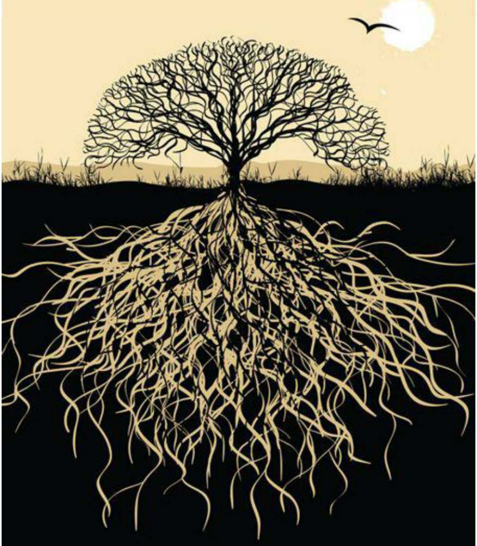
A Brief History of Psychology

Fifth Edition



Michael Wertheimer

A Brief History of Psychology

Fifth Edition

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Preface

Karl F. Muenzinger (1885–1958) (Courtesy of the Department of Psychology and Neuroscience, University of Colorado at Boulder.)

The late Karl F. Muenzinger (1885–1958) believed that the study of the history of psychology could help students develop an integrated overview of the field, which might serve to reduce the perplexing, apparently unrelated, diversity of the material encountered in various psychology courses. Muenzinger came up with the idea of seeing the emergence of the empirical science of psychology late in the nineteenth century as the product of five major scientific and three significant philosophical trends; this theme forms the backbone of much of the organization in this book. I was privileged to interact with Muenzinger and many other talented scholars in the area of the history of psychology, and the present book reflects their ideas, innovations, and contributions. Over the years, the material in this book was class-tested at several institutions with undergraduate and graduate students of the history of psychology. Student reactions and suggestions have been used in revisions of the manuscript. Some parts of it have been presented as colloquia at various colleges and universities, as well as at American

Psychological Association (APA) conventions.

An opening warning seems appropriate here. Writing a history of something implies the identification of that something. Most histories of psychology, including the first four editions of this book, at least implicitly specify that “something” as the science of psychology, with science defined as the empirical, objective study of an area and psychology defined as the domain concerned with behavior and mental life. But this definition has become blurred by the end of the twentieth century and especially during the first decade of the twenty-first. The general public now appears to identify psychology as a not very rigorous discipline concerned primarily with the subjective, with psychopathology, and with efforts to help individuals overcome difficulties in coping with disturbing feelings and problems of social interaction. Many, perhaps most, undergraduate students now majoring in psychology hope to obtain knowledge and skills to “help people,” rather than simply being fascinated by the science of psychology as an empirical discipline. Applications to graduate programs in clinical psychology, counseling psychology, and psychotherapy now typically outnumber those to graduate programs that concentrate on behavioral neuroscience, behavioral genetics, research in social psychology, and other “pure natural science” aspects of psychology.

Some might argue that a modern history of psychology should therefore be written with much more attention to personality, psychopathology, psychotherapy, the application of psychological findings to issues of public interest, and other “softer” fields, rather than concentrating primarily on the “hard science” aspects of the domain. Nevertheless, since almost all practitioners of “professional psychology”—a large number of whom doubtless identify psychology with one-on-one treatment of troubled individuals—firmly believe (or at least hope) that their practice has deep roots in science in the sense of a rigorous empirical endeavor, it still seems appropriate to focus an historical overview of psychology on its scientific core. That is why such a perspective continues to dominate the account presented here.

One aim of this book is versatility. Because the presentation is relatively brief and condensed, it could be used as a supplement to a full-length text for courses on the history of psychology. For instructors who prefer to teach from primary sources, this book can be used to provide a context for other assigned readings. Further, the book offers a concise historical overview of the field for the general reader, and can be used as a general introductory text to psychology as a whole. It can also, with the substantial index and new extensive glossary, (the first time an item in the glossary occurs in the text, it appears **boldface**), serve as a convenient general desk reference on psychology.

New to this edition is a final chapter that explores developments during the first decade of the twenty-first century and their possible implications for the future of the field of psychology. While historians prudently caution against trying to obtain a broad perspective on very recent events, so much has happened in recent years that it seemed irresponsible to ignore it all. Major recent events in psychology and their impact on the field are explored in various places (mostly in the last few chapters) in this revised edition.

Extensively updated throughout, this edition has several new features:

* There is, as just mentioned, a new final chapter with a current analysis of the state of the field including the growth of specialized organizations that promote the science of psychology and the push to influence policies that address global challenges such as environmental sustainability, intergroup conflict, health disparities, and the population explosion.
* Discussed in several places is the growth in the number and role of women in psychology and the promotion of diversity initiatives related to ethnicity, gender, age, and sexual orientation.
* Also touched on are recent developments in the growth of neuroscience, cognitive science, and the diversification of psychology.
* Mentioned are individuals who have had a recent impact on the field including Daniel Kahnemann (decision making), Rudolf Arnheim (the psychology of art), Jane Goodall (animal behavior), and Florence Denmark (international psychology and the psychology of women).

* There is a discussion of recent changes in the practice of psychology including more emphasis on "evidence-based practice," prescription privileges, and the application of psychological principles to industrial and engineering psychology.
* Updates are presented on recent changes in the APA including new divisions and new elected officials.
* Also new to this edition, as mentioned before, is a lengthy glossary and an enormous index, both of which should make the book useful as a general desk reference on psychology and its history.
* A large new batch of web-based teaching materials has been prepared. For each chapter instructors will find Microsoft PowerPoint slides with chapter outlines, a list of key terms, and discussion questions. Lecture notes, along with the chapter outlines, key terms, and discussion questions, are also available in a Microsoft Word format for those who want to customize the material. There is also a test bank of true/false, multiple-choice, short-answer, and essay questions. And for students there are chapter outlines and lists of key words and phrases, suggested readings, and hotlinks to related websites.

The current revision benefited from much-appreciated suggestions made by an unidentified reviewer, as well as Barney Beins of Ithaca College, Harry Heft of Denison University, Dean Keith Simonton of the University of California, Davis, and Ryan D. Tweney of Bowling Green State University. These reviewers, along with Wade E. Pickren of Ryerson University in Toronto, Canada, have my gratitude for their careful reading of the fourth edition. Their corrections and recommendations, and my own further reflection, have generated hundreds of (usually relatively minor) changes throughout the manuscript. As was true of the earlier editions, few if any pages escaped at least a bit of revision. Many stylistic changes are also the result of suggestions made by my daughter K. W. Watkins (PhD in English from Yale), who also prepared the final manuscript, helped with the glossary, and undertook the development of the substantially enlarged indexes.

Michael Wertheimer
Boulder, Colorado

CHAPTER 1

Introduction

Before setting out on this brief tour through the history of psychology, consider some general background. The first section of this chapter will raise a few questions about the nature of history itself and about the problems that one will inevitably encounter when taking on the role of historian. The next section presents some thoughts about why one should bother contemplating psychology's history in the first place. The final section explores the various ways the history of psychology has been organized, referring briefly to some of the better known works in the field, and ends with a characterization of the approach taken in the present work.

Some Comments on History in General

The historian faces obstacles the scientist can avoid. Historical truth is more elusive than scientific truth, although the scientist has problems too. Paradoxically, historical "facts" can change, but an empirical statement of a relationship stays put in some sense: Anybody can check it. Scientific knowledge is timeless; a scientific generalization can be tested any time, by anyone who cares to set up appropriate conditions for observation. But history is an all-or-nothing affair; something happened once, and that's that—you cannot bring past events back into the present to study them and their determinants and effects at leisure, turning them this way and that, as you can examine some scientific statement in the laboratory. To be sure, there might be relics of the past event that you can use to try to pin it down—letters, canceled checks, diaries, monuments, official documents, e-mail messages, sales slips, or the Congressional Record—but none of these is the event itself, and none is of unquestionable **reliability** or **validity.** Most important, none really tells you how to interpret the event. You can't unequivocally determine the causes and effects of the event, can't manipulate the **independent variables** responsible for it or measure the **dependent variables** it affects. In fact, you can never be sure that the presumed event actually happened at all. Perhaps it's just the figment of someone's fancy, dutifully perpetuated by those who came later. Chances are, it's harder to break a fad in history than in science.

Quite aside from questions such as whether Christopher Columbus discovered America in 1492 (or whether it was Amerigo Vespucci, or a foolhardy Norseman, or, for that matter, the indigenous Americans, who were unaware that their land had to be discovered), there is the question of the *importance* of a presumed event. It is primarily this aspect of history that changes. How important was William the Conqueror in determining the events of 900 years ago? Just how significant is the Boston Tea Party *really?* Should everybody know how many soldiers went with Cyrus on the third march of the fifth month of his Anabasis or how many accompanied Caesar from one part of Gaul to another? It might be intriguing to hear that Hannibal managed to prod a herd of elephants over the Alps, that Henry VIII had goodness knows how many wives, and that Demosthenes stuttered; but, ultimately, so what? Rather than recording that a man once stood at a graveyard and intoned, "Four score and seven years ago," and so forth, why not record that an ant, at the same time and place, happened to be walking over the letter M on poor Private Pat Smith's headstone? That's an event too. History just isn't impartial; it is highly and inevitably selective.

History, then, deals with events about which one can't be certain, the significance of which is debatable, and whose selection for attention is an idiosyncratic, subjective matter. No historian can be unbiased. Even if one had many lifetimes and infinite powers of observation and memory, it would still be an impossible chore to produce a complete, unbiased description of all of the events that occurred, say, between 4:01 a.m. and 4:03 a.m. on Friday, April 2, 2010. What do you include? That President Obama sneezed? That Gabriel Lanai Ellis was born on the porch of a cabin at 8,500 feet, 6 miles west of Boulder, Colorado, and that his cousin Cassidy Joy Wertheimer, sleeping in Windsor, Colorado, scratched her left knee? That in Rocky Mountain National Park a 13-inch-diameter, ragged piece of granite, loosened by the freezing and thawing of thousands of years, fell with a clatter from near the top of the east face of Longs Peak down onto Mills Glacier and then rolled all the way onto frozen Chasm Lake? And even if all of these items were to be included in your list of events, how much detail would you devote to each? How much would you emphasize each one? How far back before 4:01 and how far beyond 4:03 would you go to “make the event meaningful,” to “set it in its context,” to “show its significance”?

No, history is not independent of the historian. It does not stay put. Which events to emphasize, which ones to include or exclude, how to interpret what you select—all of this depends on the historian’s bias.

Much of what the student of history has to wade through is the doings that somebody thought important, of people whom somebody thought important. Perhaps the easiest (and clearly the most usual) solution is to write about people considered significant by their contemporaries and events that at the time caused raised eyebrows, an increased heart rate, or untimely deaths. Kings, dictators, presidents, prime ministers, religious leaders and their wars, battles, murders, intrigues, and other shenanigans form the bulk of most history books. Some daring souls have also tried to compile histories of ideas, of cultural movements, of humans as thinking, creative, evolving creatures rather than purely political or economic ones—a quite different orientation. Yet the basic problem remains the same: how do you select, what do you relate to what, how do you interpret what? Somebody else might see the same things very differently or might choose to look at very different things.

One recurrent issue, insistently and insightfully brought by Edwin G. Boring (1950a) to the attention of anyone interested in history, is that of the **Zeitgeist** versus the **great individual** view of events. Just what is the role of the “spirit of the time” (the Zeitgeist) or of the place (the **Ortgeist**) in determining what happens, as against the role of some unusual person who is strong enough to withstand the Zeitgeist or the Ortgeist and change the course of events? Would there have been no Holocaust if there hadn’t been an Adolf Hitler? Was Sigmund Freud just a passive agent of the climate of ideas in Vienna at about the turn of the 20th century? Would somebody else have come up with an emphasis on **unconscious motivation,** or was he, his unique existence, responsible—in spite of the Zeitgeist—for the creation of the psychoanalytic view? It is usually too simple to cast such questions into an either–or form, but the relative contribution of the great person and of the Zeitgeist still remains largely a matter of the intentional or unintentional raw preference of the historian. Even though there might be occasional circumstantial evidence, such as simultaneous independent yet similar discoveries or formulations, which suggest a Zeitgeist influence, there are no convincing objective guidelines.

And then there is the question of the organization of what the historian chooses to pull out of the stream of events. **Chronology** seems the obvious outline. But it is not really as straightforward as that. If historians try to make some sense out of what is being talked about rather than record in an endless, dull list that this happened, then that happened, and then the other occurred, they must permit themselves to jump back and forth to some extent. While busy expounding the chain they have constructed for events q, r, s, and t, they must ignore the fact that u, v, w, and x happened to be going on at the same time—according to their view, these belong in a different chain. So they run back again to u, v, w, and x after they have finished with q, r, s, and t. The extreme of a pure chronology, then, is just about impossible, even if one breaks the account down into arbitrary units such as the period 1740–1749, then 1750–1759, and so on.

The other extreme is completely separate chains, as in one book about the history of England and another about the history of France or one on philosophy and one on psychology. But this approach also has inherent problems. Most historians will want to refer to other concurrent chains occasionally, especially when they happen to have links in common—as in the invasions of France by England or vice versa. Again, it seems a matter of sheer preference whether the historian chooses to be closer to the chronology pole or the history-of-some-particular-movement (or country, or discipline, or whatever) pole.

One distinction that historians of science have pointed to is the difference between **internal** and **external** history. Most non-historians who have written histories of their fields (such as physics, chemistry, biology—or, for that matter, psychology) trace the sequence of major ideas, discoveries, theories, or other notable events in their fields without paying much attention to what else was going on at the time. In this sense, they produce internal histories: histories that focus primarily (or even exclusively) on events in the discipline itself. People with substantial training in history are more likely to place the evolution of a discipline into a much broader sociocultural, political, and economic context. They tend to write more external histories: what contemporaneous events in other fields, in international relations, in the intellectual and institutional and cultural milieu, explain why things happened as they did in a particular time and place? Clearly, some balance of internal and external is most illuminating, so long as the account doesn't end up being exhaustingly exhaustive. To help indicate the external context, this book includes a few chronological charts that are intended to place various people and events in the history of psychology in temporal relation with various people and events in world history.

A related distinction emphasized by historians contrasts **presentism** (looking at past events from today's perspective) with **historicism** (placing past events into their actual social and intellectual context rather than viewing them purely from the point of view of today's implicit assumptions). While it is humanly impossible to avoid any trace of presentism, the responsible writing of history requires recognition of the cultural, social, and intellectual settings within which the events recounted occurred.

These points are raised here partly because the present writer is not a professionally trained historian. But if history is at bottom a matter of idiosyncratic bias concerning what to include, how to include it, and how to interpret it, then even an amateur's effort might be permissible. To the extent that it differs from others' efforts, it might help to loosen a possibly too tenacious tradition of what the best way to systematize the field might be or of what "the" history of the field is. There is no such thing as "the" history of anything.

Anyone aspiring to write a history of any field comes with implicit assumptions that are inevitably biased by education, prejudices, and background. So to permit the reader to gauge this author's perspective, here is some information about where the author is coming from. It has inevitably colored every aspect of this little book.

With inspiring exposure to humanities and social sciences as an undergraduate student at Swarthmore College, he majored successively in French literature, then linguistics, then philosophy, and finally psychology. His father, Gestalt psychologist Max Wertheimer, had died before the author got to college. But a colleague of Max Wertheimer, Wolfgang Köhler, a psychology professor at Swarthmore, sent the author off to graduate school at The Johns Hopkins University, hoping that the hard-nosed science orientation there would counteract what he considered the author's excessive exposure to tender-minded humanities at Swarthmore. At Swarthmore (and earlier at home) he had learned that **Gestalt theory** had the right approach to psychology and that **behaviorism** was wrong. But Hopkins, still a hotbed of behaviorism back in the late 1940s, taught that Gestalt was wrong and that behaviorism was the answer. That was hard to swallow, so after a Hopkins MA he switched to Harvard University for his doctorate. But that change didn't help: the spirit of Titchenerian **structuralism,** taught as wrong at both Swarthmore and Hopkins, still dominated the implicit assumptions at Harvard. Perhaps these bewildering experiences helped the author to start thinking for himself a bit more rather than just to accept the dogmas that illustrious, respected professors espoused.

He did complete a dissertation—on **psychophysics**—at Harvard but then took an internship in **clinical psychology** at Worcester State Hospital in Massachusetts for a year to try to find out what that perspective was all about. Back then, some 6 decades ago, it was still possible to get a clinical internship, indeed one sponsored by the U.S. Public Health Service, without having to complete all sorts of seminars, course work, and practica beforehand.

But Worcester produced another disconcerting experience that jaundiced his perspective on clinical psychology. He learned that the scientific empirical approach that all three then-competing theoretical orientations (Gestalt, behaviorism, and structuralism) took for granted, both explicitly and implicitly, was not equally shared by *all* clinical psychologists. His mentor at Worcester, kept nameless here, was convinced that "eye" content responses on the **Rorschach test**—seeing eyes in those inkblots—are an unmistakable pathognomonic sign of paranoid ideation, especially if the response is something intense like "those threatening eyes are staring out at me from the gloom." Obeying the strong empirical orientation imprinted on him by all three schools, Gestalt, behaviorism, and structuralism, the author ransacked the copious department files of Rorschach protocols and diagnoses at Worcester State Hospital, hundreds of them, and did a simple double classification: yes or no on eye content responses on the Rorschach, and yes or no on paranoia showing up in the diagnosis or case history. Even though the Rorschach protocols had often played a role in the diagnosis, there turned out to be literally *no* relation between the two variables.

An early technical paper was actually published on this non-finding. Soon after he told his supervisor about this finding (or lack of it), the author attended a demonstration the supervisor was giving to medical and psychology interns on how to interpret Rorschach protocols. "Ah," he said, "here's a strong eye content response. This is a sure sign…" and he looked at the author and added, "—your opinion, Mike, to the contrary notwithstanding—that the patient shows extreme suspiciousness, strong signs of paranoia." The author's *opinion* to the contrary? It wasn't an opinion; it was a description of fact, based on hard data. Sheer opinions and repeatable empirical findings should by no means be considered equally compelling. This unfortunate experience is probably still tainting the author's somewhat ambivalent perspective on clinical psychology.

The author's entire career since his 1952 PhD has been spent in academia, and except for a few inevitable bumps and problems along the way he has enjoyed almost every day of it. Though of course it hasn't made him fabulously wealthy financially, to be paid to share his enthusiasm with eager young minds, to explore almost any question wherever it might lead, via lab or correlational investigations or thinking about it or by bouncing ideas off of bright, young, unprejudiced souls—it has been a most exhilarating career. It was especially gratifying to help sometimes self-doubting students in an undergraduate psychology honors program that he directed for 4 decades to perform modest but original studies that convinced them that they *were* capable of generating good scholarly products and maybe were reasonably bright after all. And he has been graced by awards for teaching, for advising, for contributions to the history of psychology, and for insisting on nonsexist language in scholarly writing.

He directed doctoral programs in **experimental psychology** and in **sociocultural psychology.** And since early in his career he has been involved in some way or another with organized psychology, including the **Psychonomic Society, Psi Chi, Association for Psychological Science** (APS), and American Psychological Association (APA). He has had some kind of official position in the APA continuously for more than half a century, having been a fellow of the division of experimental psychology and fellow, president, and a representative to the APA Council of Representatives for the divisions of general psychology, the teaching of psychology, the history of psychology, and theoretical and philosophical psychology. And he has been a member or chair of many different APA boards and committees over the years, culminating in 3 years (2007–2009) on the APA board of directors.

Some Comments on the History of Psychology

The history of psychology seems to be enjoying somewhat less popularity than it did a few decades ago. But as of the present writing, there are more books about it in print than ever before, and more have been published in the last few decades than in all the preceding time. Almost every introductory psychology text still touches on it. There is a *Journal of the History of the Behavioral Sciences* and an Archives of the History of American Psychology at the University of Akron in Ohio, and the American Psychological Association has a Division on the History of Psychology (which launched a new journal, *History of Psychology*, in 1998), all of them except the new journal established during the 1960s and thriving in the 1970s, 1980s, and 1990s.

This continuing interest must have a reason. Psychologists are expected to know something about the history of their discipline, and a course in the history of psychology is part of the requirement structure for the undergraduate psychology major at many colleges and universities. Graduate programs preparing students who wish to qualify for state or provincial licensure or certification for the **practice of psychology** have long been required to offer training in the history of psychology. Particularly when one considers that all too many people view history as a dull subject, a matter of memorizing undifferentiated concatenations of names and dates, why encourage—or force—exposure to such dry and deadly material, possibly running the risk of snuffing the student's intrinsic interest in the subject matter of psychology? Why is it widely held to be a "good thing" for the student of psychology to have some acquaintance with the history of the discipline?

First, there is Cicero's rationalization, engraved in stone over the west portico of the University of Colorado's Norlin Library, that those who know only their own generation always remain children. Humanity and human thought have evolved over the eons, and the incredible spurt of change in the last few centuries has doubtless been greatly helped, perhaps even made possible, by the practice of preserving one person's idea in writing so that another, or many others, could ponder it even when the original author of the idea was not around. To grow up, we need to extend our horizons beyond our own limited sensory experiences.

Yet one could counter that there might be harm in smelling the gray mustiness of bygone times. Perhaps this is the route to becoming a bubble, an empty Babbitt, to losing childhood's saturated enthusiasm, to acquiring an unproductive, level-headed, resigned, perspective-filled maturity and the conviction that there is nothing new or worthwhile under the sun.

Another reason sometimes given for studying the history of psychology is that it is traditional to do so. Even Aristotle's *De Anima* has a section on past philosophers' musings about the soul. Titchener inspired many listeners about the importance of psychology's history, and almost all teachers of psychology had to take a course, at one time or another, in the history of psychology. So, the argument seems to go, let us twist the Golden Rule a bit and insist that we should do unto others as others have done unto us. Maybe some depth psychologists would point to the security-providing benefits of ritual, but just because something has been done in a particular way for a long time doesn't mean it is still reasonable to continue doing it. The teachings of today should fit the needs of today; maybe a saber-toothed curriculum should be permitted to become extinct with the saber-toothed tiger.

Third, the study of history can provide perspective and humility. Knowing that there are points of view different from that to which I am committed, and that others in the past have entertained notions similar to my own, might help me develop my ideas without too much autism. Furthermore, wisdom is not limited to present writers. Great minds of the past have had great ideas that are worth pondering today and that can help us refocus on the broad, fundamental questions to which we should be devoting our efforts. Also, the chances are that ideas placed in their context will be more forceful, fecund, and consequential than ideas developed in a vacuum. Other than pointing to the possible motivating power of blind fanaticism, it is hard to argue against the desirability of perspective and humility.

Fourth, every now and then a study of history can illuminate past errors. More broadly, it has been said that those who do not know their history are doomed to repeat its mistakes. History can be profoundly liberating and might even help us become less subject to the influence of the particular sociocultural context within which we live and work. Awareness of some of the traps our ancestors have fallen into might make us tread more cautiously and make it less likely that we will be caught by the same ones.

Fifth, a rather compelling rationale for the study of the history of psychology has to do with the vastness and complexity of the field of psychology today. The typical student of psychology, graduate or undergraduate, is bewildered by the variety of materials encountered in lectures, seminars, books and journals, all of them presumably somehow relevant to that apparently senselessly conglomerate area known as *psychology*. How are the various ideas, subfields, and specialties related? How do they tie in with other disciplines? A historical examination of the field might help integrate, might show how psychology developed out of a rather limited number of fundamental philosophical and scientific concerns, and might help one to see that the seemingly infinite diversity of the disparate things that go under the name of psychology might not be quite as much of an accidental hodgepodge of unrelated facts and theories as it first appears.

Today's psychology is the child of yesterday's psychology; today's psychology makes more sense if one understands how it got to be the way it is. The historical context determines to some extent the problems that are studied and how they are studied and even the language to be used in talking about the problems. Acquaintance with what happened before can help one realize that current concerns are consequences of decisions made by people long ago rather than necessarily inherent in the subject matter itself.

Study of the history of psychology, then, can provide perspective, can point out lines of development, can indicate the origin of ideas, can help one avoid mistakes somebody else made before, can show how various things fit together, and might help free us from blind, irrational adherence to today's unspoken, implicit assumptions. But ultimately, history, like art, needs no defense. The best reason for bothering with it might well be sheer curiosity or a desire of the finite bit of flesh to find some meaning in its labors, indeed, in its existence, to transcend its here and now, to discover its place in the vast scheme of things. Just what pleasure and consolation the historian and the consumer of history get out of the enterprise might be lost in some Freudian impulse, Adlerian complex, or Jungian **archetype.** Is it a feeling of power, of identification, of being less the victim of one's past if the past is not so shadowy and awesome, like an amorphous apparition, all-powerful in a nightmare? Perhaps knowledge of the past, having a structure for what has gone before, will free us from nameless childish fears and make us able to stride forth on our own, in our own direction. Some psychoanalysts say that an understanding of our early experience will help us to discover ourselves and free us for productive endeavor. Maybe an understanding of the early experience of one's discipline—especially if that discipline is concerned with the study of humanity and human mental life—will have a similar effect.

One need not, though, rummage around in a speculative unconscious to defend the study of the history of psychology. Everybody enjoys a good story. And the history of psychology has some fascinating people and ideas in it, enough for dozens of gripping movies, television shows, or historical novels. Quite aside from that, it can be very interesting in itself. It's fun. The study of history, in the last analysis, needs no defense.

Approaches to the History of Psychology[1]

So there are good reasons for looking at the history of psychology. But how should one organize and present it? Several different strategies have been used. Most popular is perhaps the internal **chronological** account, exemplified by Boring (1950b), Murray (1983), Murphy and Kovach (1972), Hergenhan (2008), O'Boyle (2006), and Schultz and Schultz (2012). To be sure, these are really quasi-chronologies, following one trend for a while and then backtracking to take up a different trend, yet time is the prime basis for the organization of these books (although Murphy and Kovach did append a set of chapters on recent research developments, and O'Boyle added a feminist touch). Goodwin combined a book of readings (2010) with a chronological account (2009) that focuses on the last century and a half, and Benjamin wrote a brief history of psychology that examines both the science and the practice of psychology (2006) and edited companion volumes of readings (2008) and of letters by prominent psychologists (2007). Shiraev (2010) wrote a lengthy chronological account.

