wish to thank Messrs. Kegan Paul, Trench, Trubner and Company and also Messrs. Harcourt, Brace and Company for kind compliance with a number of unseasonable requests.

G.M.

January, 1932.

An Historical Introduction to Modern Psychology

PART I

The Pre-Experimental Period

CHAPTER I

THE INTELLECTUAL BACKGROUND OF SEVENTEENTH-CENTURY PSYCHOLOGY

“ Their fine ways of explaining Nature mechanically charmed me.”
—*Leibnitz*

FROM colour-theories to defence-mechanisms, from the functions of a white rat's vibrissæ to the mystic's sense of unutterable revelation, from imaginary playmates to partial correlations—wherein lies that unity of subject matter which leads us to speak, compactly enough, of “ contemporary psychology ”? From behaviourism or *Gestalt* psychology to psychoanalysis or the objective measurement of character, the eye wanders over an interminable range of experiments, measurements, hypotheses, dogmas, disconnected facts, and systematic theories. In a sense it is true to say that through all this vast *mélange* the very birth-cry of the infant science is still resounding. In another sense psychology is as old as occidental civilization, and all these seething multitudes of investigations and opinions spring from an inconceivably rich and variegated history. The complexity of contemporary psychology suggests that its understanding may well require the use of that *genetic* method which it has itself repeatedly demanded in recent years. Whatever difficulties there may be in finding unity in the various psychological disciplines, there is at least one unity to which we may cling

for orientation and perspective, for appreciation and synthesis ; and this is the tranquil unity of history.

The centuries since Descartes and Hobbes have woven together the psychology of antiquity and the physical science of the Renaissance, the nineteenth-century triumphs of biological science and the twentieth-century genius for measurement, while a multitude of social forces, as well as strokes of individual genius, have shown unities of method and conception underlying all the problems of psychology, and indeed of life itself. For what is experimental psychology if not an embodiment of the notion of a fundamental unity between psychology and physiology, and what is behaviourism if not an attempt to make that unity more complete ; what is psychoanalysis if not an insistence on the fundamental unity of normal and abnormal, and of conscious and unconscious motives ; what is the *Gestalt* psychology if not an emphasis upon those Aristotelian " forms " which contribute the patterns both of the things of the physical world and of the data of immediate experience ?

Yet each of these movements towards unity is itself but a more complete and systematic expression of movements that have been with us at least since the seventeenth century : behaviourism, for example, a refinement of Descartes' automatism and Hobbes's mechanism ; the emphasis on the unconscious a reminiscence of Leibnitz's idea of perceptions of which we are not aware ; experimental psychology itself an application of that experimental and quantitative conception of nature which Galileo and Newton so brilliantly set forth.

And the venerable antiquity of psychology shows through the gloss of its newness, and makes the finality of each new emphasis seem, perhaps, a little less final. Not indeed that there is very great usefulness in that cheerful modern dogma which asserts that each achievement of science gives but a new name to the discovery of some Hellenic thinker. But psychology has made its recent rapid advances only because of the richness of its own history, and because of the centuries of general scientific progress which lie immediately behind us.

An historical approach to contemporary psychology necessitates at the outset a clear picture of the psychology

of the early nineteenth century. But the early nineteenth century will be intelligible only if we first give brief attention to some tendencies at work several centuries earlier, and largely outside of the special field of psychology. We must attempt a brief sketch of some phases of the Renaissance, and of some psychological schools which grew out of it.

The revival of learning and the Renaissance were, of course, vastly complicated social and intellectual movements, the origin and nature of which are not, at least in our own day, to be stated in any clear and final terms. But the following facts seem to be reasonably well established. The Crusaders of the twelfth and thirteenth centuries had discovered and carried back to Europe much of the civilization of the Near East, in which many elements of classical culture had been embedded. New phases of culture showed themselves; the new universities of the thirteenth century promoted the study of the Classics, and a great artistic revival, the Proto-Renaissance, spread over southern Europe. The true Renaissance began, roughly speaking, even as early as the fourteenth century, and reached its greatest height in the sixteenth.

It gloried in explorations of all kinds, not only physical but intellectual. But perhaps the realm of geographical discovery is as representative and enlightening as any. A beautiful epitome of the whole movement is found in the coinage of the Spanish empire, changing as a result of the explorations of Columbus. In the days before the discovery of America, some of the coins of Spain bore the words *Ne Plus Ultra*. Spain and the Pillars of Hercules were the edge of the world. Then came Columbus and the age of the explorers. The inscription was changed. *Ne* was removed; and the words read *Plus Ultra*. There *was* "more beyond."

Everywhere men sought for the new, both in the new appreciation of the culture of antiquity, and in the search for new knowledge and new possessions, material and immaterial. Among the more obvious expressions of the movement was the search for new routes to the East, and the beginning of the building of empires to include the "New World," the colonization of which was one of the great achievements of the sixteenth and seventeenth centuries. As the Holy Roman Empire slowly decayed, France, Great Britain, and the Netherlands played their parts, each looking

for lands and wealth beyond anything dreamed of in the past. In the economic sphere an equally novel change was appearing. During this period went on apace the "Commercial Revolution" which followed upon the growth of towns and the development of trade by land and sea, deriving from new routes to the East and from the general improvement in means of travel and communication. The political revolution in which Cromwell was the leader and Charles I was executed, and even more definitely, the Revolution of 1688, in which the House of Orange was called to the throne, marked the emancipation of the commercial classes in Great Britain. They meant the end of the traditional "divine right of kings," and the beginning of the self-assertion of a middle class, the great trading class which grew up as these economic changes occurred.

Such tremendous unrest and activity were bound to show themselves in the intellectual world, as everywhere else; they were apparent in the interests, spirit, and modes of thought of those who devoted themselves to art, to letters, to philosophy, and to practical affairs. In science a revival had begun as early as the twelfth century. The first great achievement was that of Copernicus (1543). His doctrine that the earth and the planets moved in circles about the sun (the revival of a theory dating from the third century B.C.) was the beginning of modern astronomy. But inductive methods were not yet understood. Copernicus was far from being a bold investigator; his method was almost purely deductive, having as its purpose the substitution of a simple conception for the complicated Ptolemaic system. His views seem, moreover, to have been inspired by Greek philosophy.