Second is an approach that emphasizes the great **schools of psychology** that flourished during the first half of the 20th century. Heidbreder (1933) and Woodworth and Sheehan (1964) represent this strategy, and it is also noticeable in the books by Wolman (1960), Marx and Cronan-Hillix (1987), and Hillner (1984). In a sense, it is also the organizing principle behind several surveys of theories, in particular subareas of psychology such as Bower and Hilgard's (1981) *Theories of Learning* or Hall, Lindzey, and Campbell's (1997) *Theories of Personality*.

A third approach has been to ask prominent older psychologists to write personal or professional autobiographies; this was the basis for the volumes titled *A History of Psychology in Autobiography*, originally edited by Carl

Murchison and later by Lindzey (1930–2007), for Krawiec's (1978) *The Psychologists*, and for a volume edited by Mos (2009). A similar organization, although less concerned with the personal and centered more on the professional contributions of distinguished psychologists, is used in the classic volumes of Koch's (1959–1964) *Psychology: A Study of a Science*.

Related to this strategy is the "great individual" organization, which summarizes the contributions of major figures in the history of psychology. George A. Miller and R. Buckhout (1973) wrote a delightful introductory textbook in psychology that made extensive use of this approach, and it is the focus of works by Watson and Evans (1991), Sargent and Stafford (1965), and Hothersall (1995). Fancher (1996) used this approach perhaps most successfully of all. There even have been partly fictional accounts of significant pioneers of psychology, such as in a series of volumes edited by Kimble and Wertheimer (1991–2011).

Still a fifth approach concentrates on the external history of the field, showing in particular how the history of psychology fits with other developments in the history of ideas. The volume by MacLeod (1975) is an admirable, if incomplete, attempt of this kind; Brennan (2002), Leahey (2009), Lowry (1982), and Robinson (1995) made similar attempts. Viney, King, and Woody (2009) combined this strategy with emphasis on psychological writings before the modern era and with substantial material on **psychopathology, social psychology,** motivation, and personality. And Pickren and Rutherford (2010) do an admirable job of placing events in the history of psychology in their social, intellectual, and political contexts.

Then there are the implicit histories, the books of readings in the history of psychology, anthologies that compile excerpts from great writers of long ago and not so long ago. Dennis published a compendium in 1948, and more recently Shipley (1961), Herrnstein and Boring (1965), Diamond (1974), Watson (1979), Sahakian (1981), Munger (2003), Benjamin (2008), and Goodwin (2009) have produced additional ones. Each of the more than 100 selections in Herrnstein and Boring's work, incidentally, is preceded by a brief introduction that places it in its historical context. The same is true of Diamond's, Goodwin's, and Watson's. Robinson (1977–1978) reprinted significant works in the history of psychology in a massive multivolume edition that contains substantial commentaries.

Another approach focuses on the history of organizations. Evans, Sexton, and Cadwallader (1992), for example, edited a history of the American Psychological Association, and Dewsbury (1996–2000) edited books consisting of separate chapters on the various divisions of that association. Pate and Wertheimer (1993) edited a volume that details the histories of regional psychological associations in the United States, and Davis and Wertheimer (2000) put together an oral history of the national honor society in psychology, Psi Chi. Baker and Pickren (2007) published a volume on psychology in the U.S. Department of Veterans Affairs (VA), and Pickren and Schneider (2005) edited one on psychology and the National Institute of Mental Health (NIMH); Mangelsdorff (2006) edited a book on psychology in the service of national security.

Still another departure begins with decisions about which research fields are significant on the contemporary scene and then proceeds to an examination of the histories of these. Chaplin and Krawiec (1979) did this for each of several major subfields of psychology, such as **sensation,** perception, learning, quantitative psychology, and personality, whereas Postman (1962) chose somewhat narrower issues, such as cortical localization of function, **repression,** hypnosis, the nature and measurement of intelligence, or **nativism** and **empiricism** in perception, and asked experts in these problems to write histories of them. Hearst (1979) edited a similar work, as did Kimble and Schlesinger (1985) and Sarris and Parducci (1983). Norcross, VandenBos, and Freedheim (2011) edited a volume on the history of **psychotherapy.** And Frank Dumont (2010) wrote a thorough, scholarly history of personality psychology.

Then there are reference books focused on the history of psychology, such as Viney, Wertheimer, and Wertheimer (1979) or Watson (1974, 1976), in which the history is largely implicit. Some have written histories of special fields or groups in psychology, such as Eckardt, Bringmann, and Sprung (1985) on developmental psychology, Guthrie (1997) on African-American psychologists, O'Connell and Russo (1983) and Stevens and Gardner (1982) on women psychologists, and Benjamin and Baker (2004) on **professional psychology.** Hilgard (1978) based a fine book on presidential addresses to the American Psychological Association.

A few biographies of major figures in the history of psychology have been published as well, such as those by Jones (1981) on Freud, Bjork on James (1997b) and on Skinner (1997a), McReynolds (1997) on Witmer, and King and Wertheimer (2005) on Wertheimer.

The present book tries to combine the first two approaches with the fourth and concentrates more on experimental psychology than on other fields. The organization is primarily chronological, but with emphasis on the great individuals and ideas in psychology's history and on the schools of psychology. Part I looks at the intellectual background that culminated in the establishment of experimental psychology as an independent discipline, glancing briefly at Greek and **Renaissance** thought and then developing in greater detail the eight major trends that can be seen as the backbone of the new discipline. Part II centers on Wilhelm Wundt, who has been widely viewed as the major exemplar of the new psychology, and explores the intellectual climate of his day; it ends with a glance at psychology in the United States both before and after the world center of psychology moved from east to west across the Atlantic Ocean. Part III presents the major schools of psychology[2] that flourished in the first half of the 20th century, glances at developments in the immediate postschools era, and attempts an overview of the psychological scene of the last 4 or 5 decades. Part IV evaluates the fate of psychology early in the 21st century.

Summary

There is no such thing as a definitive or unchanging history of anything. What is fished out of the stream of events as worth paying attention to, and how what is selected is to be interpreted, depends ultimately on the idiosyncratic, subjective biases of the historian. Nevertheless, a historical overview of a discipline can provide background, integration, and perspective and can be absorbing in its own right.

Interest in the history of psychology, while it might have waned a bit recently, appeared to increase during the second half of the 20th century. Most histories have been written with a chronological internal orientation, but there have also been books based on significant schools, important individuals, significant concurrent social and political events, influential works, or major research areas. The present work combines attention to the contributions of important people with discussions of major schools in a condensed chronological account of the evolution of psychology as an empirical discipline.

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[1] Many books are referred to in this section. Most of them provide a quite different, and in many cases a more complete, account of the details of the history of psychology than the present text. See the list of references at the end of this book, which also includes some major works not mentioned here.

[2] Structuralism tried to identify the contents of the mind and break that down into its elements; **functionalism** examined the functions that mental processes achieve for the organism; behaviorism attempted to make psychology an objective science by concentrating only on observable behavior and eliminating everything "mental" from psychology; Gestalt theory emphasized that natural wholes are fundamentally different from a mere sum of their constituent parts and that properties of wholes determine the nature of their parts; and psychoanalysis endeavored to identify the hidden unconscious processes that affect conscious events and that generate psychopathology.

CHRONOLOGICAL CHART: TO 1800

Some Landmarks and People in World History	Approximate Date	Some Landmarks and People in Psychology's History
Ten Commandments	1300 BCE	
Confucius	500 BCE	Heraclitus
Buddha		Anaxagoras
Persian Empire		Democritus
		Plato
Alexander the Great		Aristotle
Great Wall of China begins		
Hannibal crosses the Alps	200 BCE	
Caesar conquers Gaul		
Cleopatra	50 BCE	
Roman Empire begins		
Jesus Christ		Galen
Byzantine Empire begins		
	400 CE	Augustine of Hippo
Roman Empire falls		Arabs rediscover Aristotle
Charlemagne		
Holy Roman Empire	1000 CE	
Norman conquest of England		
First Crusade		
Genghis Khan		
Magna Carta	1200 CE	
Inquisition established		Roger Bacon
Universities founded at Paris and Oxford		Thomas Aquinas
Marco Polo travels to China		
Bubonic plague arrives in Europe		
Renaissance begins	1400 CE	

Joan of Arc		
Byzantine Empire falls		
Gutenberg printing press		Malleus Maleficarum
Leonardo da Vinci		Machiavelli
Columbus lands in America	1500 CE	Harvey
Magellan's expedition circumnavigates the earth		Hobbes
Martin Luther		Gilbert
Elizabeth I of England	1600 CE	Descartes
Shakespeare		Francis Bacon
Galileo		Spinoza
		Locke
Louis XIV of France	1700 CE	Leibniz
Newton		Berkeley
Bach		Hume
Mozart		La Mettrie
U. S. Declaration of Independence		Hartley
Rousseau		
Steam engine invented		Kant
French Revolution		Pinel

CHAPTER 2

Early Developments

The history of psychology could, as we said in Chapter 1, be broken down in any of a large number of ways. Here it is separated into three major divisions, using the dates of 1860 and 1900 as the dividers. It was in the year 1860 that Gustav Theodor Fechner published his *Elements of Psychophysics*,[1] which for the first time demonstrated how to make precise measurements of mental quantities and how psychical quantities are related to physical ones. Hence, 1860 could be seen as the year of birth of experimental psychology. Other historians have considered 1879 as psychology's birth year, because that is when Wilhelm Wundt, according to archival records, made a formal request of the University of Leipzig administration for funds to support its institute of experimental psychology, a request often reinterpreted as "the founding of the world's first experimental psychology laboratory."

Still another candidate is 1875, since Wundt was given space for demonstrational experimentation at Leipzig in that year (so, as it happens, was William James at Harvard). As for the other dividing date, it was at about the turn into the 20th century that psychology emigrated from Europe to make the United States its major residence.

Eight great scientific and philosophical trends led to the new experimental psychology of the latter half of the 19th century and continued to characterize experimental psychology in the 20th. The present chapter, after a brief glance at psychological thought in antiquity, will survey these trends, the five scientific ones (**physiology,** biology, **atomism, quantification,** and the **founding of laboratories**) and the three philosophical ones (**critical empiricism, associationism,** and **scientific materialism**).[2]

The last two chapters in this part will examine several of the scientific and philosophical trends in somewhat greater detail.

Psychological Thought in Antiquity

The Greeks, the Middle Ages, and the Renaissance

The eight lines of development from science and philosophy did not really become clearly discernible until the 16th or 17th century or even later. Yet hints of them can be found in Greek and **Middle Ages** philosopher-psychologists; the controversies and cogitations of the ancients contained several of them in embryonic form. At about the same time as the earliest classic Greek philosophers, Buddha was also promulgating a coherent psychological theory that discussed sensation and perception, motivation and attention, the nature of mind, development, action, and health. This section touches on some of the great pre-Renaissance people and ideas to provide a background and to set the stage for the subsequent consideration of Renaissance and post-Renaissance developments.

Elementism and Anti-elementism

Among the important early concerns was the question of **elementism** in contrast with **anti-elementism.** What are the ultimate components of reality? One of the best-known early atomists was Democritus, who lived about 400 BCE; he argued that everything is composed of indivisible, unitary material atoms in constant motion. People, for example, are constituted of mind (or soul) atoms and of body atoms, the latter qualitatively the same as the former but in slower motion. In his elementism, then, Democritus exemplified some tendencies toward **reductionism** (by reducing all existence to a common denominator, the atoms) and toward a **mind–body** distinction. Another aspect of his philosophy emphasized the role of external stimuli in determining the individual's behavior, raising the question of **determinism** versus **free will:** if our behavior is controlled by outside forces impinging on us, are we really in control of our own actions?

Among the antireductionists, who held views opposed to those of Democritus, were Thales, Heraclitus, and Anaxagoras. Thales, who lived in the 6th century BCE, considered water the basic substance, the common fabric of most things in the universe. Heraclitus (ca. 540–475 BCE) held that everything is constituted of fire. There is nothing permanent or fixed; fire is the agent of change. This conception has a peculiarly modern quality, especially if one were to translate fire as "energy." He also argued that things tend to evolve into their opposites—an idea similar to one developed much later by Hegel. Heraclitus emphasized process rather than status, dynamics rather than statics. He taught that the stream you waded in yesterday is different when you step into it today. William James, in much later times, made a similar statement, to the effect that the **stream of consciousness** is never the same again; you can never experience the same thing in the same way more than once. Anaxagoras (ca. 500–428 BCE) considered neither water nor fire the basic substance; he believed that the irreducible, the smallest unit of anything, is a *relationship*. There is no such thing as permanence or fixity; everything is undergoing constant relational change. In this idea he anticipated Aristotle; his notions, and many of those of Heraclitus and Aristotle, can also be seen as distant forerunners of some of the emphases of the Gestalt psychologists of the 20th century.

The Greeks engaged intensively in **epistemological** inquiry. Originally, the issue was, how do we know anything? Later, it became how *can* we know—that is, how can we know we are right? It was particularly the Sophists of the 5th to the 2nd century BCE and Socrates who concerned themselves with this question. Among their arguments was the rather disconcerting one that we can never be sure that we *really* know anything. After all, what are the criteria for the validity of any statement, of right and wrong, of true and false, of good and bad? There are no absolute ones, independent of certain arbitrary points of reference, assumptions, or premises. And one can never be certain that one's arbitrary points of reference, assumptions, premises, or ends are actually valid.

Plato

A number of these concerns culminated in the philosophy of Socrates and of his disciple and interpreter, Plato (ca. 427–347 BCE). Popular in early philosophy was a kind of **animism,** in the form that we become aware of the souls, the essences of things, but Socrates taught that our knowledge of the **environment** is necessarily imperfect, since it comes via the imperfect avenue of our sense organs, which are subject to illusions. We learn about external objects because they emit faint copies of themselves (**eidola**), which enter our receptor organs. Although the Sophists generally doubted the certainty of the existence of objects in the external world, Socrates and Plato believed in a realm of *ideas*, which are permanent and perfect. The experienced world, they held, is but an imperfect copy of this ideal world, about which we can learn only through matter and the material senses—which are subject to all kinds of illusions. The ideal exists outside of us, independently of us, and is immutable and perfect; our perceptions are only imperfect material copies of "genuine reality."

It is therefore foolhardy to consider sensory experience as a reliable source of knowledge. Far more trustworthy, according to Plato, are rational reflection, meditation, and introspection; by these means, one can discern truth and can get to know one's self. Indeed, the self is the only object that one can learn about with any degree of assurance, but the process of gaining self-knowledge is a difficult one and is never complete. Socrates' recommendation, "know thyself," for that matter, continues to be reflected in recent years in the goals of some psychotherapeutic methods, including those based on psychoanalysis and perhaps especially those based on phenomenological personality theories, such as the **client-centered counseling** of Carl Rogers or the humanistic approach of Rollo May.

Plato's analysis of social phenomena (which differed from the prevalent social theories of his contemporaries) was based on a classification of people into three categories. Those who should have the lowest status in an ideal society, according to Plato, are people concerned with bodily functions and the satisfaction of organic needs: the servants or slaves. Next come those of emotion, of "heart," of courage: the soldiers. The highest positions, those of the rulers, are reserved for the contemplators, the thinkers, the individuals of intellect and ideas.

Plato taught that people benefit profoundly from one another; that, as John Donne put it 2 millennia later, none of us are islands unto ourselves. We are social creatures, much influenced by those around us. Here one can also discern the seeds of an **environmentalism,** already touched on by Democritus, which was to grow in the European philosophy of the 17th, 18th, and 19th centuries and to reach its zenith in the formulations of the 20th-century behaviorists John B. Watson and B. F. Skinner.

Another of Plato's contributions was his clear statement of the mind–body distinction, already in the Zeitgeist and suggested, among others, by Democritus; the problem of the difference between mind and body, and of the relation between the two, has continued to engage Western philosophers and psychologists to the present day.

Aristotle

Aristotle (384–323 BCE) was a pupil of Plato's (see Figure 2.1) and became a rival of his. He was apparently the first person to write systematic psychological treatises. His works included, among others, *Peri Psyches*, or *About the Soul* (perhaps more accurately *About the Mind* or, literally, *About the Psyche*), sometimes known by its Latin title *De Anima*, as well as works on senses and sensing, on **memory,** on sleep and sleeplessness, on geriatrics (the length and brevity of life), on youth and old age, on life and death, and on respiration.

FIGURE 2.1 Plato (ca. 427–347 BCE) and Aristotle (384–323 BCE). (From *The School of*

Athens, 1510–1511, Raphael.)

About the Soul has an outline that, with minor modifications, persists in introductory texts to the present: It begins with consideration of the history of psychology and prior systematic formulations concerning the mind and behavior. It summarizes the thought of such preceding Greek philosophers as Thales, Plato, Anaxagoras, and Empedocles. Next is a section on the nature of the soul, or what we might today call personality, followed by analysis of the abilities of the soul, in which are discussed the senses of seeing, hearing, smelling, tasting, and feeling. The account also considers a **common sense,** superordinate to the five, which serves to synthesize the information from the other senses and which includes awareness of form, number, and duration that are not specific to any of the other five senses. Next there are discussions of thinking and imagination, intelligence, knowledge, needs and motives, willing, and feeling and emotion. Aristotle's analysis of memory includes three primary laws of **association,** which were to have a significant place in the history of thought ever since: **contiguity, similarity,** and **contrast.** That is, one idea calls forth another if (1) when previously experienced they were contiguous in space or time, or if (2) they are similar, or if (3) they contrast with each other.

Aristotle was a general theoretician about nature and taught that behavior is subject to the same kinds of naturalistic principles as all other natural phenomena—a kind of **objectivism** more than 2 millennia before the formal establishment of the "behaviorist school." A thoroughgoing relativist, he considered the world as constituted of successive levels of **matter** and **form** that are defined in relation to each other. There is no fixed form or matter, but matter is the constituents, the elements, making up the form, while form is the inclusive totality whose subparts are matter. Thus, marble is matter relative to the form of the pillar, whereas, in relation to the marble, the pillar is the form. At the same time, however, the pillar is matter to the building, the building is matter to the city, and so on. The higher level is thus always the form; the lower level the matter. (A theory of perception to be developed early in the 20th century by people such as Christian von Ehrenfels and Alexius Meinong of the Graz school in Austria and by other antecedents of

Gestalt psychology bears a distant resemblance to this formulation.) Aristotle thus argued that every object is both form and matter: form to the lower, matter to the higher. He considered the highest form to be God; God is form to all things, matter to none, and thus provides meaning, structure, and organization to the matter of all the world.

Aristotle, by considering everything to be infinitely reducible via successive, ever finer analysis of form and matter, continued the reductionistic trend (although his version was not as elementistic as some earlier ones or as some in the 18th, 19th, and 20th centuries). Aristotle's formulation can also be seen as an early statement of the molecularist position in the 20th-century **molar–molecular controversy,** that is, the controversy concerning the size of the unit of analysis or the conceptual level at which explanation is to be sought.

Aristotle is also known for his doctrine that all knowledge comes from experience. At birth the mind is like a blank wax tablet (a ***tabula rasa***, literally, "a shaved tablet"): experience writes on this tablet. Much later, John Locke was to elaborate on this idea. This position has been called **empirism** (discussed later in this chapter). Altogether, Aristotle was a major influential scholar, one of the giants of Western intellectual history.

The Greek Decline and the Middle Ages

Aristotle was a teacher of Alexander the Great, after whose reign the Greek civilization began to deteriorate. In reaction to this time of crisis, of ambiguity, and of anxiety, two opposite philosophical movements sprang up, **Epicureanism** and **stoicism.** To oversimplify somewhat, the Epicureans were in a sense the "hippies" of their time, whereas the stoics were more like classical reactionaries; the former seemed at least in part to espouse living in the moment and to have an iconoclastic devil-may-care attitude, whereas the latter, more soberly ascetic, wished to preserve the order of things as they were and subscribed to a rather puritanical acceptance of their fate.

As the Greek culture began to disintegrate, major new religions arose and flourished. People were dissatisfied with their everyday lives; several of the great religions, notable among them some versions of Buddhism and Christianity, tended to concentrate on the future and held out hope that tomorrow would bring a better, more pleasant life, perhaps after bodily death. In the first 500 years after the birth of Christ, Aristotle was forgotten, and religious teachings held the center of the intellectual stage.

It was not until about 700 CE that Aristotle was rediscovered by the Arabs, and it took several centuries for his thought to influence the writings of the Church Fathers. The European Zeitgeist, as it had been for several hundred years already, continued from then until the Renaissance to be strongly antiempirical and proauthority as a source of truth, with the authority vested almost exclusively in the Church. The rediscovery of Aristotle put thinkers into a somewhat difficult spot, because many of Aristotle's beliefs were inconsistent with religious teachings. For example, Aristotle considered humanity part of the natural world, whereas religion taught that humans are separate and above the animals. It is partly because he managed to come close to accomplishing the difficult feat of reconciling Aristotle's ideas with religious dogma that Saint Thomas Aquinas (1225–1274) stands out as an important figure in the history of ideas. The period from about the 5th to about the 15th century in European history has sometimes been called the **Dark Ages,** largely because of its dominance by authority rather than by **rationalism** and empiricism, but a more appropriately neutral term for it is the Middle Ages.

The Renaissance

The Renaissance, from about 1400 to about 1600, saw a gradual, subtle, but radical change in Europeans' attitudes toward knowledge and toward sources of knowledge. The authoritarianism of the interpreters of Aristotle and of the religious writers slowly gave way to empiricism and antiauthoritarianism. Old, established ways of doing things and of thinking about things began to be questioned. It was also a period of major geographical exploration, of change in the economic system toward a trading economy, and of breakdown of the feudal manorial system, under which individuals had had their particular positions carved out for them by destiny and did not question the order of things. They had previously accepted as foreordained the particular social, economic, and political niche to which fate had relegated them. Political units became larger and more powerful, and competition—in the economic, intellectual, political, and military realms—flourished as individualism arose. Knowledge and a person's status were no longer fixed but became fluid. Gradually there arose an awareness that one need not accept one's lot fatalistically but that it might be possible to progress toward a better life and a better understanding of the world.

The Renaissance was an era of ferment in virtually every area of human endeavor. From about 1500 on, a general spirit of expansion pervaded many different spheres. New geographical horizons were opened by Spain and Portugal, and England was in a period of major expansion of its empire. The expansion was not only geographic but also cultural: it was late in the 16th century that Shakespeare began writing. The new dynamic culture flourished in France too, particularly in the French empire under Louis XIV; this was the period of the great French writers Molière, La Fontaine, Racine, and Corneille. Russia pushed its borders all the way to the shores of the Baltic, Charles XII of Sweden explored extensively and built his empire, and Prussia expanded toward the East.

The expansionist tendency was not only territorial and physical, spiritual and literary, but also scientific—as exemplified by the figures of Galileo and Newton. There was also a widening of philosophical horizons, and certain psychological concepts came into being. It is no accident that psychology, like so many other fields, had its major rebirth during the Renaissance, after more than a thousand years of relative neglect. To be sure, psychology during this time was primarily philosophical, but many of the trends that had had their origins in Greek thought and that were to join to produce the experimental psychology of the late 19th century could already be identified in this period.

Survey of Scientific and Philosophical Trends That Culminated in Experimental Psychology

During and shortly after the Renaissance there developed as distinct entities the eight movements that were to have a profound effect on the shaping of the science of psychology. The new experimental psychology arose from the confluence of two great rivers—one a river of science and the other of philosophy.

The tributaries of the river of science were physiology, biology, an atomistic approach, an emphasis on quantification, and the establishment of research and training laboratories; the tributaries of the river of philosophy were critical empiricism, associationism, and scientific materialism.

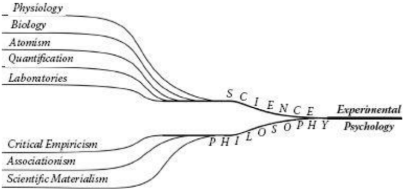

FIGURE 2.2 Muenzinger's river analogy: the trends leading to experimental psychology.

The Scientific Trends

Within *physiology*, there was much work on sense organs, and there were studies that later would have been called neurophysiological or neuroscientific. Fascination with the human body led to a detailed study of structures and their functions, and the functional units making up the body were studied in the **reflexes** of both animals and people. **Reaction time** was a topic of great interest among astronomers, then physiologists, and later yet psychologists. The controversy concerning the **localization of functions** in various brain structures, which is still raging today, was already joined in the first half of the 19th century.

The most important *biological* concept, in terms of its influence on the development of psychology, was **evolution.** It was there in the writings of Buffon and Lamarck, and it was just 1 year before 1860 that Charles Darwin published his *Origin of Species*. This influence continued with Spencer, and Darwin himself contributed a volume on the expression of emotions in humans and animals.

The *atomistic* approach was robust and successful in several different disciplines, so it was only natural that the young psychology too would try to adopt it. Physics was becoming atomic. Chemistry served as the prime example, with John Dalton's ingenious atomic theory and his classification of the elements. Incidentally, Dalton also made an important contribution to psychology in his observations on color blindness: He happened to be color-blind and provided the first description of the phenomenon, which was called Daltonism for a while. His description was motivated by his embarrassment at having bought bright-red clothes and worn them to Quaker Meeting, since he was unable to distinguish their color from black. In neurophysiology, there was Santiago Ramón y Cajal's neuron theory, and for 2,000 years some people have repeatedly viewed mental events atomistically, including also an interest in how associations are formed among **mental elements** or atoms. *Associationism*, a kind of mental atomism, has been a major movement in the history of both philosophy and psychology.