After Copernicus came Tycho Brahe, who spent his life making and recording with scrupulous exactness such observations on the motions of the heavenly bodies as the best instruments of his time permitted. He found the Copernican system unacceptable. It did not agree with his observations, and he did not guess that the reason for the inconsistency lay in the fact that the orbit of the earth's motion about the sun is not a circle but an ellipse. Even Tycho, the observer, believed that heavenly bodies must of necessity move in perfect curves, and to him the perfect curve was the circle. Nevertheless, in the hands of Tycho and his immediate successors, science was beginning to take on a

definitely empirical cast, the spirit of indifference to the perfection of theory, and eagerness for accurate data as the first step toward a sound hypothesis. In the work of Kepler there was a combination of the work of these two predecessors. Through close study and the most brilliant mathematical genius, he succeeded in showing that Copernicus was essentially correct, but that the figures accumulated by Tycho necessitated the assumption of elliptical rather than circular orbits. With Kepler came into being the first great fusion of inductive with mathematical method.

A similar step was being taken by Gilbert in England in the study of magnetism. For him direct observation was the basic method; he varied the conditions of observation in a way genuinely deserving the modern term "experimental." The foundation was then very speedily laid for the development of experimental science; and in many branches of physical science such investigations were soon under way. The work done by Gilbert was admired by Galileo, who in the first half of the seventeenth century extended the experimental method and went far beyond Gilbert both in the range and in the importance of his observations. Galileo and his followers concerned themselves primarily with the fundamental problems of mechanics and optics.

In all this group we can distinguish the leaders and the trumpeters, those collecting data and those blaring forth to the world what had been and what was to be done. Francis Bacon was the herald of the new empirical spirit as it fought its way among the many forces of the Renaissance. He was, in fact, given credit for the invention of the inductive method; but he was so far from originating such a method that he did not even recognize the significance of the work of Gilbert (nor the immensely important discoveries of Harvey). Nevertheless, as a systematizer and interpreter, he contributed much to the rapid spread of enthusiasm for empirical methods.

The greatest combination of mathematical with empirical method in the seventeenth century was that effected by the genius of Sir Isaac Newton. Newton's work consisted both in the development of new mathematical method and in the continuation of the work of Kepler in the elaborate logical use of empirical results. He was adept in using

the empirical data of others as well as his own. He contributed important original experiments, such as those relating to the composition of white light. Newton contributed much also to the philosophy of science. He gave expression to a system of thought which could be used coherently in the advancement of knowledge. He not only made observations and employed mathematical ways of generalizing from data, but occupied himself also with the fundamental conceptions with which, as he conceived it, science must deal: mass, motion, force, etc.

We need to keep in mind these three different kinds of scientific progress in the seventeenth century: the use of mathematical method; the desire to vary conditions, *i.e.*, to experiment; and the interest in the philosophical significance of the new acquisitions.

A few words about the organization of science. The only country which had organized a definite means of scientific co-operation by the second half of the seventeenth century was France; its work was confined chiefly to the city of Paris. The French Academy of Sciences began to receive royal support in 1671, which furthered the collaboration of investigators. The new impetus to scientific work given by the French Crown is in striking contrast to the situation in Britain. Newton worked practically alone. There was indeed a Royal Society, which was intended to give better means of co-operation, but he remained far greater than his own circle; and pitifully inadequate funds were granted by the Crown. The same condition existed in the German States. Germany, of course, was not a political unit, and naturally enough there was even less co-operation among its scattered men of science than in France and Great Britain, although the German university system was destined in the eighteenth century to serve as a centre for the awakening interest in scientific effort. Galileo, in Italy, had worked alone, and under the suspicion of Church and State. The energies of Spain and Portugal were being expended in explorations and conquests in the New World. So, if we are inclined to ask why a given "discovery" was announced when the facts were already known to contemporary investigators, the answer is that almost until the beginning of the nineteenth century scientific progress throughout western Europe was, with few exceptions, the fruit of the efforts of

individuals, frequently working without knowledge of kindred efforts in their own and other lands, and destined to be forgotten until some scientist or scholar of a later day stumbled upon their work.

This holds strikingly true in the biological sciences. The revival of classical medicine, particularly in the Italian universities, was actively proceeding in the sixteenth century. If vague notions of "humours," "vital principles," etc., persisted, they were scarcely more conspicuous than the similar conceptions of force, attraction, and the like, in physical science. The desire to describe, to understand in terms of observation, rather than by speculative and deductive methods, was just as marked in biological science as in other fields, though generalizations were more difficult. The empirical movement was active generally, and in the Netherlands it led in the seventeenth century to the inauguration of epoch-making clinical and post-mortem studies in anatomy. The reader will remember, for instance, Rembrandt's painting, the *Anatomy Lesson*, a representation of the then novel and amazing art of dissecting the human body. The same clinical spirit was manifested in the study of mental diseases; Burton's *Anatomy of Melancholy* (1621) gave descriptions of familiar types of insanity. In 1692 appeared Sydenham's *Processus Integri*, with a description of the varieties of mental disease, the empirical spirit and accuracy of which have been very generally recognized. But the most epoch-making discovery in the field of medicine was Harvey's demonstration in 1628 of the circulation of the blood. Before the time of Harvey the prevalent doctrine was Galen's theory of red and blue blood, each type of blood being supposed to pulsate backwards and forwards. Harvey demonstrated by actual experimentation that the blue blood became red in the course of circulation. And, almost at the same time, this discovery was paralleled in the field of instrumentation by great improvement of the microscope in the hands of the Dutchman, Leeuwenhoek, opening new fields to biological science.

CHAPTER II

THE PSYCHOLOGY OF THE SEVENTEENTH AND EIGHTEENTH CENTURIES

Heraclitus . . . says . . . that it is by something in motion that what is in motion is known ; for he, like most philosophers, conceived all that exists to be in motion.—*Aristotle*.

THE scientific movement of the seventeenth century may then be summarized in the statement that its spirit was empirical, and that its appeal was to direct observation rather than to reason or authority. Its most fruitful concepts were mechanical, that is to say, they dealt with the movement of bodies in space.

The development of objective observation had immediate and definite effects on psychology. Much of the psychology which resulted from this new spirit of inquiry was, of course, the restatement or the reinterpretation of the psychology of antiquity.¹ A very considerable amount of original psychological work was, however, done in the seventeenth and eighteenth centuries. The psychology of these centuries, though influenced by specific discoveries, especially those pertaining to mechanics, was not so much guided by *specific* scientific developments as by the general trend towards empiricism, and the desire to understand man in those aspects of his nature which are open to direct observation.

The first great name in the psychology of the Renaissance was that of Descartes.² He was an international figure whose contributions ranged from mathematics to physiology. He was indeed one of the greatest of mathematicians, and the discoverer of "analytical geometry," which shows the fundamental spatial relations subsisting between variables when-

¹ The scope and purpose of this volume do not permit any sort of consideration of the psychology of the ancient nor of the mediæval world. The reader who would grasp the psychology of the Renaissance in its relation to the previous history of psychology should read a comprehensive history of philosophy, and, in conjunction with it, vols. I and II of Brett's *History of Psychology*.

² *The Passions of the Soul* (1650).

ever the latter are represented in two-dimensional form. He concerned himself with the rapidly developing science of physiology, and enthusiastically applauded Harvey's discovery. The study of the nervous system had begun, after a long period of inactivity, to make new strides. In fact, during the sixteenth century important discoveries concerning the topography of the brain had been made. Descartes was interested in the sensory and motor functions of nerves and in the significance of these functions for psychological theory. He was the first to attempt a detailed description of the relation of nervous functions to mental processes and behaviour.

Descartes utilized the current notion of "animal spirits," which by motion within the nerve substance bring about the movements of the body. He sought to show how such conduction within the body could account for automatic and habitual acts. But some acts required the intervention of the soul. Now, if man was a free agent, as he was asserted to be, and determined his own conduct, how could his freedom operate in a mechanical universe? Descartes solved the problem by postulating a fundamental difference between animals and men. Animals were machines; their bodies were controlled by physical laws. If this were true, then there must be specific mechanisms provided for these acts. Nervous and muscular reactions followed predictably from the stimulation of the sense organs; incoming and outgoing pathways provided fixed channels for the arousal of the animal's whole repertory of acts. This conception of the *reflex* is the groundwork which psychologists of a physiological turn of mind have used ever since, on which to build up an explanation of the more complicated activities of life. Modern mechanistic psychology grew out of this seventeenth-century conception, greatly stimulated, of course, by progress in the science of mechanics in the hands of Newton and his followers.

But the explanation of human acts seemed to require a new hypothesis. Descartes divided these acts into two groups, those of a mechanical nature and those of a rational nature. The rational acts were utterly distinct from the merely mechanical, and made possible judgment, choice, and will. This theory involved a sharp cleavage between animal and intellectual functions. Descartes retained the soul as an

entity outside the spatial order ("unextended"). The lucidity of his treatment helped to make clear the opposition between strict dualists who accepted his distinction, and monists, like Spinoza,¹ who stated that soul and body are ultimately one.

Descartes himself recognized serious difficulties in this position. If mind and matter were totally different things, how could there be a working relation between the two? How could the body act upon the soul, and *vice versa*? This question caused much trouble. Descartes had to look about for the point of interaction, the "seat of the soul." Some of the ancients had placed the soul in one place, some in another. But medical studies had begun to point clearly to the importance of the brain. The trouble with the brain for Descartes' purposes was that it is "paired," right and left, and divided more finely into smaller structures which are arranged symmetrically on either side. But the pineal gland, the functions of which were unknown, is deeply embedded in the centre of the brain. There is only one pineal gland; and it necessarily follows, thought Descartes, that it is the seat of the soul. This gland acted to transmit physical stimuli to the soul, and to transmit impulses from the soul to the body. The soul's control of the body was through simple mechanical regulation of the connections between sensory and motor impulses in the nerves; the connection between the different sensory and motor nerves was directly affected by the movements of the pineal gland. "This gland is variously affected by the soul. . . . it impels the spirits which surround it toward the pores of the brain, which discharge them by means of the nerves upon the muscles."² This assumption reduced the problem of the action of the soul directly to the movements of the pineal gland, but no theory was vouchsafed as to the way in which an immaterial entity could exercise such mechanical effects. This dualism, or fundamental distinction between soul and body, so emphatically outlined by Descartes, has been the centre of many psychological systems ever since. There had been dualism before, notably among the Church fathers, but the acuteness of the difficulty was not apparent until Descartes' bold selection of the organ through which interaction was effected.

¹ *Ethics* (1677).

² *Op. cit.*, Part I, Article XXXIV.

One other feature of Descartes' work, significant for later psychology, is the analysis of the emotions. The "passions" are treated almost like mechanical events; they are explained through motion in the brain, the blood, the "spirits," and the vital organs. Descartes' account of the "passions of the soul" reduces the complexity of emotional life to six elementary passions: wonder, love, hate, desire, joy, sadness. The process of dissecting human nature into elemental emotional experiences or impulses, which in their combination give all possible modes of emotion, is so fascinating that it has never ceased to occupy psychologists.¹

But the emotions listed by Descartes were described as though they were intellectual functions. Love, he believed, depends upon one's calculation of the pleasure an object may bring, and hate depends upon expected evil. The non-rational was translated into terms of the rational. The nineteenth-century "economic man," who avoided pain and sought pleasure, grew slowly and inevitably from this type of rationalism.

Shortly after Descartes worked out this application of physics and its methods to psychology, a somewhat similar approach was made by another mathematical genius, Leibnitz.² He sought, as had Descartes, an answer to the problem of the relation of mind to body. Leibnitz held that it was impossible to accept the doctrine of an immaterial soul acting upon a material body. For real interaction either the soul must be material, or the body must be spiritual, or the two identical, made of the same substance. It is true that Spinoza had seen the difficulty and had chosen the third of these alternatives, making body and mind merely two *ways* in which the same reality is known; but despite his position in philosophy, he had strangely little influence upon psychologists.

The relation of mind and body was stated by Leibnitz in terms nearly as dualistic as those of Descartes, but dispensing altogether with the troublesome concept of interaction.

¹ Among the better known attempts are those of Hobbes, Cabanis, Gall, Lotze, James, McDougall, and Watson.

² *A New System of Nature* (1695).