Quantitative thinking in psychology received a substantial boost in the first half of the 19th century. It was then that the discipline of statistics arose, and doubtless the quantitative emphasis of the Zeitgeist—especially in physics, the science that the young scientific psychology tried so hard to emulate—helped spread the acceptance of psychophysics and of **mental testing.** Analytical geometry and calculus were invented long before, and Galileo had quite naturally stated his law of falling bodies in mathematical form.

Finally, the first half of the 19th century saw the *formal foundation of* a number of research and training *laboratories*, most of them involving the cooperative work of at least several people. Although there were laboratories in other fields as well, the movement was particularly characteristic of chemistry. Thus, in central Germany, by 1824, Justus von Liebig, who studied the chemistry of fertilizers and agronomy, formally opened a chemistry laboratory at the university in Giessen; in 1828, Friedrich Wöhler, at his newly established Göttingen laboratory, synthesized the first organic product, urea. This synthesis, incidentally, had the far-reaching implication —which fit into the mechanistic spirit of the time—that organic products can be produced outside the human or animal body: there is no need for a “vital force” or some other mystical entelechy. In 1840 Robert Wilhelm von Bunsen (of burner fame) established a laboratory at Marburg, and in 1843 another chemistry and physics laboratory was founded at Leipzig. The 1840s saw the establishment of a chemistry laboratory at London as the movement crossed the English Channel and also one at Yale University as it crossed the Atlantic.

These five scientific trends converged in the new experimental psychology, making it physiological, evolutionary, and atomistic, with an emphasis on quantification, and generating the establishment of several laboratories of experimental psychology in the last decades of the 19th century. But, to repeat, philosophy also had its marked effect on the new psychology, with three main developments contributing to this impact.

The Philosophical Trends

The *critical empiricism* movement, begun by the Greeks, was concerned with the logical critique of all experience. Among the important later writers in this tradition are Locke, Berkeley, Hume, and Kant. All were deeply concerned with the question of how knowledge is acquired. A related question was whether there are any innate ideas or whether all ideas come from experience—the issue of nativism versus empirism.

The word *empirism* was used at the conclusion of the section on Aristotle. It is prudent to distinguish between *empiricism* and *empirism* as, among others, Hermann von Helmholtz did. Empiricism is a methodological prescription: it says we should rely on observation, on experience, on measurement to obtain reliable knowledge and contrasts with rationalism, which holds that reason is the best route to knowledge (cf. Plato). Empirism is a philosophical assumption: it says that all human knowledge comes from experience and that no knowledge is innate; it contrasts with nativism. Clearly the two are not totally unrelated, since experience is central to both, yet they are obviously not identical. One can, for example, be an empirical nonempirist (by doing, say, experiments on inborn propensities) or a nonempirical empirist (by maintaining deductively or by assumption that all human behavior is learned, as, for instance, in Aristotle’s doctrine of the *tabula rasa*).

The *associationist* tradition concentrated on the question of what makes ideas hang together, how ideas bring forth others, and how ideas congeal. There was much concern with how one idea makes one think of another, how things are learned, how long a once-formed association will last, and what conditions during learning will affect the durability of the connections between ideas.

Scientific materialism consists of the attempt to describe living organisms and their processes strictly as machines undergoing physical and chemical events. French materialism, as exemplified by Julien de La Mettrie in his work *L'Homme Machine*, presented a compelling account of the human being as a machine, both physically and mentally. (La Mettrie's name, incidentally, means "of the hammer," not an inappropriate name for a man who wrote such an iconoclastic work.) By the middle of the 19th century a mechanistic approach to the understanding of living organisms, including humans, was very much in the Zeitgeist. Wöhler's demonstration, just mentioned, that one can synthesize organic material out of inorganic, was typical of this trend.

That the new experimental psychology, then, was much concerned with epistemological questions, was associationistic, and tried to reduce mental events to physical ones shows the pervasiveness of the strong philosophical trends of critical empiricism, associationism, and scientific materialism in the middle of the 19th century.

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1 In a brief work like the present one, it seems inappropriate to engage in the pedantry of citing detailed bibliographic references. Elaborations of most of the material presented in this book can be found in many of the longer works listed in the references.

2 Breaking down the origins of modern scientific psychology into these eight trends was the brain-child of Karl F. Muenzinger (1885–1958). The present author was privileged to audit Professor Muenzinger's course on the history of psychology in 1955–1956; Muenzinger encouraged him to use this analysis in writing a history of psychology text. Much of the content of this book, especially in Chapters 2–13, was influenced by notes the author took while auditing Muenzinger's course more than half a century ago.

CHAPTER 3

The Lines of Development From Science

O

f the five scientific trends, two—physiology and quantification—deserve somewhat closer scrutiny. Developments in biology will be touched on incidentally in various other places in this narrative, and Charles Darwin's (Figure 3.1) contributions in particular will be discussed in conjunction with consideration of Herbert Spencer in the next chapter. Atomism will be apparent in many formulations and will also, at least implicitly, inevitably be involved in the later discussion of the philosophical trend of associationism. As for the tendency to establish research and training laboratories, it was part of the history of all of the natural sciences during the 19th century.

The Physiological Trends

The physiological route to the understanding of psychological phenomena was evident in a variety of fields. There were efforts to find gross structural correlates for different functions, concern with reflex action, study of the nature of nervous conduction and the structure of the nervous system, much interest in the localization of different psychological functions in various parts of the brain, and the attempt to construct a physiological epistemology (in that people tried to account for how we obtain information through the senses and how this information is passed on from sense organ to brain).

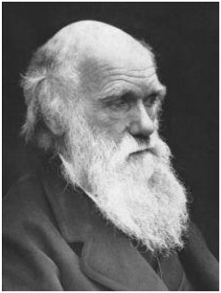

FIGURE 3.1 Charles Darwin (1809–1882).

A Gross Structural Correlate for a Major Function

Important because it showed that clear correlations could be established between physiological and behavioral events was the distinction between the sensory and the motor nerves, published independently by Charles Bell in 1811 in England (in a privately printed monograph, of which only 100 copies were made) and by François Magendie in 1822 in France. They established that the dorsal (toward the back) roots of the spinal cord are sensory whereas the ventral (toward the stomach) are motor. This discovery was hailed as significant since it showed that specific mental functions are mediated by different anatomical structures; it incidentally also serves to reemphasize the vagaries of history: The same fact had already been pointed out by Eristratus of Alexandria about 300 BCE and was reiterated by the great physician Galen during the 2nd century CE (who, as it happens, disagreed with Aristotle about the locus of the mind: Aristotle placed it in the heart, Galen in the brain). It is curious that the same "important fact" has to be rediscovered periodically.

Study of the Reflex

In the 18th and 19th centuries people were fascinated by reflex action.

Interest in reflexes was enhanced by René Descartes, who will be discussed more closely in the next chapter; vestiges of this earlier concern are seen in the 20th-century emphasis on **conditioning** and the tying together of stimuli and responses. The term *reflex* was first used by Jean Astruc in the middle of the 18th century. Robert Whytt a little later described detailed experiments with frogs, in which he investigated the role of the spinal cord in reflex action. Some issues concerning reflexes became important in the 19th century but have waned since, such as whether reflexes are the unconscious aspect of behavior and whether voluntary work and action are nonreflexive. Although there was still some concern with the voluntary–involuntary question in the first half of the 20th century, discussions of it are rare nowadays. Sir Charles Sherrington early in the 20th century wrote a highly influential systematic treatise on reflexes, *The Integrative Action of the Nervous System*.

Nervous Conduction

Then there was the investigation of the electrical nature of nerve impulses. Luigi Galvani found that a frog's leg would twitch when touched by two different metals, so he postulated the existence of "animal electricity." The German physiologist Emil DuBois-Reymond, a contemporary of Hermann von Helmholtz (Figure 3.2), published a book, *On Animal Electricity*, that summarized this area and moved the phenomenon out of the domain of mysticism into the realm of materialistic science.

Although the influential physiologist Johannes Müller said in 1844 that the speed of the nervous impulse is too rapid to be measured, his student Helmholtz in 1850 did measure it with an ingenious experiment. He recorded the time interval between stimulus and muscle twitch as a function of how far from the muscle the nerve was stimulated and, by subtraction, came up with a remarkably slow speed, which was largely corroborated later by much more sophisticated research. A detailed electrochemical theory of *how* the impulse is propagated was not clearly formulated until early in the 20th century.

The Structure and Function of the Nervous System

Intensive work on the nervous system and its building blocks characterized much of the 19th century. This work led eventually to Santiago Ramón y Cajal's neuron theory. Previous work on the anatomy of the nervous system and Ramón's own work in staining microscopic sections of the nervous system led him to the conclusion that it is made up of separate pieces, the neurons, which are hooked together at synapses. The theory implied an associationistic atomism; the whole, that is, the nervous system, can be understood as the sum of its connected parts. Making up the trend that was epitomized by the neuron theory were studies of the anatomy of the neuron, identification of axons, the study of differences between gray and white matter, and work on the speed of the nervous impulse as a function of the diameter of the neural fiber and of its myelinization, that is, whether the fiber has a white, fatty sheath. The membrane theory of neural conduction maintained that the nerve impulse consists of the breakdown of particular electrical charges in the axon's membrane. The absolute and relative refractory phases of firing axons were identified and studied, and the **all-or-none law**—that an axon either fires with all of its energy or not at all—was formulated a little after the turn of the 20th century. This made for serious problems, since, if all a neuron can do is fire or not fire, how is it possible for the nervous system to transmit information about the strength of a stimulus, or its quality? Encoding of the intensity of the stimulus was later hypothesized by the physiologist Edgar Douglas Adrian and others to occur in terms of the number of neurons firing and of the frequency of impulses in each fiber; quality of sensation was mediated by which particular fibers were stimulated—according to the doctrine of **specific nerve energies,** discussed further later in the chapter.

FIGURE 3.2 Hermann von Helmholtz (1821–1894).

Localization of Function

Are particular behavioral or psychological functions localized in particular places in the brain? Opinion swung back and forth like a pendulum on this issue.

Near the beginning of the 19th century Franz Joseph Gall developed the doctrine of **organology,** which his pupil Johann Caspar Spurzheim popularized and rechristened **phrenology.** They studied the anatomy and physiology of the nervous system in general but concentrated on the brain, with particular interest in the possibility of recognizing certain intellectual and moral traits of animals and people by examining the convolutions of the skull. The theory of phrenology was based on several interlocking hypotheses. First, each mental function is mediated by some particular part of the brain. Second, if a given function is well developed in a person, then the corresponding neural structure also must be particularly well developed, that is, enlarged. Finally, since the shape of the skull to some extent accommodates the shape of the underlying neural tissue, examination of the bumps of the skull should provide information about the degree of development of the underlying neural structures and correspondingly of the individual's behavioral characteristics. It was an ingenious theory, but unfortunately it did not work. Later research showed that one cannot identify specific attributes such as amativeness, benevolence, reverence, or cautiousness with the development of certain parts of the brain; furthermore, size of anatomical unit and complexity of function are not necessarily correlated; and unusual size of a particular neural structure need not result in an obliging corresponding dent or bump in the skull. Thus, each of the basic assumptions of phrenology turned out to be wrong, but the theory epitomized the prevailing assumption that particular brain structures are crucial in various psychological functions—an assumption that was taken for granted in the 19th and 20th centuries and continues to be the unquestioned foundation of modern cognitive and perceptual neuroscience.

Pierre Flourens, a distinguished Parisian scientist, about 1820 moved away from the extreme of specific localization of the phrenologists. He used the method of **extirpation** (surgical removal), which is the study of the relationship between loss of brain tissue and changes in behavior, and concluded that the brain acts to a large extent as a whole, although certain lobes do have fairly specific functions within the totality.

The pendulum swung back toward localized specificity in 1861, when Paul Broca, a French physician, identified a "speech center," by reporting that **aphasia,** or loss of language skills, seemed to be associated with a tumor on the lower left side of the brain of a patient in an insane asylum. This finding was buttressed later by the work of Gustav Fritsch and Eduard Hitzig, two German physiologists, who obtained further evidence of localization of function in soldiers who had sustained brain wounds during the Franco–Prussian War. Fritsch also found that if an area of the living brain is touched along the Rolandic fissure, certain eye or finger movements occur. This laid to rest an earlier dogma that the cortex could not be excited. Fritsch and Hitzig continued with laboratory studies on animals, using cortical excitation and extirpation, after the idea of doing such experiments had come to Fritsch on the battlefield. They established the principle of **contralateral representation,** that is, that functions of the right half of the body are represented in the left half of the brain and the functions in the left half of the body are represented in the right half of the brain. Their thorough studies were reported in a publication in 1870, and the pendulum swung back again from Flourens's antispecificity view, but now to specific movements rather than to the general propensities of the kind the phrenologists had tried to identify.

Later biopsychological work, such as that of Shepherd Franz and Karl Lashley, returned more to the Flourens position, with some emphasis on both **mass action** and specificity. Gestalt-oriented psychologists like Wolfgang Köhler, Kurt Goldstein, and Martin Scheerer in still more recent years performed work that further supported Lashley's principles of **equipotentiality** (that parts of the brain have the potential of performing the functions of other parts, if these other parts are damaged) and mass action (that the brain acts as a whole, as an integrated unit). Today's view seems to combine that the brain acts as a totality but also that it has some degree of specificity, particularly with regard to the simpler functions such as basic sensory experiences and specific movements. Recent high-tech brain scanning techniques have helped to establish additionally the localized specificity of certain functions; early in the 21st century, **cognitive neuroscience** and visual neuroscience have become flourishing research fields.

Specific Nerve and Fiber Energies

The doctrine of specific nerve energies was formulated to account for our ability to sense different qualities. Johannes Müller systematized this doctrine in his famous *Handbook of Physiology*, providing detailed evidence for it. He argued that the quality of the sensation must "reside in" the neuron itself, not in the nature of the physical stimulus that activates the neuron. DuBois-Reymond went so far as to speculate that if we could cut and cross the visual and auditory nerves, we would hear with our eyes and see with our ears!

Hermann von Helmholtz spoke of not only specific nerve energies but also specific energies for particular *fibers*. He developed a **specific fiber energies** theory of vision called the Young–Helmholtz color theory, which postulates three different kinds of retinal sensory cells: some sensitive to red, some to blue, and some to green. He also formulated his **resonance theory** of pitch perception, which requires several thousand specific fiber energies: each of the transverse fibers of the basilar membrane of the cochlea in the inner ear is considered to resonate to, and therefore to be sensitive to, a particular frequency of stimulation.

Other Work in Sensation

Much other work was also being done on sensation. Late in the 17th century the philosopher and physicist Isaac Newton, in a report to the Royal Society, demonstrated that white light can be broken down prismatically into the colors of the rainbow. About a century after that, the physiologist Thomas Young proposed the first three-element theory of color vision, which Helmholtz, as mentioned in the preceding paragraph, developed 50 years later into the influential Young–Helmholtz theory. About a quarter of a century after that, Ewald Hering proposed a different color theory, an **opponent-process model,** which has come back into prominence in recent years. Other developments in vision included Dalton's 1794 description, as previously mentioned, of red–green color blindness, and in the middle of the 17th century the French physiologist Edmé Mariotte had described the now well-known phenomena of the blind spot. Charles Wheatstone, a physicist famous for his work in electricity, studied color mixture and stereoscopy early in the 19th century; he invented the **stereoscope,** which was used extensively in research by the experimental psychologists of the last half of the 19th and the first half of the 20th century. The mechanism of accommodation had also been described by Young and by Helmholtz, by the latter in his monumental *Optics*.

Interest in the senses was not limited to vision. Bell (of the Bell–Magendie law) described the ear in detail during the early 1800s, paying particular attention to the **ossicles.** Johannes Müller provided an even more detailed description, and Helmholtz, as already mentioned, proposed the cochlear resonance place theory to explain pitch perception. The physicist Georg Simon Ohm, well known for his contributions in electricity, formulated in 1843 what has since been known as Ohm's acoustic law, arguing that the ear acts as a Fourier analyzer, that is, it breaks complex tones down into their component pure tones.

The senses of touch and of kinesthesis were studied by Ernst Heinrich

Weber in his doctoral dissertation, published in Latin in 1834 and made available in a larger German version in a chapter Weber wrote for a handbook of physiology published in 1846. This work included the background for Fechner's later formulation to the effect that the increment in stimulation required for a subject to sense that the stimulus has increased remains some constant fraction of the amount of stimulation already present. This law was to provide the basis for Fechner's later epoch-making general psychophysical law, which will be considered in greater detail in Chapter 5.

Smell had also come in for some attention; Linnaeus (Carl von Linné, a professor at the University of Uppsala, in Sweden), famous for the Linnaean classificatory system in botany, turned his categorizing talents to the analysis of smell as well. Later significant contributors to this field include Hendrik Zwaardemaker, with his olfactometer, and Hans Henning, who schematized smells into a prismatic space, and, more recent yet, workers such as Carl Pfaffmann and Linda Bartoshuk who undertook electrophysiological and chemical research on smell and taste.

The illustrations of the last few pages show how much ferment there was in the portion of physiology that borders on psychological issues. The research foci and methods of early quasi-psychological physiology continued vigorously as a major area of scientific endeavor later among the first self-styled experimental psychologists.

Quantification

About 1800 the great German philosopher Immanuel Kant argued that psychology could never be a science. Science requires measurement and experimentation, he held, and psychological events cannot be quantified or experimented with like physical phenomena. Both of these arguments were essentially refuted long before the end of that century. Among other landmarks, certain fundamental psychological phenomena were translated into mathematical terms by Johann Friedrich Herbart, Weber, and Fechner; psychophysics was developed to measure mental events; and Hermann Ebbinghaus did quantitative experimental work with memory.

The Personal Equation and Reaction Time

An early development in quantification was the formulation of the **personal equation,** a forerunner of the study of reaction time. At the Greenwich observatory in England, at the end of the 18th century, the astronomer Nevil Maskelyne was working with his assistant David Kinnebrook in calibrating ships' clocks against the transit of a star across a hairline in a telescope eyepiece. Kinnebrook reported the star passage on average 0.8 second later than Maskelyne, and therefore, so the story goes, Maskelyne fired him.

The Prussian astronomer Friedrich W. Bessel, at Königsberg, heard about the Greenwich matter and considered the Maskelyne–Kinnebrook difference as due not necessarily to error or sloppiness but possibly to natural individual differences. So he started to calibrate himself against his colleagues and against people at other observatories with regard to the timing of stellar transits. In this way he managed to compute personal equations, so that constants could be added to one astronomer's reported times to convert them into those obtained by another astronomer. That is, a time reported by one observer (say, t_m for Maskelyne's report) could be converted into another's (say, t_k for Kinnebrook's) by the simple formula $t_k = t_m + 0.8$ sec.

The measurement of reaction time, or **mental chronometry,** rose out of the personal equation work. The Dutch physiologist F. C. Donders performed some early reaction-time experiments, contrasting simple with complex reaction time, the first requiring a predetermined response to a particular stimulus and the latter involving discrimination among several stimuli or responses. The increase in the amount of time required for a discriminative as against a simple response was considered a measure of how long the mental process of decision takes.

Wilhelm Wundt later further developed this **subtractive method** (subtracting the time it takes for a simple task from the time it takes to perform a more complex one) for measuring various mental operations, based on the difference that Donders had obtained. One of Wundt's students, Ludwig Lange, discovered that attention to the response decreases the reaction time relative to how long it takes if one pays attention to the stimulus; this led to the distinction between sensory and muscular reaction time. Another student of Wundt's, Oswald Külpe, argued against the subtractive method, asserting that the entire act is not simply the sum of this sensation plus that decision plus the other response process but rather must be considered as an integrated whole.

This development occurred about 1900, and, although studies of reaction time continued to be important in the first half of the 20th century, they declined somewhat from their prominent position in the latter half of the 19th. But reaction time once again became a variable of major interest in cognitive science, a field that has come to dominate experimental psychology since the 1970s.

Statistics

The early investigators appeared to ignore that there are intraindividual differences in variability in addition to interindividual constant errors of the kind studied by Friedrich Bessel. Carl Friedrich Gauss, in his study of the general error distribution, developed the equation for the **normal curve of distribution** (Figure 3.3) and for various measures of variability.[1] This normal distribution played a major role in the later study of individual differences and in the interpretation of mental tests; Adolph Quetelet found that the normal law applies to many biological and social measurements on human beings.

Gauss's description of the normal curve of error early in the 19th century was also the beginning of a period of invention of a wide variety of statistical procedures. Statistics developed at about the same time as experimental psychology, with much work going on during the 19th century as well as in the first half of the 20th. The regression equation and the concept of **correlation** were devised by Sir Francis Galton and were refined by Karl Pearson (whose name is given to the product-moment correlation coefficient), Charles E. Spearman, and others.

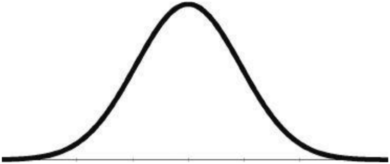

FIGURE 3.3 Gaussian (normal) distribution curve.

Early in the 20th century the theory of **factor analysis,** implicit in some of the work of Spearman and further elaborated by scholars like L. L. Thurstone, provided methods for reducing huge intercorrelation tables to simpler, conceptually meaningful structures. Statistics as we know it today developed rapidly during the first half of the 20th century, with the name of R. A. Fisher standing out as a giant contributor to what is now considered classical statistics. During the middle of the century a whole new series of statistical inferential tools were devised, including the nonparametric statistics, which do not require the series of assumptions that classical statistics requires and which all too often cannot be met by actual measurements. And new procedures, including parameter estimation and other sophisticated techniques for generating quantitative theoretical models, have flourished in recent decades.

Mathematical Models

Another trend (which has a long history, in that Euclid first developed it, and it was then used by many philosophers, such as Spinoza) is the mathematico-deductive or **hypothetico-deductive** approach to theorizing characteristic of Clark Hull in mid-20th century psychology—that is, a systematic statement of hypotheses and the rigorous deduction of consequences from them. A closely related chain is the construction of mathematical models of psychological processes. In a way, one can view Fechner's theory and certainly Herbart's work, both of which will be considered in a later chapter, as part of this tradition. The construction of mathematical models came up again as a major movement in the middle of the 20th century, especially in the form of a proliferation of mathematical models of learning. Cognitive psychology, which has flourished since the mid-1960s, appears to be obsessed with computer analogs and models of human cognitive processes. All **computer simulations** of such psychological events are necessarily, of course, highly precise, explicit, and quantitative.

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[1] Some have argued that P. S. de Laplace and A. de Moivre have priority over Gauss in developing the normal law of probability, but the curve is nevertheless most widely known as the Gaussian distribution.

CHAPTER 4

The Lines of Development From Philosophy

Although the five trends from science left their impress on later psychology, the contributions of philosophy to the emerging independent discipline were no less marked. Indeed, in the first third of the 20th century, psychology was still typically taught in departments of philosophy. Although the trends from science largely concern a collection of facts and discoveries, with empirical investigation, mathematical thinking, and a set of popular research areas dominating the Zeitgeist, those from philosophy are more a series of significant fundamental problems, with various different answers and occasional reformulations of the problems proposed by successive philosophers. Each of the three trends—critical empiricism, associationism, and scientific materialism—had a profound influence on psychology, so each one will be considered briefly here in turn.

Critical Empiricism

Before critical empiricism could flourish, there had to be a change in attitude from the one that prevailed in the Middle Ages, when writers derived their knowledge from authorities such as Aristotle and the Church Fathers. The acceptance of the idea that one should find out for oneself, the break with authority in science, occurred primarily in the 16th century—during the Reformation, when the priests' dicta began to be questioned. If one wanted to know how many teeth a horse has, maybe one should look not in a book but in a horse's mouth, even at the risk of getting one's finger of cherished authoritarian prejudice bitten in the process. The Zeitgeist changed with the discovery of America and the rediscovery of old Latin and Greek texts, and there were major political events, such as the fall of Constantinople marking the end of the Byzantine Empire, which demonstrated that the order of things to which people were accustomed was not necessarily permanent or the best.

Early Empiricists

Among the influential thinkers who carried the new spirit of freedom of inquiry into scientific matters were Nicolaus Copernicus, who dared to differ with authority in opposing Ptolemy's geocentric system by proposing that the sun, not the earth, is the center of the universe, and Johann Kepler, who mathematized Copernicus's formulations using his own and Tycho Brahe's measurements of the movements of the heavenly bodies. In the conceptions of these astronomers, human beings and the earth are not at the center of everything, the earth is not flat but spherical, and the motions of the heavenly bodies are not perfectly circular but elliptical.

Empirical measurement overrode authority and disturbed deeply entrenched beliefs, traditions, and social mores. In 1600 William Gilbert employed a strictly experimental method in the study of magnetism, holding certain variables constant while varying others systematically. About the same time Galileo Galilei was developing an empirical and quantitative approach to mechanics and physics, examining natural phenomena rather than Aristotle or Aquinas to achieve an understanding of the physical environment. Sir Francis Bacon extolled the virtues of an inductive, observational approach to knowledge in his *Novum Organum* (1620) and proposed that the sciences are related in a hierarchy and should be used as a guide to reform society. The British physiologist William Harvey published his work on the circulation of blood, heralding the new era of an empirical approach to biology. The application of measurement to physical phenomena was extended to the study of light and gravitation by Isaac Newton. The break with authority pervaded the Zeitgeist.

Many questions central to the concern of the critical empiricists had, however, already been asked by the Greeks. They were curious about what the world is made of and how it is possible for a mere human to obtain knowledge of it. Critical empiricism tries to answer both of these questions, but primarily the second one. It was in response to the first question that the sciences of physics, chemistry, and biology arose, and methods for reliable observation were developed. But in response to the second, the critical empiricists asked: What do we contribute to the knowledge we experience? What is the nature of our experience? How does the world of experience relate to the world of physical objects?

One of the most important forms of this question was the nativism—empirism issue: namely, are we born with certain ideas, or do all the contents of our mind enter it through experience? From Plato down through René Descartes, it was believed that we are born with at least some ideas, such as the axioms of geometry; many later philosophers tended more to the empirism of Aristotle, holding that we are born without knowledge of specific ideas and that all of our thoughts develop in some way or another from our experience of the world about us.