There is, Leibnitz taught, a body which follows its own laws ; that is, the laws of mechanics. The acts of a human body are just as mechanical as those of an animal. Leibnitz insisted that we must explain *all* acts of the human body in terms of known physical causes. Mental acts and sequences must on the other hand be explained in terms of mental causes. The soul carries on its acts without any direct reaction upon the body. Mental life displays an orderly sequence of events, while bodily life does the same, but these two never interact. His famous analogy was that of two clocks¹ so constructed that they always agreed perfectly, without either one acting upon the other. Thus if we know what time it is by one clock, we know what time it is by the other. Mind and body *seem* to interact simply because of a "pre-established harmony" between them. We can understand mental changes only by understanding the preceding mental changes, and we can understand physical changes only by understanding the preceding physical changes ; there is no causal connection between mental and physical. This doctrine made irrelevant the whole conception of interaction between mind and body, and sought to do away with all those apparent contradictions involved in asking how a mental event occurs in consequence of a physical event. We have in Leibnitz's system a "parallelism" of mind and body to which many shades of contemporary parallelism bear close resemblance. Through Descartes' interactionism, Spinoza's monism, and Leibnitz's parallelism, the seventeenth century outlined three of the major psychophysical theories which dominated eighteenth and nineteenth-century thought.

Mental events were themselves classified and graded according to their degree of clearness, ranging from the most definitely conscious to those which were most vague and obscure. This led to a further distinction which remained prominent in German psychology, a distinction which is now current in treatments of attention. We might, Leibnitz held, be quite unconscious of our obscure perceptions. There may be perceptions of which we are not aware, while others are clearly grasped or apperceived.² *Perception* is an

¹ *Second Explanation of the System of the Communication between Substances* (1696).

² Aristotle had distinguished between "having" and "observing" an experience.

internal condition "representing external things," and *apperception* is "consciousness or the reflective knowledge of this internal state."¹

Continental psychological work in the latter half of the seventeenth century was dominated chiefly by the school of Descartes. With the exception of Leibnitz there was no figure on the continent comparable in magnitude to Descartes; in fact, it was he himself rather than his followers who inspired, nearly one hundred and fifty years later, the use of the theory of reflex action in the brilliant work of the French physiological psychologists.

But significant as were the psychological systems of these two men, probably the most important stream of tradition for us to consider in order to understand the psychology of the eighteenth and early nineteenth centuries is the English "empiricism" of Hobbes and his successors.

The starting point for Hobbes, even more obviously than for the other thinkers we have considered, was the social and intellectual environment in which he lived. He was, in particular, engaged in the study of the great political upheaval going on about him, that surging forward of the commercial classes which weakened the grip of the nobility upon its exclusive power and prerogatives. Charles I was executed in 1649; and Hobbes published his *Leviathan* in 1651. It was, in a sense, an "heroic" age, characterized by charges of cavalry, the leader sleeping in his armour, the lyrics of Lovelace, and the echo of wars across the channel. But Hobbes bitterly hated both the commercial and the political revolution; for he was a royalist, and his conception of life aristocratic. The organization of society was for him based upon the authority of some individuals over others. The "natural" state of man (without organized society) would be "solitary, poor, nasty, brutish, and short."²

Nevertheless, he was an observer who in spite of his prejudices was singularly detached; and this in a hyper-political age in which every thinking Englishman was startled

¹ *The Principles of Nature and of Grace* (1714), 4. Perception is a condition of a *monad*, a psychic individuality or soul. Monads are irreducible psychic entities.

² *Leviathan*, Part I, Chapter 13.

to witness the disruption of the time-honoured order.¹ Though he was in a sense a part of this upheaval, he was still a spectator rather than a participant.² He observed in a spirit in which few before him had observed ; even Machiavelli and Sir Thomas More, his great predecessors in political theory during the Renaissance, had had a case to prove and a practical goal to win. He sought to understand the revolution and the human nature which lies behind both war and peace. He was the first "social psychologist" among the moderns, and the principles which he laid down were epoch-making both for social and for individual psychology.

Hobbes drew the distinction between original nature and the products of experience.³ Some human acts he attributed to innate constitution ; but most specific activities he regarded as acquired. Hobbes started out to catalogue the inherited tendencies, but he quickly lost interest. Hunger, thirst, and sex impulses were but mentioned and passed over in a moment, being such obvious things that their psychology did not interest him. But in relation to social life, he gives a much fuller exposition of the principles of motivation, an exposition based chiefly on Aristotle's *Rhetoric*.⁴ These he described not as purely impulsive forces, but as strivings based on expectation of pleasure and pain.⁵ First and foremost came fear, fear conceived not as a blind impulse but as perception of pain inherent in an object, causing withdrawal from it. Fear is dependent upon calculation of evil results. The desire for honour is another dominant motive ; it is based on the recognition of pleasure which must accrue from standing well with one's fellows. Now these elements of human nature (hunger, thirst, sex tendencies, fear, desire for honour, and, through all, the search for pleasure and the avoidance of pain) are the mainsprings of social conduct, and the basis for social organization. Each individual in

¹ Milton, for example, attached greater importance to his political writings than to his poetry ; it was his great regret that he was snatched away from politics by his blindness. The political intensity and bitterness of the age reverberates even in Gray's stately rhythms three generations later.

² He took refuge in France during some of the stormiest years.

³ *Op. cit.*, Part I, Chapter 6.

⁴ *I.e.*, the list of motives which the orator must sway.

⁵ This simple hedonism was not particularly original. Many of the ancients assumed it ; its elements were present also in More's *Utopia*.

human society was conceived by Hobbes to have proclivities which he wished to satisfy, and pains which he wished to avoid. Without society, each individual, alone, would directly seek pleasure and avoid pain. He would be obliged to engage in warfare with his neighbours in order to take from them the things he wished for himself, and to ward off the attacks which they in turn levied upon him. Man is competitive, and if alone in his self-defence is necessarily miserable through the constant seizure of his possessions or the ceaseless task of self-defence. The only hope for men lies in the organization of commonwealths in which each man agrees to forego the pleasures of robbery in order to avoid attack from others.¹ In social groups each one is prevented by the community from carrying out any attack on his neighbour. A rational social organization prevents the selfishness of original nature from making for general chaos—a conception of statecraft which borrowed freely from Machiavelli. Hobbes, like Machiavelli, insisted that the mainsprings of human conduct were self-interested, and that the most important was fear. Moralists had pointed out the essential baseness of humanity, and Augustine's and Calvin's emphasis on man's sinfulness was an expression rather than a cause of the age-long grudge which Western thought has cherished against man's moral nature. And this conception has been acceptable to penologists and to practical statesmen for centuries. Fear is the central note of deterrent punishment, as of international politics and diplomacy.