The philosophical underpinnings of knowledge were a central concern of all empiricists. Consider briefly the thought of two early modern philosophers, Descartes and Hobbes; the contrasting views of Spinoza, Locke, and Leibniz; the influential doctrines of British empiricists Berkeley and Hume; followed by the German philosopher Kant's disagreement with much of the empiricist tradition.

Descartes

René Descartes (1596–1650) was one of the great early modern figures in the nativism–empirism debate (Figure 4.1). He reported that he constantly had trouble getting away to find a quiet place where he could think and work, where he could avoid everyday social life and turmoil. A courtier and a soldier who took part in the Thirty Years' War, he is best known as a philosopher and mathematician. According to his account, on November 10, 1619, while he was in winter quarters on the banks of the Danube, he had a dream that resulted in analytical geometry. The invention of a coordinate space for the translation of algebraic terms into geometrical ones and vice versa was a landmark in the history of mathematics.

In his philosophical musings, he was determined to start from the beginning and try to find out what he could be certain of *without* recourse to authority. He doubted everything he could possibly doubt. He decided that the only thing of which he could be certain was his doubting; everything else could be a self-deceptive illusion—but he could not doubt the process of doubting itself. Arguing that doubting implies a doubter, he became convinced of his own existence, resulting in the famous statement ***cogito ergo sum***, "I think, therefore I am." Having, to his own satisfaction, unquestionably established his own existence, he went on to prove the existence of God and of the real world. In doing so, he tried also to demonstrate that certain ideas, particularly mathematical and religious ones, are innate.

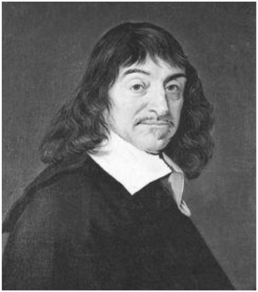

FIGURE 4.1 René Descartes (1596–1650).

Descartes espoused a mind–body **dualism** much like that of Plato: the body is conceived as material ("**extended**") substance, and the mind as thinking ("**unextended**") substance. Descartes was convinced that mind and body interact; he tentatively chose the pineal gland at the base of the brain as the probable locus of this interaction but was not fully satisfied with this solution. The body itself is a machine, like any physical body, including stars and stones (a belief that has the flavor of scientific materialism), but the human soul is not a machine. Animals are bodies without souls and are therefore automata, or machines. People, in addition to their animal body, possess *l'âme*—a soul or a mind, the unextended substance that distinguishes them from the animals. The soul perceives, wills, and has built-in ideas such as mathematical axioms (like multiplication and addition) and the idea of God; many ideas also come from experience.

Descartes, then, held a somewhat nativistic view, believed in an interactive mind–body dualism, and maintained a scientific materialism, at least as far as the human body and animals are concerned.

Hobbes

Thomas Hobbes (1588–1679) sought to analyze the dynamics of human mental activity. The springs of action, Hobbes believed, are pleasure and pain. This **hedonistic** view had already been propounded by some Greek philosophers and was also held by his contemporary, Descartes. Descartes and Hobbes argued that love is an emotion associated with positive affect, with pleasure, while hate is associated with "unpleasure"; we do what we do because we try to achieve pleasure and avoid pain. These ideas were later to be picked up by Jeremy Bentham and the rational economists, who tried to account for the behavior of humans as economic beings in terms of simple pleasure and pain; they also form the conceptual core of much of psychoanalysis and of several 20th-century learning theories, such as those of Edward Thorndike and Clark Hull.

Hobbes lived during a time of revolution and political unrest; in 1588, the year of his birth, the Spanish Armada was destroyed, and England soon became the chief sea power and colonizer. Hobbes, a staunch Royalist, was profoundly troubled by the beheading of Charles I in 1648. His enormously influential work in political science, published in 1651, titled *Leviathan*, supported the natural right of kings; in this book he undertook analyses that make it possible to consider him the originator of social psychology: What are the conditions giving rise to chaos, to revolution, and to social change? (Other contenders for this honor could include Niccolò Machiavelli and Sir Thomas More, predecessors of Hobbes, both of whom had also attempted dispassionate analyses of political behavior.)

Like Machiavelli and many other pessimistic philosophers before and since, Hobbes assumed that human nature is basically evil: we are motivated by thirst, fear, hunger, and the quest for honor. The social order, an uneasy contract among individual people, is needed if we are to live at peace with each other. Such ideas, which have a venerable origin, were also important much later, as in Freud's concept of the fundamentally self-seeking nature of the human being.

Spinoza

Benedict Spinoza's (1632–1677) philosophy was written in a more logical, geometrical form, using axioms and theorems, than the works of Descartes or Hobbes. An expert lens grinder by trade, he wrote influential works on epistemology and ethics with sophisticated and insightful observations about human motivation and is also well known for his proposed solution to the mind–body problem. He elaborated **double-aspect monism**, a position that holds that mind and body are but two different aspects of the same unitary basic underlying substance—they are like the two sides of a coin. Hence, the activities of the mind must be determined just as lawfully as are those of the body.

Locke

John Locke (1632–1704), a seminal British philosopher, was primarily a politician; when the Earl of Shaftesbury was prime minister, Locke served as his secretary (Figure 4.2). In 1690 Locke published his *Essay Concerning Human Understanding*. This book, as it happens, was the belated product of an inquiry that Locke had made in preparation for a paper that he had agreed to present at an informal evening discussion club of which he was a member. The work represents a realistic, matter-of-fact, commonsense examination of the bedrock question of critical empiricism: how do we obtain knowledge?

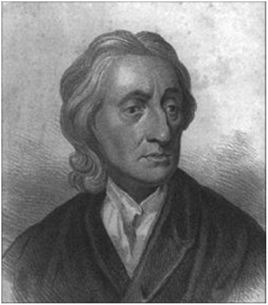

FIGURE 4.2 John Locke (1632–1704).

For Locke, the *idea* is the fundamental unit or element of mind. The elements are tied together in groups; hence, we need a principle of association. Locke was the first to use this particular term, in a later edition of his book. The associated ideas can be simple or compound. No idea is innate; *all* ideas come from experience (or from reflection—a process in which the mind looks back into itself); like Aristotle, then, Locke believed that at birth the mind is a clean slate—even the axioms of geometry and the idea of God come solely through sensation and reflection.

Locke also distinguished between **primary** and **secondary qualities** of perceptions. The primary qualities correspond directly to Newtonian characteristics of real objects: solidity, figure, motion, number, shape, and weight. Secondary qualities (color, sound, and taste) are aroused in us by the powers of objects; they do not resemble objects or represent the properties of objects. Thus, objects reflect certain wavelengths of light; their color quality as such is not in the objects themselves but is "in us."

Locke was interested not so much in what people do as in the nature of mind. This emphasis on the contents of the mind makes Locke a forerunner of early 20th-century structuralism in psychology; by contrast, Hobbes, with his emphasis on the activity of mind, can be seen as a forerunner of 19thcentury **act psychology** and early 20th-century functionalism. Aside from his contributions in philosophy and from his being secretary to a prime minister, Locke was also a highly influential political theorist: his treatise on government had a profound impact on the writers of the U.S. Constitution.

Leibniz

Gottfried Wilhelm Leibniz (1646–1716), a contemporary of Locke and Newton, was a philosopher, world traveler, and mathematician. Independently of Newton, and at about the same time, he conceived the infinitesimal calculus. A bitter squabble arose among Newton's and Leibniz's friends about priority; nowadays we still use the symbols Leibniz invented.

In his most important philosophical work, the *Monadology*, Leibniz held that the world is made up of independent **monads.** The monads are self-sufficient atoms that do not interact, but each contains its entire past and future. In contrast to Locke, for Leibniz all knowledge is therefore innate. But if all monads are "windowless," have no access to the "outside," and neither influence nor are influenced by other monads, why do monads—like the mind and the body—*seem* to interact? How are they coordinated? Leibniz's answer, which avoids the problem of a material substance being affected by or affecting an immaterial substance, is the concept of **preestablished harmony,** or **psychophysical parallelism.** Monads act as though they are synchronous clocks, all showing the same time but not affecting each other. It is God who synchronizes the clocks of psychophysical parallelism for the monads, and the mutual influence among monads is only apparent.

In Leibniz's conception, the mind monad has degrees of clarity and degrees of consciousness. His analysis made a critical distinction between sensation and higher-level perceptual processes. There are ***petites perceptions***, literally "little perceptions," which are in a sense subthreshold and correspond to sensation; at a higher level of clarity, there is **apperception,** resulting in suprathreshold awareness. Clear perceptions are apperceptions, while the least clear ones are unnoticed sensations below the threshold of awareness. Enough sensations combined can result in an apperception, as a single pebble moving on the beach might not be heard, but a large group of moving pebbles makes a clearly audible sound. This kind of summative atomism was also to be characteristic of many later writers on sensation and perception, such as James Mill, Wilhelm Wundt, and E. B. Titchener.

Berkeley

George Berkeley (1685–1753), Irish theologian and philosopher, for many years was bishop of Cloyne. He traveled extensively in the New World, including in Rhode Island and Bermuda, with the hope of establishing a university there; he was unsuccessful, but a city in California, still important on the educational scene, is named after him. Later in his life he inherited some money, left his bishopric, and went to Oxford, where he spent his time philosophizing. When he was in his early 20s, he wrote two works that were to have a profound impact on later philosophy and especially on critical empiricism: the *New Theory of Vision* in 1709, and *Principles of Human Knowledge* in 1710.

For Berkeley, mind is the immediate reality (which is reminiscent of Descartes's *cogito ergo sum): esse est percipi*—to be is to be perceived; to be perceived is to be. The question is not how mind affects matter (as in Descartes) or how matter generates mind (as in Locke) but how mind generates matter, since mind is the basic given. This is the philosophy of **idealism,** leading ultimately to **solipsism** (from *solo ipse*, "only the self"—the belief that the only reality is myself and that of which I am aware). How can I know that there really is something outside my mind causing and corresponding to my perceptions? All I can be sure of is that I have various experiences—it is impossible to escape the solipsistic trap that ultimately all we can know is our own experience.

But Berkeley did try to escape solipsism, by way of the concept of a perfect God. He proposed a slight variation of a medieval argument: since a God who allows us to deceive ourselves is less perfect than one who would not permit such deception, our experience *must* correspond to the "real world out there." In effect, God put the real world out there to correspond to our experience, simply because God is good. So Berkeley did, in a sense, believe in the existence of the outside world, although he made it a logical derivation from God's beneficence.

Berkeley also distinguished between perception and imagination by classifying our ideas about the world; vivid ones we call perceptions, while less vivid ones are imaginations. But Locke's distinction between primary and secondary qualities dissolved in Berkeley's idealism; there are no such things as primary qualities, since everything depends on the mind.

The chief contribution of Berkeley's *New Theory of Vision* was a carefully worked-out empiristic approach to perception. The visual perception of objects and of distance is based on experience and learned by association, with tactile–kinesthetic sensations forming the basis of the learning. Berkeley also provided a remarkably modern summary of the cues for the perception of distance. The primary cues, according to Berkeley, are accommodation, convergence, and blurring; he also described what have been considered the secondary cues for distance perception, like superposition, perspective, and relative size. Experience, said Berkeley, makes it possible for us to interpret such cues in terms of the perceived distance of visual objects.

Hume

David Hume (1711–1776) stated Berkeley's idealistic monism even more consistently, persuasively, and convincingly, without bringing in God to support a conviction about the existence of a real physical world (Figure 4.3). A Scottish philosopher and historian (writing, among other works, a major history of England), he held various political positions. Hume was a restless person, a perfectionist, and several writers have conjectured that he was held back by his own standards of achievement. Yet he left a major impact on Western thought. His important works include *Treatise on Human Nature*, published when he was 28, and *Inquiry Concerning the Human Understanding*, his most significant philosophical contribution, published when he was 38.

Mind, Hume argued, knows only its own processes. This led him to doubt the existence of external reality, of anything (including God) outside his own mind. Hume's skepticism about reality extended even to the existence of self—the ego is, fundamentally, nothing more than a collection of ideas. His acceptance of Berkeleyan solipsism was complete, in that he did not feel compelled to use God to try to justify the existence of a real world. Apparently Hume did not enjoy the skepticism to which his reasoning had brought him, but he was intellectually honest enough to admit that he did not know how to pull himself out of it.

FIGURE 4.3 David Hume (1711–1776).

Hume's celebrated analysis of cause and effect is a consequence of his general skepticism: how can we know that there really is a **necessary connection** between them? The necessary connection could easily be an illusion produced by the repeated contiguity in time and space of certain events. Hume also followed Berkeley in distinguishing between impressions (sensations and perceptions) and images (which are faint copies of the impressions); the contents of the mind include **simple** and **complex ideas,** the latter formed out of simple ones by association.

Kant

Immanuel Kant (1724–1804), professor of philosophy at Königsberg, an old town in East Prussia, became famous in the history of philosophy for his clarity, obscurity, pedantry, and intelligence (Figure 4.4). Strictly an academic, he epitomized the image of the Herr Professor, being interested solely in matters of the mind. He never traveled far from Königsberg, although his interests ranged as widely as geography, astronomy, pacifism, and religion. Among his many influential philosophical treatises is the *Critique of Pure Reason*, on which he worked for about 10 years and which appeared in 1781. Kant says that he wrote it because Hume's skepticism had "roused him from his dogmatic slumbers."

FIGURE 4.4 Immanuel Kant (1724–1804).

In this work, Kant compared himself to Copernicus, reversing the order of things: Our perceptions, he says, do not give us our concepts, but our **percepts** are given to us according to our concepts—according to our inborn ways of perceiving the world. These inborn molds, filters, or **categories** as Kant called them, include cause and effect, time and space; we cannot perceive the world in other than causal, spatial, and temporal terms. Thus, the mind makes us perceive the world according to certain innate principles or categories; the categories are responsible for the organization and structure of our perceptions. Kant's statement that the mind is responsible for the organization of perception can be viewed as an anticipation of later Gestalt theory and of various "constructivist" approaches to perception of the latter half of the 20th century, such as Jean Piaget's and Ulric Neisser's. A real world does, said Kant, exist—the world of ***noumena***, or things-in-themselves—but we can never be directly aware of it without the interposition of the filter of our categories.

Critical Empiricism After Kant

The immediate post-Kantian philosophers pointed to the absurdity of belief in Kant's *noumena*, a real world that is by definition unknowable, and the fundamental epistemological question of the nature—and existence—of an extrasubjective world has remained thorny ever since. Later in the 19th century and carrying over into the 20th, the "positivistic" movement developed, in which an attempt was made to analyze experience with the aim of discovering that of which we could be positive, but a genuinely satisfactory answer has not been achieved.

The critical empiricist tradition was the background for the continued concern with methodology in 19th- and 20th-century psychology. The research spirit, which persistently asks, "What do we *really* know, how can we find out, what can we conclude, how can we be reasonably sure?" gave rise to such movements as **operationism** in the 20th century and to concern with **objectivity** and the "scientific method."

Associationism

The attempt to explain complex wholes as concatenations of units, elements, or atoms hooked together in specifiable ways was made by the Greeks and continued to be very popular through the ages, down to the present. Aristotle had stated his three laws of association: contiguity, similarity, and contrast; much later Locke, as mentioned earlier, reintroduced the concept of association, and Berkeley and Hume made extensive use of it. The development of associationism in England and Scotland profoundly affected modern psychology; it explained complex mental phenomena in terms of the bonding of elemental ideas. Edward L. Thorndike called his early 20thcentury psychology "**connectionism**," and a perusal of the contents during the 1970s and 1980s of, for example, the *Journal of Experimental Psychology: Human Learning and Memory* or the *Journal of Verbal Learning and Verbal Behavior* shows that many experiments were still carried out on simple associative processes. This tendency, however, has been diminishing in recent years as a result of the "**cognitive revolution**" later in the 20th century.

Hartley

David Hartley (1705–1757) helped reestablish the doctrine of associationism in modern Western philosophy. In his work *Some Observations on Man*, he presented what could be considered an early physiological psychology of mental life; a core idea in it was that the physiological correlates of ideas become associated in the brain. Hartley argued that stimuli produce vibrations in nerves and that sensations are the result of the vibrations; these vibrations do not stop suddenly but continue, after cessation of the stimulus, in a weaker form. He called the residues of vibrations **vibratiuncles;** they are responsible for afterimages and for memory and can be associated by contiguity. Hartley's physiological speculations bear some similarity to the theory of the distinguished Canadian psychologist D. O. Hebb (1904–1985), which was influential around the middle of the 20th century. Hebb's use in his theory of the concept of reverberating neural circuits is somewhat analogous to Hartley's use of the concept of vibratiuncles.

Hartley's laws of association include repetition as well as contiguity, and he used them much as his contemporary Hume did. He also argued that simple associations get compounded into clusters or complex ideas, so that the idea of an apple, for example, is a complex compound of many associated sensory elements. Many more recent views such as those of Clark Hull or Kenneth Spence are quite similar to those of Hartley, in spite of Karl Lashley's warning early in the 20th century that explanations of behavior in terms of **reflex arcs** and chains of associated neurons are doomed to failure because they are too static. Perhaps the idea holds on so tenaciously because it is so beautifully simple. The spirit of Hartley remained very much alive in later associationism, in the conditioning approach, in the research field of verbal learning, in much of psychophysiology, and in a number of recent "connectionist" computer models of cognitive processes.

The Scottish School

The Scottish school, which flourished during the 18th century, further elaborated associationism. Thomas Brown, who preferred the term *suggestion* to the term *association* (one idea can *suggest* another), specified some conditions for association in addition to contiguity and repetition: liveliness, intensity, and recency, among others. In the Scottish school were also Thomas Reid and Dugald Stewart, the latter the teacher of James Mill; both supported the associationist position but did not contribute any major systematic changes. It was Reid who formulated the 20-odd powers of the mind that formed the basis of Gall's classification of the **faculties.** Sir William Hamilton added the important concept of **redintegration**: if an element in a large associative compound stored in your memory is reactivated, you might become conscious of the entire compound again, as when a particular melody or a distinctive smell reminds you of an earlier experience, bringing it back into consciousness in vivid detail.

The Mills

According to several historians of psychology, James Mill (1773–1836) represents the culmination of the philosophy of associationism. A civil servant in India and the author of a major history of India, he published in 1829 *An Analysis of the Phenomena of the Human Mind*. He was a strict elementist, conceiving of the mind as constituted solely of sensations and ideas, the latter classified as simple or complex, the complex being compounds of simple ideas. There is only one basic principle of association: contiguity. Ideas occurring at the same time tend to be associated (a view to be developed again in detail, in a slightly different version, by E. R. Guthrie during the 20th century); similarity and contrast are just special cases of contiguity. Any mental whole, for Mill, is the sum total of its constituent compounded ideas or elements. So, for example, our idea of "everything" is the sum total of all of the ideas in our minds.

James Mill's son, the brilliant John Stuart Mill (1806–1873), provided a major new departure for the associationist doctrine in his contention that an associative compound can have properties different from those of its component parts. Individually tutored by his father in his early years, he later was a clerk in the India House and a Member of Parliament in the House of Commons. Although he wrote no books on psychology as such, he did write influential treatises in such areas as sociology, logic, political science, liberty, utilitarianism, and women's suffrage.

Convinced like his father that association is the primary law of mind, John Stuart Mill wrote a detailed commentary on his father's work in the form of lengthy footnotes. He preferred the term **mental chemistry** (to his father's **mental mechanics**) for the compounding of ideas and argued that the compound of several elements can yield something entirely new—as, for example, the wetness of water is not deducible from the properties of hydrogen and oxygen, the elements composing it. The compounds often act like new units, or like elements with new properties. Ideas coalesce with each other, forming new wholes.

J. S. Mill also made some contributions to critical empiricism: he went beyond Berkeley by arguing that matter is the **permanent *possibilities of* sensation**; that exists which can *potentially* be perceived. Perception, he held, includes a belief in the real existence of the object perceived.

Spencer and Darwin

Herbert Spencer (1820–1903) was trained as an engineer; early in his career he became a permanent invalid, so he decided to devote his time to writing treatises about all of the sciences, including sociology, political science, and psychology. In 1855 his two-volume *Principles of Psychology* appeared. The work included the new idea of **evolutionary associationism:** associations that are often repeated in the lifetime of an individual or in a race will be transmitted to the offspring as an evolutionary **instinct.** This is how instincts like the web spinning of the spider or the nest building of birds arise; instincts are inherited concatenations of reflexes. His work anticipated, and his later thinking was influenced by, his cousin Darwin's *Origin of Species* (1859).

The breadth of Spencer's thought (which went far beyond a pure, limited associationism) is exemplified by his espousal, in his *Principles of Psychology*, of a double-aspect monism much like Spinoza's; he also developed a hedonistic account of motivation. The work included, further, discussions of feelings and of the elements of mind; in a section on education he maintained that the aim of schooling is to facilitate **adjustment** to one's environment: "Life is a continual adjustment of internal to external circumstances." An emphasis on adjustment became particularly characteristic of the functionalist psychology in the United States of the first half of the 20th century; the view is still prevalent in the current Zeitgeist, and many psychologists remain interested in the mechanisms that organisms use in coping with the problems and challenges of everyday life.

Evolutionary thinking affected the associationist traditions in the direct form inherent in Spencer's evolutionary associationist doctrine of instinct and also became the fundamental hedonistic concept in Thorndike's **law of effect** and Hull's principle of **reinforcement.** Darwin's emphasis on the survival of the species that "works," that fits its surroundings, has a parallel in the principle of later learning theory that those responses in an organism's repertoire will survive that "work" in the sense of satisfying needs, but those that do not or that lead to annoyance or pain will drop out, as Thorndike and Hull held.

Charles Darwin (1809–1882; Figure 3.1) is important in the history of psychology primarily because of his vast and detailed *Origin of Species* (1859), in which he supported with massive data his major principles of evolution: chance mutation and the **survival of the fit,** that is, of organisms that are well suited to their ecological circumstances. Alfred Russell Wallace proposed a similar theory in a brief paper at about the same time but did not present the huge wealth of data in support of it that Darwin had amassed. Darwin also wrote a more psychological book, *The Expression of the Emotions in Man and Animals*, in which he argued that evolution occurs not only in morphology but also in behavior, including the expression of emotion; examples of evolutionary vestiges include the baring of teeth in dogs before they fight, which still has some utility, as against the clenching of the teeth in an angry human, where the adjustive function of preparing to bite is, at least in modern civilized society, much less clear.

Bain

A professor of philosophy at the University of Aberdeen in Scotland, Alexander Bain (1818–1903) can be credited with a number of "firsts" in the history of psychology. He wrote the first systematic textbook of psychology in English. The book was also the first on psychology to begin with a chapter on neurology. As a whole, the work is more systematic than that written by Spencer at about the same time. Bain's treatise was published in two parts: in 1855 Part One, *The Senses and the Intellect;* in 1859 Part Two, *The Emotions and the Will*, the will being identified by Bain with the spontaneous activity of the nervous system. The work was one of the first to include a chapter on habit. His chapter on association included two laws—contiguity and similarity—and also a statement of what was later, in Thorndike's hands, to become the law of effect: behavior occurs according to **trial and error,** with chance movements, from among which the successful ones are selected for retention.

In 1872 Bain published *Mind and Body*, the first text devoted to this topic; he espoused a psychophysical parallelist position, because he believed that interactionism is incompatible with the idea of conservation of energy. In 1876 he founded the first psychological journal, *Mind,* which was to be a major outlet for influential philosophical and psychological works, including a paper by Darwin on education and childhood training.

Scientific Materialism

Scientific materialism is the belief that the phenomena of mind and behavior are ultimately describable in the concepts of the mathematical and physical sciences. Proponents of this view maintain that scientific explanations must avoid unobservable, supernatural forces. Opposite to scientific materialism are animism and **vitalism.** Animism holds that spirits inhabit inanimate things; it leads to concern with such matters as souls, spirits, and reincarnation. Vitalism, as espoused by the biologists Johannes Müller and Hans Driesch and by the philosopher Henri Bergson (with his concept of the *élan vital*), argues that living beings do what they do because of the vital spirit within them, a spirit that transcends their physical characteristics; a nonmaterial active agent determines the behavior of living things. By contrast, scientific materialism is mechanistic and deterministic; this view cleared the way for a scientific psychology by arguing that human thought and action are subject to the same mechanistic laws as any other natural phenomena.

French Materialism

Scientific materialism grew out of French philosophical materialism; some of Hobbes's mechanistic ideas can also be seen as forerunners of later scientific materialism. Descartes too had already taught that animals are automata, and Julien de La Mettrie, about a century later, made the same statement as Descartes but claimed that it held of human beings as well as of animals: people, too, are at bottom automata. His *L'Homme Machine*, which appeared in 1748, argued for an objective, materialistic, naturalistic description of mental life and behavior. La Mettrie could be viewed as an ancestor of 20th-century behaviorism.

A short time after La Mettrie, Etienne de Condillac, in his *Treatise on Sensations*, continued the argument that human behavior can be explained mechanically, materialistically. If one could endow a marble statue with only the sense of smell, he proposed, one could generate the entire gamut of mental processes in it. Although the statue will then have a mind, Condillac argued, it will have no soul. The Swiss philosopher Charles Bonnet wrote a book with a similar theme but endowed his speculative statue with the sense of sight and with nerves.

Pierre Cabanis, a French physician who took part in the French Revolution, in 1789 raised the question (appropriate to the Ortgeist because of the wide use of the guillotine) of whether beheaded people still sense and think. He studied the reflexes of severed heads and bodies, and his research convinced him that consciousness is the function of the brain, much as digestion is the function of the stomach. Once the body is separated from the head, the head is no longer conscious. Thus, the scientific materialistic answer to the question of whether beheaded people still sense and think was, according to Cabanis, no.