Another mechanism of social control lay in the establishment of a nobility and of other special groups to whom honour was given in greater or less degree. Hobbes believed that gratification derived from high station, as well as from approval of one's acts, was a necessary part of the social order. But royalty is a very special form of noble rank, for the sovereign personalizes or represents society as a whole. The revolt against the sovereign is a contradiction in terms. The sovereign is the representative of all; by receiving supreme power he protects society against marauders. The king therefore rules, not only by "divine right," but by the collective values which he holds within himself as represent-

¹ A similar conception of the Commonwealth was traced (by Glaucon) in Plato's *Republic*.

ative of the Commonwealth. Hobbes believed the overthrow of the sovereign to be vicious as well as ultimately futile. Subsequent events, especially the expulsion of the Stuarts, were not such as his scheme of society demanded, and the fact tended in some measure to discredit his theory of the State.

But there was here a system of ideas of immense importance, ideas rooted in the thought of antiquity and now revived in opposition to the doctrines of the Middle Ages. There was first the idea that human acts result from an objectively knowable human nature; that man is made in such a way that analysis may make possible prediction and control. Society can so organize itself as to control individuals and create for itself a complex but reasonably stable system of social relations. We shall see later how the "political economists," especially Bentham, continued another branch of Hobbes's thought, namely, "psychological hedonism," the doctrine that self-interest is the basis of conduct.

This description of social life, however, was supplemented by a keen analysis of certain principles of general psychology, as well as by a systematic philosophical inquiry. Philosophically, Hobbes was captivated by the desire to reduce everything to *motion*. He was delighted by Galileo's mechanical experiments, and believed that through such methods the ultimate nature of "things natural" was to be discerned. This systematic (and dogmatic) emphasis on motion, even where motion could not be demonstrated, perhaps justifies the question whether Hobbes really was as purely "empirical" as is alleged. "He attempted a task which no other adherent of the new 'mechanical philosophy' conceived—nothing less than such a universal construction of human knowledge as would bring Society and Man . . . within the same principles of scientific explanation as were found applicable to the world of Nature."¹ With the mechanical viewpoint, the notion of bodies as bits of matter moving in space and time, Hobbes built up the scheme of human nature as a purely mechanical thing, avoiding altogether the interactionism of Descartes. It is no exaggeration to say that Hobbes took the whole fabric of the seventeenth-century

¹ C. Robertson in *Encyc. Brit.*, 11th ed., XIII, p. 552.

physical view of the world and fashioned from it a conception of human nature. Every thought, feeling, and purpose was simply internal *motion*.

His psychology is nevertheless in large part an empirical psychology. He uses the principle of motion chiefly in relation to motion as supposed to occur in the *brain*, an assumption which was supported by some evidence; and whatever may be thought of his metaphysics, his psychological observations have both a matter-of-fact empirical spirit and a richness of content very far indeed from the formalism which had characterized most psychological systems. His psychology is in large part Aristotelian. Aristotle gave him a "naturalism" which he could set in opposition to the "supernaturalism" of the Scholastics. But, though Aristotle taught him where to look, much of his material evidently came from his own keen analysis. His work as a psychologist centres in close observation of his own mental processes, with the request that the reader "consider, if he also find not the same in himself."¹

All experience, Hobbes held, was some special form of motion. He made, for example, no distinction between the *will* to do a thing and the doing it.² Appetites and fears were internal motions which led to action, and will was simply the last appetite or the last fear which in the course of deliberation precipitated overt movement.³ The difference between act and impulse was merely a difference in the locus and extent of movement. Similarly, sensation was continuation of that motion which had impinged upon the sense-organs, transmitting its motion through the nerves to the brain. Descartes had taught that in higher mental functions the soul, by means of the pineal gland, controlled the passage of an impulse from one nerve to another; but Hobbes did not require the intervention of the soul. Motion in the brain was sufficient. The motion occurring within the brain substance constituted the basis for all qualities of sensation. He proceeded to attack the popular conception that the qualities

¹ *Op. cit.*, Introduction.

² A protest against a Scholastic teaching that the internal motion was merely metaphorical.

³ *Humane Nature* (1651), XII, 2.

of experience are *inherent in* the objects we perceive.¹ "There is nothing *without us* (really) which we call an *image* or colour . . . the said image or colour is but an *apparition* unto us of the *motion*, agitation, or alteration, which the *object* worketh in the *brain*, or spirits, or some internal substance of the head."² Moreover, after the external object has ceased to act upon the sense-organ, the motion in the brain may continue. Such residual or "decaying" sensation constitutes the material of memory and imagination.³

There remains, however, the problem as to the *order of events*, the "trains" of imagination and thought. All thought follows the same sequence as the experiences caused by the world about us. "Those motions that immediately succeeded one another in the sense, continue also together after sense: insomuch as the former coming again to take place, and be predominant, the latter followeth."⁴ This simple and epoch-making doctrine is basic for the associationist teaching which flourished for two centuries thereafter.

But we cannot predict from a given thought which one of a variety of other thoughts may follow. A thought may have been followed, in different situations, by a variety of different thoughts. There may be many competitors, each one of which has a definite claim upon the next position in a mental series. A passage in his *Humane Nature* may perhaps mean that he believed the factor of primacy to be of paramount importance. "The *cause* of the *coherence* or consequence of one conception to another, is their first *coherence* or consequence at that *time* when they are produced by sense: as for example, from St. Andrew the mind runneth to St. Peter, because their names are read together; from St. Peter to a *stone*, for the same cause."⁵ But in the *Leviathan* we read:

¹ The astronomer Kepler had clearly distinguished a half-century earlier between such objective reality as motion, and such subjective phenomena as colour. For the history of these concepts from Kepler to Berkeley, see Burtt, *Metaphysical Foundations of Modern Physical Science* (1925).

² *Ibid.*, II, 4. Hobbes constantly emphasizes the brain, as had some of the Greeks; but he is a good enough Aristotelian to emphasize motion from the brain to the heart, and to give the latter a position of importance in mental life.

³ Again an Aristotelian doctrine.

⁴ *Leviathan*, Part I, Chapter 3.

⁵ *Humane Nature*, IV, 2.

"In the imagining of anything, there is no certainty what we shall imagine next ; only this is certain, it shall be something that succeeded the same before, at one time or another."¹ He failed to work out his position. Neither he nor his immediate successors realized the possibility of attaining a more adequate statement of the varieties of association. It was not, in fact, until the work of Thomas Brown, in the beginning of the nineteenth century, that this problem was fairly faced, reducing the problem of mental sequence to a large number of specific laws of association, taking into account the *competition* among experiences.