British Materialism

The British versions of scientific materialism were not as extreme and outspoken as those of the French, but the tendency was there nevertheless. Scientific materialism came into British writings, as it were, somewhat casually. W. Harvey, about a century before Descartes, had written in Latin on the motion of the heart and the blood, implicitly describing these functions as purely mechanical and hydraulic; vital spirits or animal spirits had no place in his account. In 1677 Francis Glisson, a noted philosopher–physician in England, pointed to the importance of an experiment by the Dutchman Jan Swammerdam, in which it was demonstrated that the contraction of muscles is not due to their being entered and expanded by mysterious animal spirits. If a muscle is immersed in water and then contracted, the level of the water does not rise. This elegant, simple experiment provided a direct disproof of the Cartesian notion that the contraction of muscles is due to the flowing in of substantial animal spirits. Touched on earlier were the researches of Robert Whytt, who demonstrated in the middle of the 18th century that reflexes in frogs are due to specific stimulation and that no animistic or vital force is required to explain their occurrence. At about the same time, David Hartley was trying to reduce mental processes to his physiological speculations concerning vibrations and vibrati-uncles, which he conceived of as strictly natural, material events within the nervous system.

German Materialism

German thinkers such as Leibniz and Kant tended toward idealism in philosophy but toward scientific materialism (with some reservations) in science; thus, Johannes Müller, for example, was a leading biological and physiological scientist but held a vitalist position. Wöhler’s synthesis of urea in 1828, already referred to several times, demonstrated that the production of organic compounds does not depend on the presence of a living body; his synthesis destroyed vitalism in chemistry.

Among the more dramatic declarations of scientific materialism was one made by four of Johannes Müller's students, all in their 20s at the time, in 1842. The manifesto was written by DuBois-Reymond in collaboration with the physiologist Ernst von Brücke; soon after, Hermann von Helmholtz and Karl Ludwig joined them, and legend has it that each signed it with his own blood. Although no one objected to scientific materialism in the physical sciences, the closer that one came to psychology, the greater the general opposition seemed to be, mainly on religious and ethical grounds. Defiantly, DuBois-Reymond wrote:

Brücke and I pledged a solemn oath to put into effect this truth: no forces other than the common physical-chemical ones are active within the organism. In those cases which cannot at the time be explained by these forces one has either to find the specific way or form of their action by means of the physical-mathematical methods or to assume new forces equal in dignity to the chemical-physical forces inherent in matter, reducible to the forces of attraction and repulsion.

Later Materialism

Later in the 19th century and early in the 20th, partly as an outgrowth of the Darwinian revolution, biological workers such as George John Romanes, C. Lloyd Morgan, John Lubbock, and Jacques Loeb provided detailed mechanical descriptions of animal behavior. In 1890 Loeb reported some of his work on the **tropisms,** or specific, directed mechanical movements of animals—and plants—as a function of stimulation; the tropistic view, growing out of German materialism, was an explicit return to Descartes's conception of organisms as automata. Russian **reflexology,** too, in the 19th and early 20th century, with contributors such as Sechenov, Bekhterev, and Pavlov, had a profound effect on the growth of behaviorism in the United States. It will be considered in greater detail in Chapter 11 when the antecedents of behaviorism are summarized.

Perhaps best known as a kind of corollary of the DuBois-Reymond statement is Lloyd Morgan's version of the law of parsimony, later referred to as **Lloyd Morgan's canon:** "In no case may we interpret an action as the outcome of the exercise of a higher psychical faculty, if it can be interpreted as the outcome of the exercise of one which stands lower in the psychological scale." In the 20th century John B. Watson and especially B. F. Skinner were exemplars of the thoroughgoing application of scientific materialism to all behavior of all organisms, including human beings.

Summary of Part I

Although the origins of many of the trends culminating in the experimental psychology of 1860 and beyond can be seen in Greek and pre-Renaissance thought, it is primarily the history of ideas since the Renaissance that casts light on the academic and intellectual Ortgeist and Zeitgeist of mid-19th-century Europe, where experimental psychology was born.

Five major lines of development from science contributed to the birth of experimental psychology about 1860. In *physiology*, there were the rediscovery of the anatomical distinction between sensory and motor nerves, the study of the electrical nature of the nerve impulse, anatomical and functional studies culminating in the neuron theory, the controversy concerning the localization of functions in the brain, the doctrine of specific nerve energies, and extensive research in sensation. *Biology* contributed the careful study of morphology and, to a lesser extent, behavior; the most important influence from biology was the concept of evolution. *Atomism* was a prevalent and useful approach in physics, chemistry, and other fields, and therefore many people tried to be atomistic in the analysis of mental phenomena too. The desirability of *quantification* was very much in the Zeitgeist; study of the personal equation led to mental chronometry and the study of reaction time, descriptive and **inferential statistical** tools were developed, and the psychophysical methods grew out of the attempt to quantify mental events. There was a strong tendency to *establish* formal research and training *laboratories* in the natural sciences.

Three major trends in philosophy influenced the newly developing science of psychology. *Critical empiricism*, with roots in Greek and Renaissance thought and carried on by the new philosophers—among whom Descartes, Locke, Berkeley, Hume, and Kant stand out—examined the important question of how one can acquire knowledge. *Associationism*, begun by Aristotle and taken over particularly by the British philosophers of the 18th and 19th centuries, attempted to explain how ideas hang together. *Scientific materialism* had its modern origins in Descartes, was picked up in particular by French philosophers, but was also contributed to by British and German thinkers; one of its chief tenets is that mind and behavior are part of the natural world and can be described and studied just as scientifically and materialistically as any other phenomena.

It was, then, out of scientific developments in physiology and biology, the establishment of laboratories, and the tendency toward quantified atomistic thinking as well as the philosophical views of associationism, critical empiricism, and scientific materialism, that the new science of experimental psychology arose.

PART II

THE RISE OF EXPERIMENTAL PSYCHOLOGY

CHRONOLOGICAL CHART: 1800 TO 1900

Some Landmarks and People in World History	Approximate Date	Some Landmarks and People in Psychology's History
Goethe	1800	phrenology
Beethoven		
Napoleon	1810	Charles Bell
War of 1812		Flourens
Monroe Doctrine	1820	Herbart
Mexican Republic		Magendie
Erie Canal		Wöhler
first public railroad		James Mill
Victoria of England	1830	Weber
industrial steel		John Stuart Mill
Dostoyevsky	1840	scientific materialist manifesto
Tchaikovsky		Ohm
		Dix
Marx: *Communist Manifesto*		Johannes Müller
California Gold Rush	1850	Helmholtz
Crimean War		Lotze
		Spencer
		Darwin
U. S. Civil War	1860	Fechner
Emancipation Proclamation		Broca
Trans-Atlantic telegraph cable		Donders
Dominion of Canada established		Galton
Suez Canal	1870	Hering
A. G. Bell invents the telephone		Fritsch and Hitzig
		Brentano
Edison invents the light bulb	1880	Wundt: first laboratory
Red Cross founded		Hall
Booker T. Washington: Tuskegee Institute		Stumpf
		Ebbinghaus
Statue of Liberty		Mach
		Cattell
Eiffel Tower	1890	Ehrenfels
		James

		Calkins
		APA founded
X-rays discovered		Witmer: first clinic
		Külpe
		Dewey
Klondike Gold Rush		Titchener
Spanish–American War		Thorndike
		G. E. Müller
Boxer Rebellion		Wundt: *Völkerpsychologie*
	1900	Freud

CHAPTER **5**

Wundt's Immediate Predecessors

W

hether one selects the year 1879, in which Wilhelm Wundt received a budget for what many people later considered the first laboratory of experimental psychology, or chooses 1860, the year of publication of Fechner's *Elements of Psychophysics*, or pulls out still some other arbitrary date, such as the year 1875, when Wundt at Leipzig and James at Harvard each received space for a demonstration laboratory for psychology, clearly it was during the latter half of the 19th century that experimental psychology achieved its status as an independent science. The new discipline manifested the eight trends that are the focus of Part I: it was influenced by five developments in science (physiology and biology, quantification and atomism, and the founding of laboratories) and three in philosophy (associationism, critical empiricism, and scientific materialism).

Fechner might have been the herald of the new psychology, but Wundt is generally viewed as its founder. Accordingly, Part II is organized primarily around Wundt. First will be a characterization of German psychology just before his time to provide context and further background. Then Wundt and his system are considered in some detail and thereafter some other figures who were prominent in late 19th-century psychology. Part II ends with a glance at psychology in the United States, for by the early 20th century psychology's center of gravity had shifted from Germany to the United States.

Some German Contributors Before Wundt

The German Zeitgeist in the age of Wundt was an Ortgeist; it was local to Germany and still characterized much of German psychology during most of the 20th century. The intellectual climate was academic, with ponderous terminology and heavy, serious, hard-to-read tomes; many of these works are very formal and appear pedantic to the modern reader. Much of German philosophy was strongly nativistic, which contrasted with the empirist emphasis that Wundt and his colleagues were to impose on the new psychology. The Ortgeist nevertheless venerated objectivity; it was scientific, with an emphasis on rigorous experimentation, and systematic, with explicitly stated, thorough theoretical formulations. Paradoxically, mysticism was in the air at the same time, particularly on the fringes of psychology (and even among some early pioneers of psychology), in concerns with God, social behavior, and the soul. Romanticism was locking horns with classicism, and there was much interest in other languages and cultures, particularly "exotic" Oriental ones. The great literary figure Johann Wolfgang von Goethe exemplified this fascination with folk culture and emotional expression. It is perhaps no accident that psychology focused, somewhat romantically, not on behavior but on subjective experience (in contrast with the Ortgeist in the United States, particularly the later behaviorism, with its extreme emphasis on the "objective"), but German psychology was also physiological, largely under the influence of the scientific trends characterized in Chapter 3.

Wolff

This spirit had been developing over a long period. Leibniz, who was mentioned in Chapter 4 under "Critical Empiricism," was a major early figure in this development. His approach influenced another 18th-century philosopher, Christian von Wolff (1679–1754). A contemporary of Hume, Wolff published two major, formidable treatises: *Empirical Psychology* in 1732 and *Rational Psychology* in 1734. In these volumes, Wolff expounded and popularized Leibniz. Adopting a psychophysical parallelist view of the mind–body relation, Wolff also attempted a detailed explanation of human mental events in terms of faculties; he proposed a set of faculties for knowing, remembering, imagining, sensing, understanding, reasoning, loving, and so forth. This faculty psychology was to be used later ingeniously by the phrenologists. In his discussion of the will, Wolff argued that feelings of pleasure and pain determine behavior, carrying on and strengthening the hedonist tradition, which was already evident in Descartes and Hobbes and which culminated in the law of effect of Thorndike and the law of reinforcement of Hull. Wolff was the first writer to use the word *psychology* in the title of a monograph. The first use of the word as such was apparently by Martin Luther's linguistic consultant, Philip Melanchthon—whose last name, incidentally, as was the custom of the day, was rendered into Greek in his writings; his German name was Schwarzerd—or "black earth."

Herbart

A major pre-Wundtian figure was Johann Friedrich Herbart (1776–1841), philosopher, psychologist, and, according to some, the first educational psychologist; one can also make a case for him as the first mathematical psychologist. Even though he contradicted Kant concerning the possibility of a science of psychology, by developing a sophisticated mathematical approach to psychology, he succeeded Kant as professor of philosophy at Königsberg. That Herbart was offered the chair at Königsberg was apparently no accident, since the university was at the time famous for mathematics, with such renowned scholars as the mathematician–logician Leonhard Euler on its faculty. After Königsberg, Herbart went to Göttingen, also well known for its contributions to mathematics.

Herbart published his *Textbook of Psychology* in 1816 and *Psychology as Science* in 1821. It was in the second book that Herbart gave what he considered his answer to Kant; he showed that psychology could be quantitative. Already in the *Textbook*, he maintained that psychology must be based on experience, that is, that it must be empirical; further, it should and can be mathematical. However, he held that it could be neither physiological nor experimental, because physiological concerns and experimental techniques tend to fractionate, and one must deal with the mind as a whole. This conception of the mind as organized and unitary is part of the holistic tradition out of which Gestalt ideas emerged a century later.

According to Herbart, ideas in the mind are dynamic; they possess energy in that they attract or repel one another. Ideas are constantly at war; they struggle with each other to win a place in consciousness. Ideas are never really forgotten; they are just pushed below the threshold or limen of consciousness by competing ideas.

Herbart's formulation makes explicit use of the concepts of the unconscious and of repression, which played such a major role in Freud's later theorizing; it is also a forerunner of some aspects of Kurt Lewin's **dynamic psychology.** Each idea strives to rise into consciousness but can do so only when the pattern of ideas already in consciousness—that is, what Herbart called the **apperceptive mass**—is receptive to that idea. The new ideas fuse with the apperceptive mass; what one learns, therefore, depends to a large extent on what one already knows and on the immediate mental set. The function of **attention** is to produce an appropriate apperceptive mass, making ideas easier to consider, easier to apperceive. Herbart quantified his theories of apperception, the limen of consciousness, the activity of ideas, and their fusion in a manner clearly anticipating some of the late 20th-century's mathematical models approaches.

Basing his pedagogy on his psychology, Herbart argued in his educational prescriptions that the teacher, in planning a lesson, should follow five steps: (1) review previous material; (2) prepare for what is to come next, the purpose of which is to induce an appropriate apperceptive mass; (3) when the mind is in the right receptive state, and only then, present the new material; (4) relate the new material to what came before; and (5) look forward, showing applications of the new material and also introducing what will come next. Many teachers today still use some variant of this teaching technique, and it is considered by many to be effective.

J. Müller and Weber

Two physiologists, both mentioned before, also contributed substantially to the rise of experimental psychology: Johannes Müller and E. H. Weber (Figure 5.1). Müller's influential *Handbook of Physiology* included detailed discussions of depth perception and sensation, and presented a full statement of the doctrine of specific nerve energies. Weber did quantitative work in a number of sensory modalities. He also studied the **two-point threshold** and found that there are major differences among various parts of the body in how far apart two points touched simultaneously must be for a person to tell that they are two and not just one. And he concentrated on the **just noticeable difference** (jnd; i.e., how much a stimulus has to be changed for a person to notice that it has changed), the work on which resulted in the generalization that Fechner later called **Weber's Law** (discussed under **Fechner's Law**).

FIGURE 5.1 Ernst Heinrich Weber (1795–1878).

Lotze

Another important figure in the emergence of the new psychology was the philosopher–psychologist Hermann Lotze (1817–1881), a patron of the experimental psychologist G. E. Müller and a teacher of the phenomenologist Stumpf and the act psychologist Brentano. Herbart's successor in Göttingen, Lotze published his influential *Medical Psychology* in 1852. Lotze was a mystic, philosopher, and poet; he is best known in the history of psychology for his theory of **local signs,** an explanation of space perception that is partly nativistic and partly empiristic. Following Kant, he held that one cannot perceive the world without construing it in spatial terms. The details of the spatial relations among various parts of the retina, between different parts of the skin when touched, and so forth, however, are based on learning. Long experience with the sensory consequences of certain movements eventually produces a local sign for each part of the sensory surface, so that we become aware not only of the fact that we are touched but also of precisely where we are touched and learn about the relative locations of various parts of the sensory surface. In his book, which is considered the first genuine physiological psychology, Lotze also described facial expressions of various emotions and patterns of expressive movement a few years before Darwin's well-known work in the same area. Lotze's achievements were recognized by a call to a chair at the prestigious University of Berlin in 1880, but he died a few months after he arrived there.

Helmholtz

An intellectual giant in 19th-century science, Hermann von Helmholtz (1821–1894; Figure 3.2) was a physicist, physiologist, and psychologist; each of these disciplines claims him for its own. His father was an instructor in a military college that had a surgical department, where Helmholtz was trained (on what was then equivalent to the post–World War II GI bill in the United States) as an army surgeon. He never undertook formal training at a university but was close to various leading university figures of the day, including especially the physiologist Johannes Müller at the University of Berlin. He moved from appointments at Königsberg (where he remained for 7 years and where Kant and Herbart had preceded him), then at Bonn (for 2 years), then at Heidelberg (where he stayed for 13 highly productive years and where the young Wundt assisted him in his physiological laboratory), to the University of Berlin, where he spent the last 23 years of his life.

Physical and Physiological Contributions

In 1847 Helmholtz published a highly significant monograph on the conservation of energy; that the concept was in the Zeitgeist is demonstrated by the fact that it was proposed independently by J. R. Mayer, a physician, who published a popular paper on it in the same year. In 1856 there appeared the first volume of Helmholtz's *Handbook of Physiological Optics* (Volumes 2 and 3 were published in 1860 and 1866); Boring, as late as 1949, still called the work a "gospel in this field." The year 1863 saw the publication of his work on hearing, *The Sensations of Tone*, which like his *Optics* was destined to remain very important in physics, physiology, and psychology. In 1878 appeared *The Facts of Perception*, a theoretical analysis of perception that elaborated on his influential concept of **unconscious inference.** Helmholtz accepted an invitation to visit the Chicago World's Fair in 1893; he also visited William James while he was in the United States (James, incidentally, found him a bore). On the way home he fell down a hatch on his steamer, broke his hip, and never fully recovered; he died in 1894.

Helmholtz made an astonishing number of contributions to the science of his day. Aside from his works in physics, among the most significant was his measurement of the speed of the nervous impulse in 1850 at Königsberg, which was described briefly in Chapter 3 and which defied his teacher, Johannes Müller, who had thought that the speed of nervous conduction might be in excess of the speed of light and could probably never be measured. Helmholtz's father, on hearing of the experiment and the surprisingly slow measured speed, wrote to his son that he would as soon believe this result as that one can see the light of a star that burned out a million years ago—inadvertently a singularly apt analogy. In vision, there were his detailed experiments on color mixture and the Young–Helmholtz color theory, which is a highly influential account of how our perception of hues is mediated by differential activation of three different kinds of retinal cones: those sensitive primarily to stimuli in the red, green, or blue parts of the visual spectrum. This theory remained the main theory of color vision until a rival opponent-process theory was proposed by Ewald Hering years later. He also invented the ophthalmoscope, a device for observing and measuring the interior of the eye and the retina and in his *Handbook* presented a detailed physiological description of the mechanism of accommodation, showing how lens curvature varies with the activity of the ciliary muscle. In hearing, he contributed extensive studies of musical consonance and dissonance and a specific fiber energies theory of pitch perception, the resonance place theory. The theory, which was mentioned briefly in Chapter 3, held that the basilar membrane in the cochlea in the inner ear is composed of minute fibers of varying length under various degrees of tension, each of which resonates to a different impact frequency.

Perception and Unconscious Inference

As for general perceptual theory, Helmholtz distinguished between sensation and perception in a manner similar to that later espoused by Titchener and later still by the mid-20th-century transactionalists: sensation is awareness of stimulation, whereas perception is compounded of sensation plus experience. What one receives is the bare sensory pattern, the stimulation of the end organ. Perception is a far more complex cognitive process, involving unconscious conclusions based on past experience: the perception of a chair, for example, involves the addition of a great deal of further material to the bare sensory input by a process of unconscious inference (*unbewusster Schluss*). Added to the raw input to the receptor surface—that is, on the various wavelengths of light impinging on various parts of the retina—is one's past experience with chairs, for example, that they typically have four legs, are usually made of wood, and are made to sit on. The sensory experience has no meaning as such; perceiving that it is a chair depends on a complex cognitive judgment, inference, or conclusion, which occurs without the perceiver's awareness. This empiristic view of perception is epitomized by Helmholtz's favorite example: the perception of depth arises by unconscious inference from **retinal disparity;** that is, the discrepancy between the immediate sensory patterns on the two retinas leads to the unconscious inference, and hence the perception, of depth. Although unconscious inference is an *unconscious* logical contribution of the perceiver to the percept, Helmholtz argued that the inference is nevertheless irresistible.

Helmholtz also pointed to a derivative principle that is important to the philosophy of science. Because observers inevitably contribute to their perceptions, Helmholtz argued, any observation, however much it might be supported by information precisely obtained with scientific instruments, necessarily remains a personal observation. It can therefore be affected by the observer's prejudices, past experiences, and personality—an idea that was to be central to the "new look in perception" and the theory of the transactionalists of the mid-20th century.

One should not leave Helmholtz without once again referring to his militant acceptance of scientific materialism in his blood oath, jointly with DuBois-Reymond, Ludwig, and Brücke, which was mentioned in the preceding chapter in the section on "German Materialism."

Fechner

Gustav Theodor Fechner (1801–1887), one of the contenders for the title of the first genuine experimental psychologist, was the son of a village pastor (Figure 5.2). He led a quiet life, obtaining his MD and then teaching as a physicist at the University of Leipzig, where for a long time he stayed at the beginning postdoctoral academic teaching level, equivalent to what would be an instructor or assistant professor in the United States. He worked many hours doing translations to supplement his meager income and reportedly ruined his eyes; fairly early in his life he retired with a small pension. Some of his research while he taught physics culminated in a significant paper on the theory of the production of electricity by batteries. Although officially a physician and physicist, he was more of a philosopher and a mystic, fighting the materialism of his day in the interests of spiritualism.

FIGURE 5.2 Gustav Theodor Fechner (1801–1887).

Fechner's Mysticism

Fechner's animistic mysticism was evident in a number of antimaterialistic books that elaborated on a panpsychic view of human beings and the world, the view that mind pervades all of nature. These books, many of them tongue-in-cheek, were published under the pseudonym of Dr. Mises. One made fun of materialism (particularly in the form espoused by Georges L. L. Buffon); in it Fechner used the then current methods of rational physiology to go into great detail on the comparative anatomy of angels. In another he tried to prove scientifically by the same methods that the moon is made of iodine. In response to DuBois-Reymond's materialistic oath, he published another book, which he meant seriously: *Nanna, or Concerning the Mental Life of Plants;* also serious was his *Zend-Avesta, or Concerning Matters of Heaven and the Hereafter*. Interesting as these panpsychic works are and crucial as they seemed to Fechner in his own thinking, his most influential works for the development of psychology proper were the epoch-making *Elements of Psychophysics* (1860) and also, to a lesser extent, his *Introduction to Esthetics* (1876); the second of these volumes marks the founding of a quantitative, empirical approach to esthetics.

Fechner's Law

Fechner's mathematical facility, his predilection for experimentation, and his philosophical beliefs combined to produce psychophysics. Like Spinoza, he held a double-aspect view of the mind–body relation, but he went further than Spinoza in that he sought to prove it by writing an equation demonstrating the fundamental identity of the two. He began with the statement of what he called Weber's Law: $\Delta R/R = k$, where R stands for *Reiz* (the German word for stimulus). Any *jnd* can be considered a ΔR; $jnd = \Delta R$. Weber's law says that the *jnd* is relative; stimuli, to be noticeably different, have to be changed by a relative, not an absolute, amount. This critical fraction is different for different sensory modalities, but, argued Fechner, in all modalities, for *jnd*, one can write ΔS (S for sensation—a just noticeable difference, and ΔS is the minimal physical change in the stimulus required for a minimal change in the sensation), so that the two aspects of matter (mind and body) can be related. This yielded the fundamental formula:

$$\Delta S = C(\Delta R/R)$$

where S is sensation, R is *Reiz*, or stimulus, and the constant, C, varies from one sensory modality to another. The left half of the equation is the mental aspect and the right half the physical aspect of the "fundamental substance." Integrating the fundamental formula yields the well-known measurement formula:

$$S = k \log R$$

That is, the mental sensation is a logarithmic function of the stimulus (if the stimulus is measured in terms of increment above threshold); as the stimulus increases linearly, the sensation increases as the logarithm of the stimulus. This equation, incidentally, is largely responsible for the various logarithmic measures of physical intensity used today, such as the decibel for sound intensity.

Psychophysics

While Fechner's law is still of considerable interest, it has been largely superseded by the formulations of Harry Helson and S. S. Stevens in the 1950s. Still more significant was Fechner's methodological contribution. In attempting to establish the empirical validity of his law, Fechner did extensive experimental work and invented the psychophysical methods that now form the basis of measurement in a wide variety of fields, including not only sensation but also many forms of psychological testing, the measurement of social attitudes, and other subfields of psychology.

Fechner used three primary methods; all involve a standard stimulus and a variable stimulus, the latter to be compared with the former:

1. The **method of limits** (sometimes also called the **method of just noticeable differences**) involves the serial presentation of successively different values of the variable stimulus, in order, in an

attempt to find the limits of what stimulus values are considered equal to the standard, or you can begin outside the "equal" region and slowly increase or decrease the variable stimulus until it is considered equal to the standard. In this way, you can find the limits of the "equal" zone.

2. The **method of constant stimuli** (also known as the **method of right and wrong cases**) is the most exact of the methods. The research participant is presented with trials composed of the variable stimulus paired in random order with the standard. The task is to judge whether the variable is greater or less than the standard (a variation also permits a judgment of "equal").
3. The **method of reproduction** (also called the **method of adjustment** or the **method of average error**) requires the research participant to set the variable stimulus so that it appears equal to (or just greater than or just less than) the standard.

These three methods for the first time made it possible to measure psychological quantities precisely.[1] Altogether, psychophysics was not only the first empirical excursion into the quantification of experience; it was also the first explicit effort to conduct experiments on the mind. Even Wilhelm Wundt was to acknowledge that Fechner's psychophysics was the first work in truly experimental psychology.

Experimental Esthetics

For Fechner, psychophysics was really an avocation; his main interest was philosophical, yet his philosophical works are now largely forgotten, and his main claim to an illustrious place in history lies in the development of psychophysics. But he is also remembered for his attempt to make **esthetics experimental** in his 1876 book, which contains the formulation and empirical examination of such questions as what are the most pleasing proportions of doors, animals, and geometric figures and marks the beginning of an attempt to develop esthetics as a quantitative discipline.

The Stage Is Set for Psychology's Emergence

Late 19th-century Germany was a fertile setting for the establishment of an empirically based psychology as a new discipline. The Ortgeist was ready. Leibniz and Wolff had begun the process in the 18th century, and Herbart proposed detailed quantitative analyses of mind early in the 19th century. Müller, Weber, and Lotze did seminal work on sensation that was to become part of the new discipline, and Helmholtz dealt with psychological questions from the perspective of natural science. Fechner took a decisive step in the founding of psychophysics, a clearly experimental psychology. All this came together in the systematic work of Wilhelm Wundt.