But Hobbes did take account of the vital distinction between such free or uncontrolled association, on the one hand, and directed or purposive thinking, on the other hand. "Mental discourse is of two sorts. The first is *unguided*, *without design* and inconstant . . . The second is more constant ; as being *regulated* by some desire, and design."² He devoted much attention to the "regulated" type, taking account of the "desire" which guides the process, and of the tendency to seek causes for consequences and *vice versa*. He proceeds to give illustrations of the familiar (Platonic and Aristotelian) principles of association by contiguity and similarity. Association by similarity had, curiously enough, been omitted in the discussion of unregulated thought.

Hobbes had, then, outlined an empirical psychology in which sensation was emphasized as the source of our ideas, and had given a rough sketch of association which served to explain the interconnections between the elements of experience.

The first great follower of Hobbes had an immense advantage over him as an intellectual leader. Locke³ was one to attract not only the attention but the allegiance of the intellectuals of his age. He was gentle and delightful in his exposition, clear and easy to read. Whereas Hobbes had wanted to fight, to argue, and to make fun, Locke was winsome and approachable.

Locke devoted himself primarily to the study of perception

¹ *Leviathan*, Part I, Chapter 3.

² *Ibid.*, Part I, Chapter 3.

³ *An Essay Concerning Human Understanding* (1690).

and of thought. Ideas, he held, come from experience.¹ Observation "supplies our understanding with all the materials of thinking." But ideas have two sources. They come either from sensation or from reflection. Our minds are equipped not only with ideas directly derived from such sensory qualities as colour, temperature, and taste, but also from a variety of mental processes such as perception, thinking, reasoning, and willing. Our observation of our own mental operations gives rise to ideas which are not in themselves sensory.

Locke agreed with Hobbes that "simple ideas of sensation" are the properties of experience, and not of the objects outside us which excite these ideas in us. He proceeded, however, to distinguish between "primary" and "secondary" qualities.² Primary qualities, such as size and motion, produce in us ideas resembling the physical stimuli which excite them. On the other hand, secondary qualities are those aspects of external objects which produce in us ideas unlike anything really existing in the external world, *e.g.*, such ideas as colour and taste. He supposed that some aspects of experience are genuine duplicates of patterns existing in external bodies, while others bear, in fact, no such resemblance to external bodies.

Ideas, however, may be either simple or complex. The mind creates complex ideas by combining simple ideas. Many of our ideas, designated by single words, can in fact be analysed in such a way as to show clearly that they are but combinations of simple sensory constituents. "Thus, if to substance be joined the simple idea of a certain dull, whitish colour, with certain degrees of weight, hardness, ductility, and fusibility, we have the idea of lead."³ The principle was, as we shall see, far-reaching. "Even the *most abstruse* ideas, how remote soever they may seem from sense, or from any operation of our own minds, are yet only such as the understanding frames to itself, by repeating and joining together ideas that it had either from objects of sense, or from its own operations about them."⁴

¹ The mind before all experience is "white paper." The Latin *tabula rasa* (wax tablet, smooth and ready for writing) is a familiar epitome of Locke's conception of a mind upon which experience has as yet written nothing.

² See footnote 1, p. 18.

³ *Op. cit.*, Book II, Chapter XII, 6.

⁴ *Op. cit.*, Book II, Chapter XII, 8.

Two things were needed to make a systematic psychology out of these principles. One was to lay stress upon and give content to the notions of "repeating" and "joining," which constituted the basis for integration of simple into complex experiences. The other necessary step was to postulate a physical basis for mental interconnections. Both steps were soon to be taken. In spite of Locke's study of perception, judgment, and other intellectual functions, perhaps his chief permanent contribution lay in making explicit the possibilities of an association psychology which should start with the data of experience and work out the laws governing the interconnections and sequences among experiences. The germ of associationism had, of course, been apparent in the work of Hobbes, which in turn went back to Aristotle. But Locke's lucid exposition of the implications of empiricism, and of the possibility, through analysis, of clearly understanding the origin and organization of ideas, gave empiricism an appealing quality which greatly contributed to its strength and influence.

Locke's distinction between primary and secondary qualities was systematically demolished by Berkeley.¹ He showed with an indomitable logic that there are no qualities in experience except those qualities which Locke had already described as subjective; in other words, that there are no "primary" qualities. Berkeley asserted that these qualities are, as a matter of fact, not properties belonging to some external object, having mathematical character (location, size, shape, mass, and movement). We never know anything but experience; the whole objective world is a pure hypothesis supported by no evidence whatever. In analysing our experience we notice that we have such qualities in ourselves as the colour of a rose, the prick of a pin, and so on. And when we talk of external *objects* we do not know what they are; objects external to experience are nothing at all. He laid the corner-stone of that great edifice in modern philosophy, "subjective idealism," which portrays a world of experience-qualities, and denies, throughout, the existence of any other world whatever. This was the logical end of the train of thought which began with Hobbes's

¹ *A Treatise Concerning the Principles of Human Knowledge* (1710.)

teaching that experience is made up of sensory qualities alone.

But Berkeley was forced to find some kind of unity in mental life, something that should hold these mental states together. There is no intrinsic reason why pain should follow the thrusting of the hand into fire, or why the odour of a rose should accompany the visual and tactual experience of the rose. Why do two persons see the same object or sequence of events? And what is it that holds together one collection of experiences in a group designated "the mind," distinct from another group called "the mind of another"? Why do not ideas from two separate minds become confused, if in fact there is no body which gives personal identity? It is clear that breaking up the universe into bits of experience does not give personality. The soul must be assumed to exist. It is the invisible, unobservable, but logically necessary background of our experience. There must be a soul if there is to be experience. Furthermore, there must be an active cause for the succession of experiences, and this cause is to be found in God Himself.

Berkeley made a very important contribution to the theory of visual space perception.¹ He furthered the trend towards associationism. He got rid of the simple, atomistic mechanism of Hobbes, but he showed nevertheless how the principle of association must be used to explain some of the most complicated facts of perception. Locke had recognized that in the compounding of ideas elements might be drawn from two or more sense modalities. Berkeley went further with this analysis of the origin of compound ideas; and theories of perception in general, and space perception in particular, were profoundly affected by his discussion.