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[1] As indicated in an earlier paragraph, these methods are applicable not only in the perception laboratory but also in the assessment of individual differences, in the measurement of attitudes, and in industry; for example, producers of alcoholic spirits use sophisticated psychophysical scales of the quality of their products.

CHAPTER **6**

Wilhelm Wundt

W

ilhelm Wundt (1832–1920; Figure 6.1) was the pivotal figure of the era in which experimental psychology emerged as a separate discipline on the intellectual scene. Reported to have been humorless, aggressive, and an untiring worker, Herr Professor Dr. Wundt in his experimental work personified the spirit of post-Fechnerian systematic German psychology. But Wundt was actually less interested in experimental psychology (which he considered basic) than in what is now called cognitive psychology, sociocultural psychology, and **psycholinguistics,** not to mention philosophy. Recent scholarship has established that the view of Wundt that has pervaded English-language history of psychology, as primarily a systematic experimental psychologist, is a distortion that perhaps was fostered by Wundt's student Titchener, and Titchener's student Boring, possibly as an inadvertent consequence of their effort to add legitimacy to Titchener's structuralism. Be that as it may, Wundt remains a major figure in psychology's history.

The Man and His Works

Wundt's was a long, productive life, spanning a period of rapid change. In 1832, the year of his birth, the first railroad tracks were laid in Germany between Nürnberg and Fürth; this was also the year of Goethe's death. People used horses for travel and candles to light their homes. Wundt lived until 1920, 2 years after the end of World War I, by which time electricity, the radio, and the airplane had become commonplace.

FIGURE 6.1 Wilhelm Wundt (1832–1920).

Wilhelm Wundt had a quiet childhood; like Fechner and Friedrich Nietzsche, he spent his early years in a village pastor's house. Several of his siblings died, and one brother left home early; much of the time he was the only child in the home, but his parents apparently did not pay much attention to him. He was taught by a tutor, a vicar who was his father's assistant. The vicar left after a few years; what home must have meant to Wundt is shown by the fact that Wundt left with him.

When Wundt entered school, he did not do well, mostly, it seems, because of problems with social adjustment. His mind wandered; his work was so poor that he had to repeat one year, although later he did do well enough to keep up. When he was 19 he began attending Tübingen University in southern Germany and thereafter went to Heidelberg, where he studied medicine and became interested in physiology. His reason for going into medicine and earning an MD degree was strictly practical and economic—he chose it because he wanted to make a decent living.

After a year's internship at Heidelberg, he realized he did not enjoy working with patients and went for a year to the University of Berlin to study with Johannes Müller. He received his medical degree at age 24 and started teaching at Heidelberg. Later Hermann von Helmholtz gave him an assistantship in his laboratory, and Wundt directed the exercises in Helmholtz's laboratory course in physiology. He started publishing while at Heidelberg and continued to be astonishingly prolific throughout the remainder of his career.

Wundt obtained his first regular teaching position in 1874 at Zürich, Switzerland, as professor of philosophy in inductive logic. In 1875, to Wundt's surprise, he received a call from the University of Leipzig to become professor of philosophy there; this was a major chair at the time. According to his autobiography, Wundt never knew why the offer came; it might have been because of the 1874 publication of his *Physiological Psychology*, or largely through Fechner's influence, or perhaps because the physicist J. K. F. Zöllner (who has a well-known perceptual illusion named after him) was impressed with him.

At any rate, Wundt became professor of philosophy at Leipzig and stayed there until the end of his life (even though an attempt was made later to get him to go to Berlin, a university with even greater prestige). In 1875 he requested space for demonstrations, and by 1879 he had a functioning psychological research laboratory, the Psychologische Institut, which began as a single room.

At Leipzig he led the dedicated life of a scholar; he did not appear to be excited about anything other than his work. Even his wife and family received no more than one paragraph in his published autobiography. His dedication went so far that he analyzed his psychological experiences when he was very seriously ill and near death; at one point in his life he expressed interest in the idea of experiencing the process of dying.

During the first few years he had no assistant at the Institut; then, according to Wundt's autobiography, James McKeen Cattell, his student, came to him and said "in typical American fashion," "Herr Professor, you need an assistant, and I shall be he." Cattell served for a time without pay; later the university provided funds for an assistant for Wundt and the Institut grew rapidly.

Many of the books Wundt wrote turned out to be important. In his late 20s, he published two books: one on the theory of muscular movement, and one titled *Contributions to the Theory of Sense Perception*. In his early 30s, because he needed it for his medical students while teaching for Helmholtz, he published his *Textbook of Human Physiology;* for the same reason, he published another, the *Handbook of Medical Physics*. In 1863 appeared what might be considered the first comparative psychology: *Lectures on the Minds of Men and Animals*. In 1874 he published his influential, lengthy *Fundamentals of Physiological Psychology;* the title was intended to imply, in part, that psychology should employ the same scientific methods as those used in physiology. This usage was to affect later practice as well as the book published by psychologist George Trumbull Ladd in the United States in 1887. In 1881, largely to serve as a publication outlet for research conducted in his laboratory, he started a new psychological journal, *Philosophische Studien*, whose title was later changed to *Psychologische Studien*. During a period of about 12 years he published a series of books on philosophy, each a huge, compendious volume: a logic, an ethics, and a major systematic philosophy. His *Outline of Psychology*, which underwent many revisions before he died, first appeared in 1896.

Between 1900 (when he was 68) and 1920 (when he died at the age of 88) he published a series of 10 weighty volumes titled ***Völkerpsychologie***, a kind of cultural psychology based on artifacts and institutional products. Concern with cultural psychology had been a major focus of influential German psychologists such as Hajim Steinthal and Moritz Lazarus for several decades by the time Wundt began publishing in this field. Many of these, as well as most of his other books, underwent several revisions before Wundt's death. In recent years, his work on language and cognition, which had previously not been translated into English, was "rediscovered"; it contains many seminal ideas similar to ones current in the psycholinguistics and cognitive psychology of the 1970s, 1980s, and 1990s. Indeed, to repeat what was said in the opening of this chapter, though Wundt is still widely seen as the founder of experimental psychology, it is now clear that he was much more interested in the problems discussed in his *Völkerpsychologie* (and rediscovered in the fields of psycholinguistics and cognitive psychology in the 1970s) than he was in experimental psychology as such.

As several historians have remarked, it is fitting to Wundt's systematic nature that his autobiography appeared in 1920, the year of his death. It has also been proposed that Wundt's enormous productivity was in part due to a gift from his assistant Cattell, who gave him a typewriter from the United States—the same typewriter that Cattell had used for his PhD thesis in 1886.

Wundt's Psychology

Wundt's primary interest throughout his long life was the relation of the individual to society. He viewed experimental psychology as a small but crucial step toward the larger goal of a genuine science of human social evolution. By "science" he meant not only natural science but social science as well; psychology must be both. His 1863 book on human and animal minds devoted as much space to sociocultural as it did to experimental psychology; from the start, sociocultural psychology was his primary interest. The first course he taught at Zürich in 1874 was on the psychology of language. At Leipzig, to which he moved permanently in 1875, he lectured on a broad array of topics in philosophy and psychology, and the last course he gave there, just before his retirement in 1917, was on cultural psychology.

Wundt called his own view of psychology **voluntarism.** Organisms are striving, purposive, goal-directed creatures, he insisted; mental life is active, a developing process rather than a static, passive one.

Wundt did not promote introspection in the sense of the rigorous description of subjective experiences (this became the method of preference of Wundt's disciple Titchener); instead, he advocated what he called "experimental self-observation"—but self-observation complemented by rigorous measurements. He championed the experimental method for psychology in the sense of the use of objective indices (such as reaction time, word associations, or discriminative responses to sensory stimuli) of mental processes. The typical investigation involved an experimenter who manipulates technical apparatus and records measurements and a separate research participant, whose responses are largely controlled by the apparatus. For that matter, Wundt advocated sparing use of the experimental method in psychology; too much attention to it could detract from and interfere with the more significant work of theory development, in part because experiments can be performed only on relatively simple, basic psychological processes. Indeed it is somewhat ironic that Wundt chided his devoted follower Titchener for his excessive use both of **systematic introspection** and of the experimental method. Wundt argued for naturalistic observation of social and developmental processes; this basically historical method, he held, is a necessary complement to experimentation because experimentation tends to have too narrow a range of application and is incapable of use with the more interesting complex psychological processes.

While Titchener later developed and elaborated a psychology of mental elements, Wundt claimed that the active processes of mind are such as to make it very difficult, if not impossible, to isolate the elements in mental compounds as one can in chemical compounds: mental elements do not exist independently of the compounds within which they occur. Thus, Wundt's psychology was not as atomistic or structural as Titchener's was to be; rather, it was synthetic and almost functional in the sense that the functionalist school later used the term.

Sociocultural psychology was for Wundt a far more promising route to the understanding of emotion and volition than experimental psychology. And much of his sociocultural psychology, as was typical of philosophers and psychologists of his time, was devoted to the psychology of language, or what is now called psycholinguistics. Wundt believed that inborn expressive gestures are the origin of language both in human evolution and in the individual child. Words, he held, obtain their meaning (consistent with his principle of **creative synthesis,** of which more is said later in this chapter) from the context of the sentence within which they occur; in fact, Wundt invented the tree diagram for parsing sentences, showing their structure, which has been used by linguists ever since and by cognitive psychologists as well in recent years. In line with his emphasis on the active, constructive nature of mind, Wundt viewed language as generative: utterances are the product of the creative synthesis of one or more mental contents, following specific grammatical rules. His approach was, at bottom, not fundamentally different from the generative or transformational grammar of Noam

Chomsky that was to revolutionize the psychology of language soon after the middle of the 20th century and that was to help establish the new cognitive psychology. Indeed, to repeat, many of the problems that now claim the attention of cognitive scientists in general and of psycholinguists in particular can be found in at least germinal form in Wundt's sociocultural psychology.

But the content of Wundt's cultural psychology was broader than that. Other volumes of the massive set focus on comparative studies of the arts, religions, mythologies, and moral and legal codes. The scope of Wundt's writings on psychology is enormous.

Wundt's System

Wundt's works on psychology as well as on philosophy were highly systematic and logical. He had a place for everything, he classified phenomena and methods into clear-cut categories, and he formulated principles about how the various classes are related.

The Field of Psychology, Its Methods, and Its Task

Wundt considered the older definitions of psychology, such as the science of the mind or of the soul, too metaphysical. He recommended that psychology should be defined as the science of consciousness. The subject matter of psychology is ***immediate* experience,** that is, experience as it is directly, phenomenally, given to the observer, whereas the subject matter of physics and the other natural sciences is ***mediated* experience,** that is, experience that has undergone inferences and conceptualizations. Experience is not fixed or static but rather involves connected events or processes, not objects; experience can *refer* to objects but is itself a series of subjective processes. Since psychology is the science of consciousness, it is complementary to all of the other sciences, for it studies the immediate experience—that is, psychology studies experience with the subjective left in, whereas the other sciences study experience with subjective factors removed. Psychology was for Wundt basic to, and a prerequisite for, all the "cultural" disciplines such as philosophy, history, law, and sociology, and preparatory to the philosophical fields of epistemology and ethics.

The methods of psychology are experimentation and observation without experimentation—still the two major methods. For Wundt, to repeat, an experiment consists of systematic variation of an independent variable (usually some kind of stimulus), while holding all other conditions constant, and assessment of concomitant changes in a dependent variable (typically some kind of reaction or report). Only observation, argued Wundt, can deal with the **higher mental processes,** with social phenomena, personality, cognition, and the like; these must be studied by way of the cultural products or artifacts of social life: language, art, religion, cultural mores, and ethics. Experimental method, then, is appropriate for the investigation of basic processes such as sensation, reaction time, and association, but observation—and systematic theory-driven developmental and comparative studies—must be used for the more interesting higher mental processes, which are inaccessible to experimentation. It was this conviction that led Wundt to his monumental *Völkerpsychologie*, dealing with the highest and most intriguing problems of psychology. *Völkerpsychologie*, for Wundt, was the keystone of psychology's arch. As mentioned previously, Wundt's strong interest in *Völkerpsychologie* reflected the then-current Zeitgeist and could be seen as part of the legacy of the romantic tradition in Germany late in the 19th century.

One task of experimental psychology is the analysis of conscious compounds and complexes into their constituent elements, the study of how these compounds are synthesized out of their elements, and the establishment of principles and laws of psychological events. In Wundt's system, the elements together form compounds; compounds together form combinations and complexes. The elements are axiomatically basic. Later critics, among them the Gestaltists, raised here the question of whether this might not be putting the cart before the horse. If immediate experience gives us compounds, why not start with these and derive the elements from the compounds rather than assume certain elements and then conceptually build up the compounds from them?

The Elements of Experience

According to Wundt, the elements can be categorized into sensations (referring to the objective contents of experience) and **feelings** (referring to the subjective contents of experience). Sensations can be classified according to the modality in which they are received; furthermore, they have quality and intensity. Feelings accompany the sensations and their compounds. Feelings have a much shorter time course than emotions and play a significant role in directing the process of apperception (see next section).

Wundt had different classificatory schemes for feelings at various times; perhaps the most influential was his **three-dimensional theory,** which used the dimensions of pleasantness–unpleasantness, tension–release, and excitement–calm. This theory was subject to extensive criticism later: Is calm the opposite of excited, as pleasant is the opposite of unpleasant? Or is it rather just the absence of excitement? Furthermore, is there a neutral point between tension and release or between excitement and calm, as there seems to be between pleasant and unpleasant? In addition, Wundt's theory assumed that the three dimensions are independent, but their independence soon came to be questioned. The hope was that specific feelings could be demonstrated to accompany certain physiological events, like a raised heartbeat and shallower breathing; Wundt's student Alfred Lehmann tried to establish that each feeling has its own particular physiological correlate, a different pattern for each feeling, but his attempt, like those of later researchers, was largely unsuccessful.

The characteristics of compounds are not, said Wundt, necessarily derivable from the characteristics of the elements—a conception Wundt took from John Stuart Mill's mental chemistry. The mind performs a *creative synthesis* on the elements. The sensations combine into perceptions like tone and space, and the feelings combine into the emotions and other mental contents like the feeling for rhythm, feelings accompanying volition, and so forth. Thus, the components of a piano tone, while they never occur separately when that tone on the piano is struck, can be made to occur separately, as with appropriately driven tuning forks.

Consciousness and Attention

Consciousness is a succession of combinations of compounds, by Wundt's definition; the basis of consciousness is the structure of the animal organism. The brain, which conditions consciousness, has separate organs for language, for writing, and so forth—a conception consistent with the assumptions of earlier faculty psychology and phrenology.

One of the major processes of consciousness is **attention,** which makes certain parts of the conscious field clearer than the background. The product of attention is a condition of very clear perception—the area attended to is the clearest part of consciousness. Apperception is the process of bringing things to attention, that is, to clearest perception; here the word *apperception* is used as it was by Leibniz, not by Herbart—that is, as clear, complex perception, not as a global attribute of consciousness and its receptivity to new ideas. Wundt distinguished between the ***focus*** and the ***field* of consciousness;** attention involves bringing things into the focus—items that are not in the focus are in the field. This conception is distantly related to Edgar Rubin's later distinction between **figure** and **ground,** which the Gestalt psychologists were to make a major part of their theoretical system; it is more similar to some ideas in the **Gestalt therapy** of Frederick Perls, who used these terms not in the way they were to be used in Gestalt theory but as essentially synonymous, respectively, with Wundt's *focus* and *field.*

Association

How are elements combined into compounds, and simple compounds combined into still higher-order complexes? The process is one of association, which occurs in three different forms—**fusion, assimilation,** and **complication:**

1. Fusion is a combination of elements that never occur separately, as, for example, a piano tone; you do not hear separately the pure-tone elements that compose it.
2. Assimilation is the fusion of elements, not all of which are present in consciousness; for example, when you are reading a word, you might not be aware of the particular letters, or of the particular type face. Assimilation involves supplementing what is perceived by

elements that are not in consciousness—a conception that has something in common with Hamilton's redintegration.

3. A complication is a compound of elements from different sense modalities, as in flavor (which is composed of taste, smell, temperature sense, and possibly tactile, kinesthetic, and visual components).

Mental Development

Wundt proposed two major fields of developmental psychological research: the study of child development, that is, the study of the development of psychological processes in the individual, and the cultural development of groups, which involves the study of language, law, art, religion, and so forth. The two were seen as entirely distinct fields; the latter, the evolution of the mind in the history of the human race, is a major focus of *Völkerpsychologie*, Wundt's favorite area.

Psychic Causality and Creative Synthesis

Wundt's answer to the mind–body problem was a psychophysical parallelism: causal laws operate in the mental sphere in a manner similar to the way they work in the physical sphere. What he meant by causality, however, was related to Hume's analysis. All that he referred to was regularity and lawfulness—the principle of **psychic causality** holds that mental events are just as orderly as physical ones. Wundt held that experience is unitary, even though one can conceptually divide it into mediated (the physical sciences) and immediate (psychology). The two kinds of experience are mutually consistent. Mediated experience involves causality; causality is inherent in all experience and thus also in immediate experience; mental causality cannot possibly contradict physical causality.

Although mental contents are compounded of elements, mental activity culminates in a creative synthesis. The mind acts on the mental elements, producing creative, unifying combinations; the result of the creative synthesis is different from the sum of the elements composing it. Here Wundt was in a way following the tradition of J. S. Mill and of Kant; a revised version of this principle was to become central in later Gestalt theory.

Wundt's Laboratory and Students

Wundt's laboratory flourished for many years. About half the work performed there was on sensation and perception, most of it with a strong physiological component. There was also much research on reaction time; Lange's finding that muscular reaction time is shorter than sensorial came to be hailed as one of the more significant discoveries in this field. Attention, association, and feeling, as, for example, the investigations of Lehmann referred to earlier, were among the list of areas studied.[1]

Much of the work emanating from Wundt's laboratory, including his own voluminous writings, involved Wundt in controversies. It has been reported that he became irritated and lost his temper in these controversies, usually being the one who made the first personal attacks. Wundt's name, incidentally, is an old spelling of a German word meaning "sore, wounded, chafed, or galled." Possibly his vituperation was another reflection of the social ineptitude that had troubled him during his school years.

Before long, students flocked to Wundt to learn about the new psychology. Leipzig became the world center for psychology, with a very active laboratory and with the first truly systematic and experimental psychologist, in the person of Wundt. He and his students raised important issues one after another and were doing something about them. Furthermore, Wundt's experimental approach epitomized the Zeitgeist; it exhibited the influence of all of the eight trends mentioned in Part I. The work was physiological and biological, with quantification a major aim. It was performed in a bustling research laboratory, with a primarily elementistic, atomistic orientation; the goal was to reduce all of consciousness to its elements. The theory behind the research, and much of the research itself, was associationistic, and scientific materialism was evident in, for example, the effort to relate psychological to physiological events. Finally, the emphasis on empirical, experimental methods, as well as the ideas that mental life is the product of the compounding of experience and that most mental events depend on past experience, exemplified the critical empiricist and empirist traditions.

Many of the students who came to Wundt became important in Europe and in the United States in later years. Among the Europeans was Emil Kraepelin, a psychiatrist who was responsible for the classification of mental disorders which, in a greatly modified form, is still in use in the 21st century; the current version is the *Diagnostic and Statistical Manual of Mental Disorders*, fifth edition (*DSM-V*) published by the American Psychiatric Association. Hugo Münsterberg was brought to Harvard by William James to enlighten U.S. scholars about the exciting new developments in Germany and to carry on experimental research in psychology. Alfred Lehmann began the tradition of trying to find physiological correlates of emotion, and Carl Lange provided the first formulation of what was later the renowned **James–Lange theory** of emotion. Then there was Oswald Külpe, who was to found his own influential rival school at the University of Würzburg.

Among Wundt's students from the United States was G. Stanley Hall (whose PhD, though, was from Harvard in 1878, under William James), later at Clark University, who wrote on child psychology, adolescence, and senescence as well as on many other areas and who founded the American Psychological Association. James McKeen Cattell, Wundt's first assistant and later a major figure at Columbia, was to start the massive tradition of testing people—especially college students—for individual differences. E. B. Titchener, later at Cornell University, became the center of U.S. structuralism, a school against which other U.S. psychologists could contrast their views, during the first quarter of the 20th century. H. C. Warren produced the first dictionary of psychology. G. M. Stratton, later at California, undertook classical studies of vision with inverting lenses. C. H. Judd, first a professor of education and later dean of the School of Education at Chicago, wrote a major psychology of social institutions, to some extent patterned on Wundt's *Völkerpsychologie*.

Wundt, then, even though his main interests lay elsewhere, became the personification of the new experimental psychology. Many issues he and his students raised dominated the psychology of the beginning of the 20th century and have persisted to the present. And the questions he addressed in his sociocultural psychology were rediscovered by the 1960s and 1970s and became the focus of the new cognitive science of **information processing** that has led psychological research during the last few decades. He was a seminal figure indeed.

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[1] Although Wundt's experimental work has sometimes been criticized as suffering from a certain narrowness, this criticism may be considered inappropriate. After all, this was just the bare beginning of genuine experimental psychology. Wundt can hardly be blamed that there were no studies of learning in the early years of his laboratory; that kind of work was not yet in the Zeitgeist and had to wait until after 1885, when Ebbinghaus's monograph on memory was published.

CHAPTER 7

The Contemporary Scene in the Age of Wundt

Significant though he is in the history of modern psychology, Wundt was, of course, not the only important psychologist at the end of the 19th century. Three of Wundt's contemporaries were making their own independent way and attracting students, although they did not have quite the influence Wundt had. These men were Franz Brentano, Carl Stumpf, and G. E. Müller. Two nonpsychologists of the time also had a profound impact on later psychology: the physiologist Ewald Hering and the physicist Ernst Mach. Wundt's student Oswald Külpe has already been mentioned, and then there was the quiet and independent Hermann Ebbinghaus, who also has been briefly referenced. In England, the versatile Sir Francis Galton was helping to lay the foundations for a psychology of individual differences and of **behavioral genetics,** which was to become a major focus of research starting in the middle of the 20th century. Stirrings were also beginning in the United States, but consideration of those developments is left for the next chapter.

Three of Wundt's Contemporaries

Brentano

Franz Brentano (1838–1917) founded the act school of psychology, whose tenets included ideas fundamental in later schools as diverse as functionalism, Gestalt psychology, and behaviorism. He came from a celebrated family, originally merchants in Italy that settled in Germany near Bonn on the Rhine River. The Brentano family included Clemens Brentano, a lyrical poet who collected folk songs (the world-renowned composer Gustav Mahler used this material in his musical work); Clemens's sister Bettina, who was one of Goethe's paramours; and Heinrich Brentano, who during the 1950s was foreign minister of Germany; in addition, a branch of the family owned the huge Brentano's bookstore in New York City.

Franz Brentano experienced several crises. A restless man and independent thinker, he studied for the priesthood; he earned his PhD in philosophy at Tübingen and was ordained the same year, 1864. His career as a Catholic priest ran into difficulty because of his liberal views (opposition to the doctrine of the infallibility of the Pope), which eventually led him to leave the Church. Later, he had an intense, long love affair and finally married his beloved; not many years later she died, leaving him heartbroken. He traveled a great deal in Switzerland and Italy and taught at several universities in Germany and Austria, including Würzburg and Vienna. A man of strong convictions, he was a pacifist and was plagued during the last 2 decades of his life by progressive blindness that, to his exasperation, interfered with his struggles to write philosophy.

In 1874, the year in which Wundt's *Physiological Psychology* appeared, Brentano—who, it must be remembered, was much more of a philosopher than a psychologist, advocating the **phenomenological** study of mental events—published his most important psychological work, *Psychology From the Empirical Point of View*, which presented views that were strikingly different from those of Wundt. Brentano held that it is a mistake to make psychology predominantly or exclusively physiological. Although he agreed that psychology should be empirical, Brentano believed it should not necessarily be experimental—if by experiment one means only systematic variation of an independent variable and concomitant measurement of a dependent variable.

Experiments are basically of two kinds: crucial and systematic. **Crucial experiments** serve to decide between two mutually incompatible conceptions. However, Brentano advised, one should not engage in unproductive **systematic experiments**—routinely changing an independent variable and measuring the resulting changes in a dependent variable to generate a mathematical function relating the two variables; they tend to be tedious and not very useful in the early stages of the development of psychology. One should try to systematize psychology, and, when there are doubts, perform an *experimentum crucis* (crucial experiment). Crucial experiments help decide about important issues, but systematic experiments do not. Brentano further declared that systematic experiments can produce an overemphasis on method and can create a blindness to the main issues facing psychology. This clearly is a very different position from that of Wundt, who championed thorough systematic experimentation. It can be argued that the distinction has a flavor that is too definite, too final; it is not always easy to tell whether an experiment is systematic or crucial. Furthermore, blindness to important substantive issues might be a characteristic not of a method, but rather of a poor experimenter. Also, it is by no means always possible to perform a crucial experiment—examples abound in 20th-century psychology, as in transposition, latent learning, and the continuity–noncontinuity issue, in which experiments first thought to be crucial turned out not to be decisive after all.

Another major difference between Brentano and Wundt lies in the distinction between psychology and physics. For Brentano, physical phenomena are self-contained and do not refer to other objects; they have an *intrinsic completeness*. Mental phenomena, on the other hand, have ***immanent objectivity***. That is, they refer to content, *imply* an object or a referent. All mental phenomena are acts referring to outside objects; objects are immanent in mental acts. The mental acts include ideating, recalling, perceiving, sensing, judging, loving and hating, feeling, wishing, and intending to do something. It is because mental events are all oriented "outside," because all acts imply objects, refer to something else, that Brentano's approach has been called "act psychology."

Brentano did not have many students but had a wide influence nevertheless. Külpe, trained primarily by Wundt, was later an admirer and follower of Brentano and perhaps his most outstanding one; although the British psychologists Ward, Stout, and McDougall did not study with Brentano, they were all influenced by him. McDougall, for that matter, translated the German word *Akt* into the English word *behavior*, defining psychology as the study of behavior—almost a decade before John Watson did. Although he cannot be considered a close follower of Brentano, the founder of modern psychoanalysis Sigmund Freud also happens to have attended Brentano's lectures for a year.

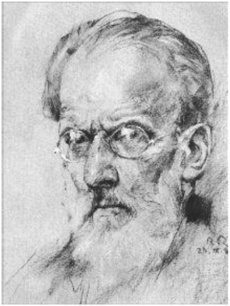

FIGURE 7.1 Carl Stumpf (1848–1936).

Stumpf

Carl Stumpf (1848–1936; Figure 7.1), who also studied for a year with Brentano and became one of his most ardent followers, was an outstanding figure of the time. An accomplished musician, he is reported to have played some six different instruments very well. Stumpf occupied the chair at Berlin for 26 years, after which it passed to the Gestalt psychologist Köhler. Stumpf had been preceded at Berlin by Hajim Steinthal (1823–1899), who with Moritz Lazarus (1824–1908) founded a journal of cultural psychology and linguistics in 1860 and who devoted most of his life to the study of language as a key to cultural psychology. Also paving the way before him was Wilhelm Dilthey (1833–1911), who pleaded for a psychology of understanding (rather than explanation); Dilthey's ***verstehende Psychologie*** remained influential for many years, especially in philosophy. Stumpf founded the Berlin Psychological Laboratory, which concentrated under his guidance primarily on work in space perception and audition and which became one of the world's leading psychological institutes during Stumpf's time there, a serious competitor to Wundt's Leipzig. In 1883 he published an influential *Tonpsychologie*, a major supplement to and rival of Helmholtz's work on tonal sensation. Stumpf also founded the Berlin phonogram archives, containing recordings of indigenous music from throughout the world; with the help of Stumpf's assistant Erich von Hornbostel, these archives became seminal in the establishment of the new field of **ethnomusicology.**

Stumpf held that the primary data of science are human experiences or "phenomena"; this led to the philosophy and methodology of phenomenology. Stumpf maintained that phenomenology, the unbiased examination of experience as it comes, is preliminary to all sciences, both psychology and the physical sciences. Psychology studies mental functions (much like Brentano's acts) and relations among phenomena. It is inadvisable to decide a priori on appropriate elements as the Wundtians had tried to do. One of Stumpf's students, Edmund Husserl, developed the later highly influential philosophy of phenomenology in voluminous writings. Also, all three of the earliest Gestalt psychologists, Köhler, Koffka, and Wertheimer, along with Lewin, extensively used the phenomenological method and studied at one time or another with Stumpf. Stumpf's philosophical position had a lasting effect on psychology as well as philosophy, and his work in hearing and in the phenomenological method has remained influential for many years. He also deserves credit for building the Berlin Psychological Institute into a major world center for psychological research.

G. E. Müller and His Students

Georg Elias Müller (1850–1934), though, was the systematic experimenter of the trio of Müller, Brentano, and Stumpf. Whereas others generally had their students conduct the experiments, Müller did them himself. He held the Göttingen chair for 40 years; this chair had been held before by Lotze for 37 years and before that for 8 years by Herbart.

After his PhD on attention, Müller embarked on wide-ranging work in a wide variety of areas: psychophysics, vision, physiological psychology, and memory, after Ebbinghaus's fundamental work. He invented the **memory**

drum, an instrument that was to be used frequently in experimental psychology, especially in the United States. Müller was somewhat disturbed by phenomenology and Gestalt psychology when they came on the scene. After his retirement he wrote a polemical critique, published in 1923, in which he maintained that not only was this all known before but also that several of his students had done much of the work later considered fundamental to Gestalt psychology.

A number of Müller's students did make major contributions, many of them to be taken up by the Gestalt school. This was documented by Harry Helson, among others, who compiled a history of Gestalt psychology for his doctorate; this history was published in several installments in the *American Journal of Psychology*. Adolph Jost became known for his work in memory; under Müller, Jost studied the effects of **distributed** and **massed practice** and had a law named after him—that old associations are strengthened more by a single repetition than are equally strong newer ones. David Katz, Müller's assistant for 11 years and later professor of psychology at the University of Stockholm, published a detailed phenomenology of color vision. Narziss Ach developed the concept of **determining tendency,** or **set,** which became central in the research of the **Würzburg school** and was adopted and modified in the 1930s by Kurt Lewin. E. R. Jaensch worked on **eidetic imagery** and personality types and traits, and Edgar Rubin, later professor of psychology at the University of Copenhagen, obtained his PhD with Müller for fundamental work on the distinction between figure and ground. There were many other students as well, and a wide variety of areas was studied in Müller's laboratory. Müller is perhaps best remembered as the indefatigable and dedicated early systematic experimenter in the new psychology and personally made many lasting contributions to the experimental psychology of memory and learning.[1]

Two Nonpsychologists at Prague

Hering

Ewald Hering (1834–1918) was a physiologist, succeeding Jan E. Purkinje at the University of Prague, in Central Europe. Purkinje, also a physiologist, had used a phenomenological approach and had discovered, among other things, brightness shifts with dark adaptation. Hering too was a phenomenologist and was interested in vision. He did significant work with space perception, about which he held a nativistic position.

Hering proposed a new color theory based on the phenomena of negative afterimages. The retina has three kinds of cones, he argued: the red–green, the yellow–blue, and the black–white. The cold colors (i.e., green, blue, and black) produce an assimilation, a building up, or anabolism of the substance in the retinal cones; the warm colors (i.e., red, yellow, and white) result in its dissimilation, breaking down, or catabolism. This theory was soon severely criticized, because it seemed to go against the all-or-none law—how could the same fiber send one message for anabolism and a different one for catabolism? But the theory again became very influential in the middle of the 20th century, when it was discovered that such an opponent-process mechanism can and does exist: Russell De Valois found that one process can reduce and the other can increase the rate of firing engaged in spontaneously during the neuron's resting state.

In 1870 Hering published a monograph on memory, in which he argued that, in a sense, inorganic matter can demonstrate memory. A folded piece of paper or a hammered nail that had been bent and then straightened will subsequently fold or bend more readily in the same place. William James used this same idea in his writing some 20 years later.

Hering was also an elegant experimenter and gadgeteer. Among other devices, he invented a stereoscope and the **Hering papers,** a standardized series of gray chips ranging from white to black, which were still in use over half a century later.

Mach

Ernst Mach (1838–1916), physicist and mathematician, spent his most important years at Prague. In spite of his professional identification as a physicist, he published much experimental research on vision, space perception, hearing, and the sense of time as well as a major book on the perception of bodily rotation.

Perhaps Mach's most significant work in psychology, though, was his

Analysis of Sensations (1886). Writing on the fundamental bases of science, Mach argued that the data of all sciences are sensations or experience. Furthermore, he accepted Kant's conclusion that space and time are basic to all sensory processes. Since the raw material of all sciences is sensation, he argued, all the sciences are basically the same. They differ only in their content; different ones study different classes of sensations. His work had a major influence on the phenomenologists and, later, the logical positivists. Among his more frequently cited epistemological contributions was a sketch of his room as seen by one eye (framed by a mustache below and an eyebrow above), about which he commented that this percept was all that he, as physicist, psychologist, human being, was actually given visually. His attempt to determine the epistemological bases of all knowledge made him an important early figure in what was later to develop into the positivist movement in philosophy.

But Mach is, of course, best known generally for his contributions in mathematics and physics; his name has been given to the unit of measurement for supersonic speeds: Nowadays almost everybody knows that Mach 4 means four times the speed of sound.

Ebbinghaus

Hermann Ebbinghaus (1850–1909; Figure 7.2), an inventive, ingenious experimenter, was not directly associated with any particular school. He became the equivalent of an associate professor at Berlin, but when Stumpf was brought in over his head as professor Berlin held no future for him, so he left for Breslau. Ebbinghaus wrote a widely used *Outline of Psychology*, the style of which has been compared to that of William James's book *Principles of Psychology*, famous for its felicitous writing. Ebbinghaus was also the first to publish a paper on the intelligence testing of school-children, proposing a completion task that is still included in some current test batteries. This work, later taken up by Alfred Binet, Théophile Simon, and others, was to burgeon into the vast mental testing movement in the United States in the first half of the 20th century. In 1890 Ebbinghaus, with Arthur König, founded a new journal on the psychology and physiology of the sense organs, which broke the monopoly on German psychological journals previously held by Wundt with his *Philosophische Studien*. Ebbinghaus became highly respected for the eclectic, fair, and nondoctrinaire manner in which he edited the journal.

Ebbinghaus's most significant contribution, however, was published in 1885: the extremely influential monograph *Über das Gedächtnis* (*On Memory*). In the late 1870s, Ebbinghaus was spending three post-PhD years in England and France, studying philosophy. He picked up a copy of Fechner's *Elements of Psychophysics* at a secondhand bookstall on the Rive Gauche in Paris. The work impressed him deeply and inspired him to try his hand at a comparably precise and experimental investigation of memory. The result, after years of work, was the monograph, which reported the results of a prodigiously thorough series of replicated experiments that Ebbinghaus had patiently performed on himself; this was the first time that learning and memory were studied experimentally and quantitatively. Since the meaning of material influences how easily it is learned, Ebbinghaus invented *sinnlose Silben*—literally, "meaningless syllables," usually called nowadays **nonsense syllables**—constructed of consonant, vowel, consonant, with meaningful words excluded. Among his many robust findings that have stood the test of time is the shape of the **forgetting curve** (Figure 7.3) for meaningless memorized material. Retention of such material drops precipitously within a short time after initial learning and reaches a very low asymptote (as low as 20% or even less).

FIGURE 7.2 Hermann Ebbinghaus (1850–1909).

His primary techniques were complete **mastery** and **savings.** That is, he counted how many trials it took to memorize by rote a list of such syllables so that he could recall it at least once without an error; alternatively, for the savings method, he memorized some material at a particular time, then had no further contact with it for a while, and finally determined how much easier it was to relearn it later on. The difference in the number of trials required to relearn, relative to the number required for original learning, or the saving, could then constitute a measure of the amount retained.

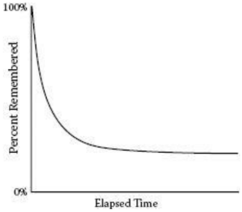

FIGURE 7.3 Ebbinghaus Forgetting Curve.

In addition to the basic memorization experiment, Ebbinghaus undertook many variations: he studied the effect of the time interval between learning and test, varied the amount of material learned, changed the order of the syllables, and so forth. Ebbinghaus's account included a detailed examination of how the curve of retention is influenced by the amount of material; he also studied the strength of forward and backward associations **(remote associations)** as well as the effects of **overlearning.**

Mary Whiton Calkins (1863–1930) pioneered experimental work beginning in 1892 on the memorization of **paired associates;** in 1905, she became the first woman president of the American Psychological Association. Other developments in the experimental study of rote memory produced Jost's and Müller's work on massed compared with distributed practice, Müller's studies of the influence of intervening material, and ultimately studies of **retroactive inhibition** by many people, problem areas still very important in the memory research of the last third of the 20th century, as in the investigations of Benton J. Underwood. One finding was the phenomenon of **reminiscence,** perhaps a somewhat confusing name for remembering material a bit better a short time after original learning than immediately after it, especially if the original memorization trials were massed.

The spirit and method of Ebbinghaus's work continued to be central to psychology long after his death. His pioneer effort was a manifestation of atomism or elementism and of course of associationism; perhaps most important, it demonstrated that it is possible actually to experiment quantitatively with the cognitive processes of learning and memory. This same kind of approach, involving the serial learning of items, was extended in the 20th century to the study of maze learning by animals as well as to a wide variety of additional problems in animal and human learning. His seminal experiments must be viewed as the start of what was to become the currently popular field of cognitive psychology.

Many writers intrigued by the history of psychology note that it was Ebbinghaus who made the insightful comment that psychology has a long past but only a short history. Incidentally, internal evidence within

Ebbinghaus's *On Memory* makes clear that he began his experiments in 1878 or even earlier, so one might consider the desk drawer in which Ebbinghaus kept his slips of paper with nonsense syllables on them—rather than Wundt's institute—as the first functioning psychology laboratory in the world.

Külpe and the Würzburg School

Külpe

Oswald Külpe (1862–1915), a Latvian by birth, had a varied career as student and professor, moving from one university to another, and originally wavered among psychology, philosophy, and history. He studied at Leipzig, then Berlin, then at Göttingen with Müller (with whom he began his doctoral dissertation), then went for a year to the University at Dorpat to study history, and finally returned to Leipzig, where he was to work with Wundt for 8 years, becoming his second assistant (succeeding Cattell). After Leipzig he went to Würzburg, where he became the moving spirit of what was to be called the Würzburg school. Külpe was at Würzburg between 1894 and 1909 (it was at Würzburg, incidentally, that Wilhelm Konrad Roentgen, in 1896, discovered x-rays). In 1909 Külpe went to Bonn and thence to Munich; he died at the early age of 53.

Külpe began in history, switched to philosophy, then moved to esthetics, music, and finally psychology; after further wavering, he settled primarily on philosophy and psychology. During his philosophical phase, he wrote five popular books on philosophy for the lay public, including one on Kant and another on philosophers of the turn of the century. While at Leipzig, Külpe met and roomed with Titchener; apparently he was at first "repulsed by Titchener's British brusqueness" but soon overcame his dislike. Titchener regarded Külpe and his work very highly and in fact translated some of Külpe's writings into English.

Külpe's psychological views moved gradually from the psychology of Wundt (as exemplified by Külpe's early *Outline of Psychology*) toward that of Brentano; this change contrasts sharply with Titchener's uncompromising Wundtian experimentalism. Among Külpe's themes was the attempt to refute Wundt's insistence that experiments cannot be used to study complex mental processes. According to his contemporaries, in spite of his early animosity toward Titchener, Külpe was a charming individual, who got along well with everybody. He was a hard worker who wrote a great deal, and whatever he wrote was thoughtful. He made it a matter of principle to serve as a participant in his students' experiments to know what they were doing—but never made himself a coauthor on his students' works, even though this was (and to some extent continues to be) rather standard practice among professors.

The Würzburg School and Its Students

The Würzburg school became an important rival to Leipzig. Much experimental work was performed, a substantial proportion of it producing results inconsistent with a thoroughgoing Wundtian position. (Titchener urged Külpe to write a summary of the work from the Würzburg laboratory, but Külpe never got around to it.) The major problems studied included esthetics (like so many psychologists of the time, Külpe was an excellent musician), attention, association, and particularly thinking; the Würzburg school is best known in subsequent history for its work on "**imageless" thought.** Wundt had said that it is impossible to experiment with the higher mental processes, including thinking; Külpe in effect said "Why not try?" and went ahead and experimented with it. His fresh approach attracted many of the best students of the day; they flocked to him to help him try to find out whether there is an element of thinking commensurate with Wundt's elements of sensation and feeling. But Külpe and his students found none; hence, they concluded that thinking can be imageless. The Wundtians called this finding negative, but it had positive consequences in that it led to important concepts such as set, which are still of interest.

Among the PhD theses written under Külpe was one by Karl Marbe on "levels of consciousness," which concerned itself with the difficulty of shifting among levels of thought. Max Wertheimer, later at the center of the Gestalt school, wrote his doctoral dissertation under Külpe on the use of the word association technique in the determination of guilt. Another was undertaken by Henry J. Watt; it demonstrated the strong influence of set, attitude, or instruction. A research participant, given a problem, develops a task set, or **Einstellung,** and thought runs automatically once the task has been accepted—a principle still very important in the middle of the 20th century, as, for example, in the well-known work of Abraham S. Luchins on the effect of set on modes of solution in an algebraic puzzle, the water-jar problem.

Narziss Ach, after having studied with Müller at Göttingen, came to Würzburg and continued work on the *determining tendency*: The original set to solve a problem is not enough but must persist throughout the entire thinking process, during the phase of judging various attempted solutions, and so forth; in uttering a sentence, for example, the first part determines to some extent the characteristics of the remaining words in the sentence. This approach to thinking was similar to that of Brentano: Thought and action are in a sense identical; thinking is a process, and it is unprofitable simply to examine the static mental content at any given moment. This emphasis on the directionality of thought has aspects in common with the Gestalt approach to insightful thinking made much of later by the Gestalt psychologists Köhler and Wertheimer; it can also be seen as a forerunner of interest in sequential dependencies in behavior, a focus of research among several later quantitative psychologists. The outcome of the Würzburg experiments, then, was not negative; rather, they began a chain of influential new work.

Galton and Other British Psychologists

Developments that were to have a profound impact on 20th-century psychology were not, of course, limited to Germany or to continental Europe. The English tradition exemplified by John Stuart Mill, Charles Darwin, Herbert Spencer, and Alexander Bain had perhaps its greatest original genius of the latter half of the 19th century in Sir Francis Galton (1822–1911; see Figure 7.4). A versatile, restless, and inventive man, he was the founder of the eugenics movement as well as of the currently flourishing field of behavioral genetics, the inventor of fingerprinting for the unequivocal identification of individual human beings, and a major contributor to the mental testing movement that was to snowball in the United States in the 20th century. Other British psychologists—Ward, Stout, Sully, McDougall—also contributed to the growth of the new discipline of psychology. But England had no early laboratories for psychological research (other than Galton's "anthropometric laboratory"), so England fell somewhat behind in the development of psychology as a natural science.

FIGURE 7.4 Francis Galton (1822–1911).

Galton

Ten years after the publication of his cousin Charles Darwin's *Origin of Species*, Galton came out with a book, *Hereditary Genius*, in which he traced the family trees of outstanding people and proposed that Darwin's principle of evolution holds for the inheritance of particular human psychological traits as well as for various morphological characteristics of other species. The **family pedigree method,** with the finding that special gifts—and stigmata—tend to run in families, led Galton to suggest that selective breeding of humans (that is, eugenics) might be desirable to improve the stock of Homo sapiens just as selective breeding has been used for centuries in animal husbandry—an idea that generated much heated controversy.

Galton's convictions about the importance of heredity in human behavior and morphology led him to conclusions that today would be viewed as unacceptably racist. They also led him to an analysis of human races in terms of their adaptation to their particular ecological circumstances and to an abiding interest in individual differences. Among many other contributions, he studied quantitatively, by questionnaire, the incidence of different kinds of imagery (e.g., visual, auditory, olfactory) in different people and also measured **free associations** to standard words experimentally. His quantitative bent led eventually to the invention of the coefficient of correlation, an index of the degree to which two characteristics covary; this work was in the tradition of Laplace, Gauss, and Quetelet, the pioneers in statistics, and was later ably carried on by Karl Pearson and Charles E. Spearman at the Galton laboratory in the University of London.

Ward, Stout, and Sully

James Ward (1843–1925) founded a laboratory of experimental psychology at Cambridge but turned out to be more of a systematizer than an experimentalist. His system was presented in its most elaborate form in his *Psychological Principles* (1918), although its first statement appeared in an influential article in the 1886 edition of the *Encyclopædia Britannica*. Ward's psychology, like many of its time, was tripartite; he divided psychological processes into cognition, feeling, and **conation.** More popular than Ward's writings were the systematic textbooks of George Frederick Stout (1860–1944) who, like Ward, was more of a systematizer than an experimentalist and also the works of James Sully (1842–1923), another systematic British psychologist who was influential in his day.

McDougall

William McDougall (1871–1938) was a major figure in the evolutionary tradition. He developed his own **hormic** or **purposive psychology,** emphasizing particularly the conative or striving part of Ward's division. He developed a detailed theory of human sentiments and instincts, wrote a highly influential early text on social psychology, and performed experiments on acquired characteristics. He taught at London and Oxford and then at Harvard and Duke, but even though he was in the United States for 24 years, he remained British in outlook throughout his entire career. Indeed, although he had been one of the first to call psychology the science of behavior, he rescinded this definition later because he meant something quite different by the term *behavior* (something more akin to Brentano's "act" than to Watsonian reflexes) than the objectivistic U.S. behaviorists did.

Animal Darwinists

Another part of psychology growing out of Darwinism was interest in animal behavior. George John Romanes (1848–1894), C. Lloyd Morgan (1852–1936), Jacques Loeb (1859–1924), Leonard T. Hobhouse (1864–1929), and Sir John Lubbock (1834–1913) belong in this tradition. The study of lower animals became more relevant to an understanding of human beings once the principle of evolution had placed people into the context of other species. Romanes, who knew Darwin personally and well, wrote an early book on comparative psychology, *Animal Intelligence;* it was published in 1882. Morgan wrote several books on animal and comparative psychology and in 1894 propounded his version of the law of parsimony, which was introduced in Chapter 4 as Lloyd Morgan's canon. Chapter 4 also mentions Loeb's work on tropisms, done in Germany. Hobhouse undertook experiments on animal behavior and reported them in his *Mind in Evolution* in 1901. Lubbock presented detailed observations on the complex social behavior of ants and other insects in a work published in 1892.

The Character of the "New" Psychology

Some European academics toward the end of the 19th century, then, viewed the "new" psychology as an innovative, exciting approach to the study of mental phenomena.

The new approach was experimental, evolutionary, and primarily introspective and dealt with experience and consciousness; it was elementistic and associationistic. The chief emphasis was on the study of conscious content, but there was also some attention to act or function. The new perspective resulted from the converging trends and tendencies before 1860, each of which contributed its distinctive stamp to the new formulation. Within the next decades, laboratories had been established at Leipzig, Berlin, Würzburg, and Göttingen as well as at some lesser places. Physiology was the keystone in the study of sensory phenomena, and Wundt called the new approach physiological psychology. The influence of evolution and other biological concepts was particularly strong in British psychology and was touched on in Wundt's lectures on the minds of humans and animals; it also emerged in the interest in animal behavior late in the 19th century and particularly in the 20th. The atomistic trend was evident in the concentration on elements, as in Wundt's systematic approach, in Ebbinghaus's nonsense syllables, and in Külpe's search for the element of thought. Quantification was at the core of Fechner's work and that of later psychophysicists and was a major goal in the study of reaction time, in Ebbinghaus's elegant experiments, and in Galton's work on individual differences.

The definition of psychology in terms of experience, the emphasis on the introspective method, and the attempt to understand the contents of awareness all exemplified the critical empiricist trend, as did the new fad of doing experiments and trying to explain everything in terms of past experience. Associationism was the rule in approaches to learning and also to perception; Ebbinghaus, Wundt, Müller, and others concentrated on the compounding of elements and on serial learning, and Helmholtz's associationistic doctrine of unconscious inference was prominent in attempts to understand perception. Scientific materialism had been established by Helmholtz, DuBois-Reymond, and others; concern with the "soul" was no longer relevant to psychology, and almost all theorists were trying to reduce psychological phenomena to physiological ones.

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[1] Müller was reported, though, to be not very gracious to persons who visited Göttingen and wanted to see the laboratory. Some contemporary observers claim that this was because he considered the equipment at Göttingen quite meager compared with that at Leipzig or Berlin.

CHAPTER **8**

William James and Psychology in the United States

A

lthough experimental psychology was born and raised in Europe, particularly in Germany, it emigrated to the United States at the end of the 19th century. By early in the 20th century, world psychology had become centered in the United States.

U.S. Psychology Before James

Before William James helped bring the new European psychology across the Atlantic, psychology in the United States had been philosophical, religious, and moralistic. To the extent that there were any U.S. psychologists at all before James, they were mostly church men.

One of the early original thinkers was Jonathan Edwards (1703–1758), a Puritan president of Princeton University who lies buried on that campus. Edwards had a stormy career in the church before he got to Princeton, moving from Congregationalism to Calvinistic Presbyterianism. In 1754 he published a treatise in which he supported, with persuasive argument and logical reasoning, the Calvinistic creed that everything is predestined and that it is impossible to escape one's destiny. His detailed account of how the will can be deterministic (without falling into the trap of a mysterious "free will") generated many efforts in the United States during the late 19th century to refute his arguments.

Writers who came after Edwards in U.S. psychology were generally less provocative and original; as was true of most earlier and later authors, they typically repeated the ideas of others. Many of the works were written in an attempt to influence students' morals, to get them to think and act properly. Among such books, purporting to be about psychology, was one by Henry Tappan, president of the University of Michigan; the 1860s saw another by

Noah Porter, president of Yale, and in the 1870s one was published by James McCosh, president of Princeton. Clearly, one criterion for the selection of university presidents in the United States during the 19th century was their competence in the field of **moral** and **mental philosophy** (i.e., what was later called “psychology”). Colleges in the United States during the 19th century tended to have a strong moralistic aim. The emphasis on moral issues characteristic of the works of these scholars exemplified to some extent the Puritan Zeitgeist that pervaded much of the United States in the 18th and 19th centuries.

William James

The Man and His Works

William James (1842–1910; Figure 8.1), brilliant, tolerant, and cosmopolitan, has often been called the first true U.S. psychologist. A contemporary of Wundt, who was born 10 years later and died 10 years earlier than James Wundt, was an entirely different kind of person. He came from a Boston family, led a fairly quiet life, and traveled extensively in Europe and elsewhere. His well-known novelist brother Henry James was also a world traveler; Henry finally spent most of his years in England. Although he did so geographically, William never got away from Harvard University academically. He received his MD there and became particularly interested in physiology; his first teaching appointment at Harvard was as assistant professor of physiology. Later he taught some courses in philosophy and eventually was made professor of philosophy, then professor of psychology, and finally again professor of philosophy. James suffered from poor health, and to some extent from hypochondriasis, throughout much of his life but nevertheless managed an output that was both voluminous and qualitatively highly regarded both by his contemporaries and by later critics.

FIGURE 8.1 William James (1842–1910).

For psychology, his most important contribution was his two-volume *Principles of Psychology* (1890). In 1892 he published a condensed version of the *Principles: Psychology, Briefer Course*, which the graduate students of the first half of the 20th century affectionately called the "Jimmy" and which may well have been the first genuine best seller in psychology. In the 1890s James also published a smaller volume, *Talks to Teachers on Psychology;* this grew out of his strong interest in educational psychology. About the turn of the century came *Varieties of Religious Experience*, a book that helped initiate and define the 20th-century field of the psychology of religion. Then there were several philosophical works, among them *Pragmatism*, which had a tremendous impact. *A Pluralistic Universe, The Meaning of Truth*, and *Is Life Worth Living?* were written during his last years.