In the consideration of visual experience, he knew that the retina is spread out as a surface. It happens to be curved, but as a surface it has an "up" and "down," and a "right" and "left." How can we by this surface perceive a third dimension? Berkeley answered in terms of tactual experience. Through reaching and touching, the whole notion of distance is associated gradually with the elements given by the retina. The perception of the third dimension is not a unitary function. Touch qualities are not directly perceived when we analyse our visual perception of three dimensions;

¹ *An Essay Towards a New Theory of Vision* (1709).

but somehow or other, when visual impressions are combined with tactual memories derived from reaching for objects, we find a three-dimensional quality in our objects. The retina "gives" us three instead of two dimensions. Since Berkeley used the notion of compounding sensory qualities, he became, unwittingly, one of the founders of association psychology. Although his fundamental motive was quite foreign to the mechanistic leanings of associationism, he contributed to it in spite of himself.

Now appeared one who questioned the premises and conclusions, the beginning and end of all these views which had been propounded with a confidence characteristic of the leaders of the Renaissance. The central psychological contribution of Hume¹ was the analysis of the stream of thought into one endlessly changing kaleidoscopic series of experiences. For Berkeley there had been the necessity of a soul to bring all these experiences together, to make a coherent sequence; we must have some unity to tie together yesterday's experience with to-day's experience. Berkeley had separated the soul from its experiences. Hume declared that he had patiently examined his consciousness without succeeding in finding evidence for the soul. What one calls the "self" turns out to be a group of sensations from the body. For the description of personality all that was necessary was a series of experiences. The soul might be dispensed with. Each experience was sufficiently related to what followed.

Hume took the position toward which Hobbes had groped, that psychology deals with experience as it comes to us, and not with any logical postulate of the observer as a separate entity. Hobbes had not been able to see the real issue, because there had not been a Berkeley before him to make this sharp distinction between self and experience. Hume could do it because there *had* been a Berkeley. Hume, denying the validity of Berkeley's assumption of the soul, and of God as an active cause of experience, offered a psychology which was nothing but the study of a series of experiences combining and recombining, following one another in an endless chain. Here arose one of the central

¹ *A Treatise of Human Nature* (1739-40).

problems which association psychology had to face henceforward : what made these different bits hang together and what made them follow in certain sequences ? This was long before the day of a detailed physiological psychology ; the idea that there was an organism that holds things together could scarcely be worked out. The association psychology, until its demise in the middle of the nineteenth century, made a desperate effort to give continuity and unity to the various experiences with which it dealt, by means of the continuity of the physiological substrate.¹

By the middle of the eighteenth century associationism had begun to be the central point around which psychological problems revolved. But associationism as a psychological *system* is usually traced to Hartley.² He differed from his predecessors not so much in his enunciated principles as in the clearness with which he grasped the need of a thorough-going physiological basis for association. He undertook to define the physical facts upon which memory images and their sequences depend. Greatly interested in Newton's study of the pendulum, he held that if certain experiences follow in a given order it means that nerve fibres must *vibrate* in a given order. When a stimulus arouses a sense-organ, and a moment later a second stimulus arouses a second sense-organ, the vibrations in the brain caused by the first are followed by vibrations caused by the second. The parts of the brain are so connected that if now the first stimulus is again presented and arouses the first brain region, the arousal of the second region follows, with no need for the presentation of the second stimulus. A series of sensations *A, B, C, D*, forms such a pattern in the brain that later the arousal of *A* will set going *b, c, d*—that is to say, *memory images* of *B, C, D*. These images are produced by the vibration on a *small* scale of nervous tissue previously stimulated more actively.

He realized that there was a resemblance between motor habits—a series of acts in which, step by step, each act leads to the next—and purely mental activities like memory,

¹ As is done by many schools of psychology to-day.

² *Observations on Man, his Frame, his Duty, and his Expectations* (1749). The preface to the work makes it clear that the core of his system of thought was suggested by a "Rev. Mr. Gay," whose views on association were stated nearly twenty years earlier.

where a series of experiences follows in a certain order because of past experience in a certain order. There was, moreover, a distinction between sensation and image only in so far as differences in *intensity* of nerve function were concerned ; the image had its seat in the *same region* which served as basis for the sensation.¹ He had therefore by physiological principles brought the whole realm of thought and of imagination into the same physiological terms as the perception of external objects, and had offered a clear theory to explain why ideas occurred in particular sequences.

Hartley accepted Locke's conception of compound ideas. A group of revived sensations might cohere so as to form a mental product. But this mental product was to be conceived as parallel to a physical product, a group of nerve-excitations. He delighted in reducing complex experiences to the elementary sensations which by association constituted them. Now Aristotle had laid down certain fundamental laws of association—those of contiguity, similarity, and contrast. Hartley reduced all these types of association to one simple physiological principle. First, as regards contiguity (in time or space). He reduced all *successive* association to sequence of one physical change upon another. Nor was any difficulty presented by the association of *simultaneous* events, because, if stimuli are presented together, there is simultaneous response in the brain. The nervous system furnishes, Hartley said, sufficient explanation of either type of association through contiguity in time. But things which are together *in space* are also frequently *observed* together, so that their perception involves contiguity *in time*. Contiguity either in space or time is another way of saying contiguity in experience, which is in turn stated in neurological terms.

Further, Hartley showed great originality in the treatment of association by similarity. He assumed that an idea (a complex experience or cluster of elements) may lead to another idea by virtue of a common element, an element which is a part of both experiences and therefore contiguous to the elements of each. Certain elements in any total situation are a little more active than others ; and of these bits, which we may designate A, B, C, D, one element, D, may have occurred together with E F G. To pass from one

¹ A refinement of Hobbes's statement as to the relation of image to sensation.

complex idea A B C D to another one similar to it, it is necessary only that D should have occurred sometimes in the context A B C D and sometimes in the context D E F G. This classical explanation of association by similarity is still to be found in current textbooks.

And association by contrast may be handled in the same way. Terms are not contrasted because they are really totally unlike; contrasts have a great deal in common. "Good" and "bad" would never be contrasted were they not both terms of valuation having in common a constellation of similar ideas of value. We contrast things only when the elementary ideas which compose them are to a large extent identical. Thus Hartley reduced the Aristotelian laws to the one law of contiguity in experience.

For Hartley, as for Locke, the child begins life without associations. But rejecting the notion of ideas derived from reflection, Hartley held that the child has simply the capacity for *sensory* experience. In the course of time, sensory experience, by making endless connections and establishing trains of association, building up complex objects of thought, becomes more and more intricate; and finally systems of thought, such as philosophy, religion, and morals, arise. Hartley had almost arrived at a complete psychical atomism. He and his followers had as their goal such a thorough understanding of association as would enable them to take a number of psychical elements and show how their combination in various ways, acting according to a few simple laws, could produce all known experiences. This fascinating game is one which had not yet been played with vigour and thoroughness.

There were many associationists in the half-century following Hartley's writings, but they added little of importance. Perhaps the chief contribution was Tucker's¹ elaboration of the notion of compound ideas. He emphasized cases in which the compounding of sensory elements produces a new synthesis wherein the sensory components can no longer be *separately* observed; such compounds differ from those in which the elements are still introspectively observable.²

¹ *The Light of Nature Pursued* (1765-1774).

² The former are to-day sometimes called "blends," the latter "patterns." Hartley had himself noted the distinction, commenting on the fact that the flavour of a medicine is not the simple *sum* of the separate elements, but a fusion.

Though associationism continued to thrive in England, there was another direction open to post-Hartleyan thought. The whole tendency to simplify and mechanize mental processes led to a revolt, a revolt arising chiefly from religious and ethical sources. The reaction against Hobbes's mechanism, and, in particular, against Hume's indifference to the claims of the soul, was evident in the Scottish universities, where empiricism had made less headway than in England, and where intellectual circles were ready to support the claims of established religion against impending infidelity. The mind had been reduced, not only by Hobbes, to motion, but by Hume to a mere series of elements, and by Hartley to nerve-vibrations causing particular bits of experience to be fitted together in various ways—destroying not only the soul but the possibility of the soul.¹ This might be all very well as speculation, but it had moral implications. Religion and the State, which had been closely allied throughout the known history of western Europe, were alike threatened; popular education (through the parochial schools) was taken in real earnest in Scotland as in few places in the world, and public opinion could not brook an attack upon the core of its ethical and religious structure. There was sure to be a reaction. Ever since the time of Knox and Presbyterianism there had been a cleavage between England and Scotland on religious grounds. Religious freedom was tolerated in some circles in England; respectability did not necessarily involve orthodoxy in religious thought. But Scotch Presbyterianism of the mid-eighteenth century definitely and consciously undertook to create a philosophy that would combat a degrading mechanism. Universities looked about to find suitable champions.

The Scottish school began with Thomas Reid.² He undertook to show, in the first place, that the skepticism of Hume was absurd, that we know perfectly well that we have minds, the capacity to perceive real things, to think and to know. How could we be certain of all these things? Reid appealed to the practical reliability of our senses, and

¹ Though Hartley was not himself a mechanist, but a parallelist, he was easily misinterpreted.

² *Essays on the Intellectual Powers of Man* (1785).

to common observation.¹ Do we not, for example, observe ourselves reasoning—that is, exercising a capacity which to the skeptics and associationists has become a useless term? Can we not think mathematically and logically? Have we not intellectual powers which actually work in solving all sorts of problems, making it possible to understand the external world, and to predict what will happen? Does this not mean that the human mind is endowed by nature with the capacity to know the universe? And how can we by a mechanistic philosophy explain the aspirations of humanity? Not only the rational but the moral nature of man is unexplained by associationism. Moreover, no amount of pleasure or pain will give a child *concepts*. These come from powers of insight and analysis, which are inborn. The child is endowed likewise with the ability to classify things as good and evil. Do we not know, moreover, that we are free to choose between right and wrong? Does not our moral nature defy the fundamental mechanism of associationism? In all this Reid was not only trying to undermine the basis of association psychology, but to build up another system; he appealed to common observation as against the subtlety—the sophistry, he maintained—of the empiricists.

This teaching was characteristic enough of the trend of the period. Such a revolution against prevalent philosophic thought would probably have taken in the thirteenth century, or in the sixteenth century, the form of an appeal to logical principles. Demonstration of the soul had then been effected by means of certain steps in deductive reasoning. But in the eighteenth century empiricism had taken such hold that rationalism was no longer trusted; even the enemies of the empirical movement resorted to experience rather than to deductive logic as their defence. Reid says in substance: “there are the facts on which *you* rely, but look at *my* facts; they are more conclusive than your facts.” One of the last up-flarings of the dying embers had been Berkeley’s demonstration of the existence of the soul. We shall not find any

¹ The Scottish school was called the school of “common sense,” but the term is confusing. Aristotle had assumed a “common” sense through which the reports of the senses are apprehended. Dugald Stewart pointed out the confusion between the Aristotelian usage and the use of the term in the sense of “mother-wit.” (See Hammond, *Aristotle’s Psychology*, Introduction, li.)

thorough-going return to rationalistic principles in British thought.

Because of its insistence upon the unity and coherence of mental life, and because it pictured the individual as an active entity, not as a mere field in which capering ideas assembled and reassembled, the greatest contributions of the Scottish school were necessarily general, rather than specific.¹ It contributed but little to the solution of specific problems until the school became blended to some extent with the associationist movement. But Reid and his direct followers had great influence, not only in Scotland but later in England, France, and the United States, because they appeared to save the individual and society from intellectual and moral chaos. Something, also, was due indirectly to the intellectual activity apparent in Scotland at the beginning of the nineteenth century. Many business men (members of a class which had not heretofore thought such a process necessary) began to educate themselves. The Scottish school became genuinely popular.

There was another tendency at work which in part grafted itself upon the Scottish school, but also continued a separate existence in Germany, the "faculty psychology." This was never "founded" at any particular period; we find it implicit or explicit in the psychology of some of the ancients and some of the Scholastics. As the soul carried out the activities, for example, of memory, reason, and will, it made use successively of the different faculties. It is ordinarily stated that the founder of modern faculty psychology was Wolff, whose *Rational Psychology* appeared in 1734. The central doctrine is simple and intelligible. There are definite and distinct faculties or capacities of the soul; the soul enters for the time being into each activity, just as the whole body may at different times take part in widely different acts. But the soul remains a unity, never a mere sum of constituent parts. German thought remained for more than a century steadfast to this general principle.² For

¹ Reid did include the empirical findings of Newton and others on the senses.

² The profoundly significant teachings of Leibnitz concerning the mind-body relation and apperception bore but little fruit until they were transformed by the transcendentalists and the Herbartians. Kant gave new life to the doctrine of the faculties at the same time that he elaborated his own theory of apperception.