Although James was chiefly a philosopher, he was also very much a psychologist. Rather than a scientist, he was more a literary man—an excellent writer. He read very widely and was actively and creatively critical of what he read, but extremely fair in his criticism. He was "naïve" toward facts and theories, in the best sense of being free to look, but was sophisticated and incisive in his interpretations of what he found. Erudite yet not pedantic, he had many new ideas and could express them in highly colorful prose. He permitted his ideas to lead him wherever they wished, and in this sense he was eclectic; it is not accidental that later behaviorists quoted him favorably, as did the functionalists and Gestalt psychologists. He was also intrigued by **parapsychology.**

The Principles of Psychology

James's *Principles of Psychology* is essentially a collection of essays. As a whole, it is much less tightly organized than Wundt's systematic books. Although it is impossible to shuffle Wundt's chapters, one can readily jump about among James's. The topics seem to follow one another almost haphazardly.

In his chapter on habit, James asserted that "habit is the enormous flywheel of society." (A flywheel is a heavy disk or wheel that rotates on a shaft so that its momentum keeps the shaft and all connected machinery rotating at an almost constant speed.) This doctrine is characteristic of the concentration on habit and rote learning so prevalent in U.S. psychology and sociology since James. Like many of his intellectual predecessors, James argued for a physiological basis of habit: repeated activity produces a "pathway" in the brain, through which subsequent energy is channeled. This simple and compelling idea, in various slightly modified forms, was to be *the* physiological theory of learning in psychology for the next 3 or 4 decades, notably in the writings of E. L. Thorndike and John B. Watson, until Karl Lashley showed that it was neurological nonsense—and it even persisted after that. Central to the theory is an atomistic notion of concatenated discharges, of reflex paths, the "deepening of ruts," a conception of isolated sensory processes and muscular contractions, or reflex arcs, hooked together. The later version was bonds or connections between stimuli and responses, and later yet it became connections between nodes in a neural net or in a computer simulation of such a net. James also originated the idea of **response-produced stimuli,** a construct central to the later work of Clark Hull and his followers, E. R. Guthrie and Charles Osgood. For James, as for Hering, the brain process of memory is a function of the plasticity of organic matter.

In the field of emotion, James is known for the theory which he promulgated independently of the Danish physiologist Carl Lange, who published a similar idea at about the same time. The James–Lange theory is that we do not perceive an emotion-arousing situation, become emotional about it, and then suffer bodily changes because of the emotion but rather that the perception of the situation leads to a bodily state and that awareness of the bodily state *is* the emotion. Thus, according to the theory the sequence is not that we lose our fortune, are sorry, and weep or that we meet a bear, are frightened, and run but rather that we feel sorry *because* we cry when we lose our fortune, are frightened *because* we run. The chief significance of the theory lay in the fact that many people took issue with it in the next years; it generated a great deal of research and interest.

James's description of the stream of consciousness, another contribution for which he is deservedly remembered, still appears quite modern more than a century after it was formulated. This stream, James wrote, has five major characteristics. First, thought is personal; that is, it is *my* thought. Second, it is constantly changing—no two states of consciousness are ever identical. Third, it is sensibly continuous in that there are no breaks in it; even though it is constantly changing, it remains fundamentally one chain. Fourth, it always deals with objects independent of itself, namely, reality (note the similarity to Brentano's immanent objectivity). Finally, consciousness is selective: at a given time, the stream concerns itself with one aspect of awareness more than with another (a formulation reminiscent of Wundt's position on the focus of consciousness).

His psychology is not a true system, in the Wundtian sense. What James did was to give a detailed and critical report on the German work and to use much of it to develop his own thoughts. Although his summary of the new German psychology was careful, thorough, and fair, he did not really like the work but considered it dry and pedantic—he characterized the "new" psychology as "that nasty little science." His interest in process rather than content and his analysis of habit, emotion, and the stream of consciousness exemplified his functionalism. Some have argued that James should be considered the first true functionalist.

James's Philosophy, His Laboratory, and His Students

James was interested in religious experience and was also fascinated by the occult phenomena of psychical research. In philosophy he held a neorealistic position in epistemology and ontology and espoused **pragmatism** when it came to truth: in general, if neither experience nor reason can provide a clear decision, what is true works, as long as it works, and until something that works better comes along. James's famous assertion that "the first act of free will is to believe in free will," he argued, refutes Edwardian determinism by pragmatically resolving the question of whether free will exists. Pragmatism, a position first formulated clearly by Charles Sanders Peirce (who also engaged in some pioneering experimental work in psychology near the middle of the 19th century in the United States), has had a major impact on modern philosophical thought.

There is some controversy about whether James or Wundt had the first laboratory of psychology; James did use a room for psychological demonstrations as early as 1875, a full 4 years before the formal existence of Wundt's research laboratory. But Wundt too had a demonstration laboratory in 1875. Wundt probably deserves credit for having established the first *research* laboratory for experimental psychology.

All in all, James played a major role in U.S. psychology, largely through his writings but also through the American Psychological Association and through his students, among the more influential of whom were James R. Angell, Mary W. Calkins, G. Stanley Hall, William Healy, Boris Sidis, Edward L. Thorndike, Robert S. Woodworth, and Robert M. Yerkes.

Other U.S. Psychologists of the Turn of the Century

Most of James's contemporaries and those who came right after him studied abroad and helped bring the new psychology back to the States. Most of them went to Germany to be, as it were, anointed by Wundt or one of Wundt's established contemporaries and returned to found demonstration laboratories in experimental psychology. Consider very briefly a few of the more significant ones.

Hall and Sanford

G. Stanley Hall (1844–1924) studied at Bonn, Berlin, and Leipzig (Hall was the first person from the United States to study with Wundt); if one omits James's demonstration laboratory at Harvard, Hall founded the first U.S. laboratory at Johns Hopkins in 1883 (Figure 8.2). Thereafter he went to Clark University as president. He started the first psychology journal in the United States, the *American Journal of Psychology*, edited the *Pedagogical Seminary* (which later became the *Journal of Genetic Psychology*), and also started the *Journal of Applied Psychology*. His interests were broad; he was one of the first to devote much attention to individual differences. Using a light literary style similar to that of James, he wrote books on adolescence and on old age; he championed genetics and evolutionary theory, which became one of the first major theoretical views to dominate U.S. psychology. He also played a major role in the child study movement that swept the United States late in the 19th century. An innovator in many areas (who, for example, was a strong early advocate for Social Security), Hall was among the first to use the questionnaire method for psychological investigations, a method pioneered by Francis Galton. It will be necessary to return to Hall and his role in the founding of the American Psychological Association later in the chapter.

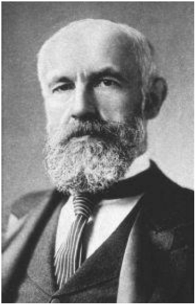

FIGURE 8.2 G. Stanley Hall (1844–1924).

Hall turned over the Hopkins laboratory to Edmund Clark Sanford (1859–1924), a close associate of Edward Bradford Titchener's. It was Sanford who published the first laboratory manual of experimental psychology in the world. Sanford was a master equipment designer and builder; among other accomplishments, Sanford constructed the first maze for the study of learning in the rat, which Willard S. Small used in his pioneering studies in 1901.

Ladd and Scripture

George Trumbull Ladd (1842–1921), at Yale, wrote the first text on physiological psychology in English in 1887; this work, later revised by Robert S. Woodworth, who had been James McKeen Cattell's student, continued to be influential for many decades. As was true of Wundt's 1874 book, the term *physiological* in the title of Ladd's book was intended to be almost synonymous with "experimental."

Edward Wheeler Scripture (1864–1943), a renowned experimentalist, studied with Wundt but also heard Ebbinghaus lecture; Ladd brought Scripture to Yale to head the psychology laboratory there. He did infuential experimental work on reaction time, audition, and phonetics. Although the number of students introduced to the new psychology in his laboratory was not large, the output of the laboratory was very great. For the 10 years Scripture was at Yale a large annual volume, *The Yale Studies*, served as the publication outlet for this work. After having established himself well at Yale, late in his career Scripture left with his secretary for Europe, obtained an MD, and became professor of phonetics at the University of Vienna.

Seashore and Baldwin

Carl Emil Seashore (1866–1949), born in Sweden, took his degree under Scripture at Yale and then started a psychology laboratory at the University of Iowa. (When he came to the United States, he anglicized his name; it had been Sjöstrand.) It was from Scripture that he obtained his interest in psychology in general and in music in particular—for many years Seashore was well known for his widely used tests of musical ability. During Seashore's tenure as professor and then later as graduate dean at Iowa, the institution produced the large number of 269 PhDs in psychology. Seashore also served as director of the Iowa Child Welfare Station, helping launch the child study movement, which in turn supported the growing scientific interest in the child that was shaping the new field of developmental psychology.

James Mark Baldwin (1861–1934) established a psychology laboratory at Toronto and then another at Princeton. He started several journals: the *Psychological Review*, the *Psychological Index* (a forerunner of *Psychological Abstracts*), and *Psychological Monographs*. He also published a major dictionary of philosophy and psychology. Much interested in the psychological development of the child and of the human race, he advocated the evolutionary notion that ontogeny recapitulates phylogeny, that is, that each child, in its development, repeats the development of the human race—an idea that can be traced back to the German physiologist Ernst Haeckel.

Cattell, Jastrow, and Münsterberg

James McKeen Cattell (1860–1944) was an aggressive teacher, organizer, and editor; some 300 students, including E. L. Thorndike, R. S. Woodworth, and S. I. Franz, took their PhDs with him. He started the *Psychological Review* with Baldwin. After a few other appointments, he settled at Columbia; the remarkable breadth of his competence and interests is shown by his having edited *Popular Science Monthly;* the *Scientific Monthly; Science, School and Society;* and *The American Naturalist*, at various times. He began the Psychological Corporation, important in applied psychology in later years. In addition to his promotional activity, he also engaged in research, chiefly in individual differences, reaction time, and psychophysics. Cattell hoped to measure individual differences in intelligence, but his battery of simple sensory, perceptual, and reaction-time tests did not succeed in tapping the more complex cognitive aspects of intellectual capacity.

Joseph Jastrow (1863–1944) directed the Wisconsin laboratory. Having obtained his PhD under Hall, Jastrow did extensive research in psychophysics. He also popularized psychology in several books: one on Freud, another on irrational beliefs, and yet another on general psychology.

Hugo Münsterberg (1863–1916) was brought by James to Harvard to head the experimental laboratory; James felt obliged to develop a laboratory at Harvard, even though he himself did not wish to run it. Münsterberg had been a prominent experimentalist in Germany but once in the United States turned his talents primarily to industrial and applied psychology, writing texts on law, industry, and national character. He generated the first book on forensic psychology, *On the Witness Stand*, as well as the first book with the title *Psychotherapy*.

The Founding of Laboratories

Several laboratories were founded in the United States and Canada during the last few decades of the 19th century, including the Harvard laboratory in the late seventies under James and the Johns Hopkins laboratory by Hall in 1883. The founding of psychological laboratories in North America was only a few years behind similar events in Europe. In 1891 Frank Angell established the laboratory at Cornell, and in 1892 Ladd and Scripture founded the Yale laboratory, and Baldwin founded one at Toronto. The next year Baldwin founded one at Princeton. Most major universities had their own laboratories within the next few decades.

The busy founding of laboratories, and the translation and writing of texts by teachers who were trained abroad, made the early leaders believe that they were following the German tradition. However, a change was gradually taking place, particularly in Chicago, leading to functionalism and eventually to behaviorism. The new psychology, transplanted to the American continent, soon took on a very different flavor, more appropriate to the Ortgeist there.

The Founding and Development of the American Psychological Association

Early during the period of growth of U.S. psychology, the discipline institutionalized itself. The American Psychological Association (APA) was founded in 1892.

Who were the midwives at the APA's birth, and how did the association get founded? Then, as always, there were the promoters, the organizers. Certainly one of the candidates most worthy of some such title was Granville Stanley Hall, the APA's first president, who back in 1878 had been the recipient of the first U.S. doctorate specifically in the new psychology, for work with William James at Harvard University. At his invitation, according to several standard historical sources, a small select group of seven prominent psychologists convened at Clark University on July 8, 1892, to help Hall found the American Psychological Association. The delegates, who appointed themselves to the APA's governing body, the Council, were Hall, then president of Clark University; G. S. Fullerton of the University of Pennsylvania, who was another early officer of the association; William James of Harvard; the laboratory founder James Mark Baldwin, who at the time was at Toronto; Joseph Jastrow of the University of Wisconsin, who a short 6 years before had received one of the earliest U.S. doctorates specifically in psychology; G. T. Ladd of Yale, who became the APA's second president; and James McKeen Cattell of Columbia University, who in 1888 had been appointed to the first professorship specifically in psychology anywhere in the world.

At least this was the composition of the group according to several sources; that there is some confusion about what actually happened is shown by the claim of some other sources that James was in Switzerland at the time, that Cattell and Jastrow both claimed that they were not present at that historic July meeting after all, and that Sanford, Burnham, Fullerton, Nichols, Bryan, and Jastrow were there. At least all reports agree that Hall and Fullerton were there. How hard it is really to pin something down in history! At any rate, whoever his colleagues were on that date, it seems that Hall founded the APA in his study at Clark University (or was it in the study of his nearby home?) on July 8, 1892.

The original group elected some 20-odd additional charter members, such as Angell, Scripture, Witmer, and others whose names are no longer so familiar; before the first regular annual meeting, held December 27, 1892, five more were added, including Hugo Münsterberg and Edward Bradford

Titchener, both of whom had come to the United States earlier in the year.

In 1892 when, at Fullerton's invitation, the first meeting was held in Philadelphia at the University of Pennsylvania, there were 31 members. Hall of course was elected president, since the idea of an APA had been his. APA membership grew dramatically—from 31 in 1892 to 375 in 1917, 25 years later. It went to over 3,000 a quarter of a century after that, in 1942, and to some 26,000 in 1967; by the late 1990s it exceeded 150,000. Membership almost multiplied by 10 every 25 years. To make a slight variation on a projection that E. G. Boring undertook in the 1950s, if the APA continued to grow at the rate it did during the first century or so of its existence, by some time in the 21st century there should be more psychologists than people in the world. It turns out that membership remained fairly stable during and since the last decade of the 20th century.

A formal constitution was adopted in 1894, when the APA met at Princeton, with William James as president. A total of *22* members attended this meeting, and 38 had paid their dues. The first article of the constitution specified that "the object of the association is the advancement of psychology as a science. Those are eligible for membership who are engaged in this work." At this third annual meeting, which lasted a day and a half, the secretary-treasurer, James McKeen Cattell, reported that expenditures for the year were $63.93, leaving a balance in the APA's treasury of $127.17. Eighteen papers were presented at that convention, among them one by Sanford on apparatus, one by Cattell on the distribution of exceptional ability, studies on pain by several writers, a report on foveal nightblindness by Christine Ladd-Franklin (1847–1930), and of course James's presidential address.

How did people let others know what they were doing, if they did *not* present a paper at the APA convention? For one thing, there was much informal correspondence. But publication was also an active medium. Many published in popular cultural magazines that reached a broad audience. Some published in *Mind*, edited in England, and some in Wundt's *Philosophische Studien;* occasionally such journals as the *Educational Review*, the *Journal of Comparative Neurology*, and the *Philosophical*

Review carried articles by psychologists. A major outlet was the *American Journal of Psychology*, but William James and several others considered it too much a house organ for Hall and his Clark colleagues and did not hold it in high regard. Yet in several respects Hall was quite conscientious in his editing of the *American Journal of Psychology*—he tried to publish exhaustive abstracts and summaries of the entire psychological literature of the world in it, just as he tried similar exhaustive summaries of the literature in education and childhood in his *Pedagogical Seminary*.

As indicated previously, the psychological scene during the APA's infancy was largely imported from Germany; most of the prominent psychologists of the time had studied overseas. But the United States, too, had its own laboratories, was developing its own textbooks, and had its own journals. The mental testing movement was beginning, primarily through Cattell's interest, but there were no clinical psychologists or psychological clinics as yet, although Hall did teach psychology to psychiatrists at Worcester State Hospital for a number of years from 1889 on. What with the presidency of Clark, his books, his journals, his research, his teaching, and his involvement in the APA, one can only wonder where Hall obtained his prodigious energy. The APA was founded by excited, deeply involved people who considered themselves scientists and pioneers, on the frontiers of the new scientific psychology.

The APA rapidly grew and prospered. Its character gradually changed. Although it owned no journals in 1892, by 1942 it owned 6, and by the late 1990s it owned more than 20. These acquisitions clearly were consistent with Article I of the constitution adopted in 1894. Less consistent with it were the growing incursions of professionalism, which led to a formal split, later somewhat precariously healed again, among the ranks of psychologists. The APA was at first a scientific organization, but by the middle of the 20th century it was clearly less so. It became both a scientific and a professional association, an amalgamation of the earlier American Psychological Association and the American Association for Applied Psychology, which separated from and then rejoined the APA late in the second quarter of the 20th century. In 1892 almost all APA members were academics; by the middle of the 20th century the academic had become a minority member.

In 1930 two regional associations, the Eastern Psychological Association and the Rocky Mountain Psychological Association, were affiliated with the APA. Other regional associations had been founded earlier but did not affiliate with the APA until later; all of them flourished, at least for a time: the Western Psychological Association, the Midwestern Psychological Association, the Southwestern Psychological Association, the Southeastern Psychological Association, the Southern Society for Philosophy and Psychology, and the New England Psychological Association. A national student honor society in psychology, Psi Chi, was founded in 1929; it grew to become the world's largest psychological society, with a third of a million members and chapters at more than 900 institution of higher education by the end of the century and some 1,100 by 2010. By 1939 10 state associations had affiliated; by the 1960s almost all of the states (and many of Canada's provinces) had organizations affiliated with the APA, and many were represented on the APA's Council of Representatives. Most states and provinces had certification or licensure of professional psychologists shortly after the middle of the 20th century, and at the national level the American Board of Professional Psychology conducted thorough examinations for practitioners of clinical, **counseling,** and industrial psychology. The American Association of State Psychology Boards, later renamed the Association of State and Provincial Psychology Boards, was soon preparing a semiannual written examination that was used by most states (and Canadian provinces) as part of the rite of passage for candidates seeking licensure or certification for the professional practice of psychology.

Professionalization, or changing from an almost exclusively academic to an overwhelmingly practitioner organization, was not, of course, the only difference between the 1892 APA and the APA of the first years of the 21st century, although it might be the most visible one. The early APA annual budgets were of the order of $100, whereas by the late 1990s they reached $80 million, and the APA owned two new office buildings it had built near Union Station in the nation's capital. For a time, it tried (unsuccessfully) to publish a popular magazine, *Psychology Today*. Psychology, at the national level and also at the institutional level, had become big business. In 1892

U.S. psychology was a few dozen interested people; by a century or so later it was a powerful political force, composed of more than 150,000 individuals, with local, state, national, and international influence. The APA's Central Office was restructured into four "directorates," one each for science, education, practice, and public interest, exhibiting in its organizational structure the major concerns facing the discipline.

As will be elaborated in Part III, since 1892 the age of the great schools of psychology—structuralism, functionalism, Gestalt psychology, behaviorism, and psychoanalysis—has come and gone, but later in the 20th century there were different schools, some new, some not so new: factor analysis and psychoanalysis, existentialism and computer modeling, humanism and **biofeedback,** and at least one later school, the Skinnerian, was formally enshrined as an APA division. The operationist revolution opened up areas to empirical research of which the founders of the APA could not have dreamed—the scope of problems investigated empirically by the early 21st century was vastly greater than what could be studied in 1892; it has become possible to measure motivation; meaning; minute currents, magnetic fields, or trace chemicals in neural tissue; subtle aspects of interpersonal interaction; and myriad other things that were unheard of as measurements 75, 50, 25, or even 10 years earlier. The contents of the APA convention guides in recent years show the vast diversity of what people who call themselves psychologist were doing more than a century after the APA was born. Qualitatively there were, to be sure, papers on several problems and areas similar to those their ancestors were working on, but there was also much that could not have been seen in an APA program in the 1890s—some of it scientific, much of it professional. Quantitatively there were typically at least 100 times more program items included in APA conventions by early in the 21st century than were presented at an 1890s APA meeting.

There are other ways U.S. psychology changed from the day of the APA's founding to the time of the present writing, some of which have already been touched on and some of which will be considered in greater detail in Part III and Part IV. One could point to the mental measurements movement, the interdisciplinary ideology, the fragmentation into specialized areas, and the mushrooming of new APA divisions (see Table 8.1 for a list). Other developments in recent times include the prodigious growth and subsequent decline in research and training grant support; movements to establish certification and to lobby for licensure; efforts to assure that services of professional psychologists can be reimbursed by insurance agencies (following the devastating effect of "health maintenance organizations" and "managed care" programs on reimbursement for professional psychological services by insurance companies); initiatives to assure prescription privileges for properly trained practicing psychologists; the proliferation of miniature theoretical models; the emphasis on quantification; the development of an expensive but amazingly intricate and effective new technology for studying brain–behavior relationships with brain scans; the publication explosion and the incredibly rapid changes in the technology for sharing information; the mushrooming of new APA divisions; and the concern with minority group and women's issues. Only three bona-fide "minority" psychologists have been president of the APA: Kenneth B. Clark in 1971, Richard M. Suinn in 1999, and Melba J. T. Vasquez in 2011. A total of 14 women have won this distinction so far: Mary Whiton Calkins in 1905, Margaret Floy Washburn in 1921, Anne Anastasi in 1972, Leona E. Tyler in 1973, Florence L. Denmark in 1980, Janet T. Spence in 1984, Bonnie R. Strickland in 1987, Dorothy W. Cantor in 1996, Norine G. Johnson in 2001, Diane F. Halpern in 2004, Sharon S. Brehm in 2007, Carol D. Goodheart in 2010, Melba J. T. Vasquez in 2011, and Suzanne Bennett Johnson in 2012. Most presidents of the APA during its almost 6-score years of existence have been research scholars honored for their contributions to empirical science, but that has changed in recent years. Consistent with the change in the APA's membership, many of the APA's presidents during the last few decades have been identified primarily with the practice of psychology instead.

TABLE 8.1 The Divisions of the APA as of 2010

1. General psychology
2. Teaching of psychology
3. Experimental psychology

5. Evaluation, measurement, and statistics
6. Behavioral neuroscience and comparative psychology
7. Developmental psychology
8. Personality and social psychology
9. Psychological study of social issues
10. Psychology, aesthetics, creativity, and the arts
12. Clinical psychology
13. Consulting psychology
14. Industrial and organizational psychology
15. Educational psychology
16. School psychology
17. Counseling psychology
18. Psychologists in public service
19. Military psychology
20. Adult development and aging
21. Applied experimental and engineering psychology
22. Rehabilitation psychology
23. Consumer psychology
24. Theoretical and philosophical psychology
25. Experimental analysis of behavior
26. History of psychology
27. Community psychology
28. Psychopharmacology and substance abuse
29. Psychotherapy
30. Psychological hypnosis
31. State psychological association affairs
32. Humanistic psychology
33. Intellectual and developmental disabilities
34. Population and environmental psychology
35. Psychology of women
36. Psychology of religion
37. Child and family policy and practices
38. Health psychology
39. Psychoanalysis
40. Clinical neuropsychology
41. Psychology and law
42. Psychologists in independent practice
43. Family psychology
44. Psychological study of lesbian, gay, bisexual, and transgendered issues

45.	Psychological study of ethnic minority issues
46.	Media psychology
47.	Exercise and sport psychology
48.	Peace psychology
49.	Group psychology and group psychotherapy
50.	Addictions
51.	Psychological study of men and masculinity
52.	International psychology
53.	Clinical child and adolescent psychology
54.	Pediatric psychology
55.	Pharmacotherapy
56.	Trauma psychology

Note: The first 19 divisions were established in 1946; the rest were established piecemeal thereafter. Divisions 4 (comparative) and 11 (abnormal) were absorbed by divisions 6 and 12, respectively.

Doubtless the tireless Hall would have applauded these directions and been overjoyed at the status of the APA and of U.S. psychology at the end of the 20th century. Clearly, psychology had arrived. The field had grown prodigiously. The great majority of psychologists were engaged in the practice of psychology, convinced that they were applying sound, scientifically based psychology, but even with much necessary information concerning validity still lacking practiced it anyway, and the public demand for practitioners continued to exceed the supply until late in the 20th century, although by then it had become harder to place new doctorates in the professional practice of psychology into desirable positions—and traditional academic jobs too became very hard to find. At the end of the century there were thousands of practitioners, thousands of teachers, thousands of researchers, and hundreds of thousands of students. It was not clear what would happen to them in the near future or what the fates would be of graduate students who were still in the pipeline. Overproduction of doctoral psychologists, both practice oriented and research oriented, had become a major workforce problem by the end of the 20th century and continued to be problematic into the first decade of the 21st century.

Summary of Part II

Wilhelm Wundt, great systematizer, was influenced by the German Zeitgeist and Ortgeist of the middle of the 19th century, which had been developing in the preceding century. Leibniz's views on apperception and Wolff's psychology set the stage. Herbart's mathematical psychology, J. Müller's physiological work, and Weber's experimentation in sensation as well as Helmholtz's many scientific contributions helped make the time ripe for Fechner to invent psychophysics. It was Wundt in the last decades of the 19th century who became the symbol of the new experimental psychology, with his detailed, logical, systematic views; his active laboratory; and his many students. Wundt's system somewhat overshadowed Franz Brentano's act psychology, Stumpf's phenomenological work, and G. E. Müller's devoted experimentation, which nevertheless helped mold the new image of psychology. The physiologist Hering and the physicist Mach, both of whom contributed to the growing field of sensation and perception, also helped shape the new psychology. Külpe, the leader of the Würzburg school, questioned some of Wundt's systematic assumptions with his own and his students' influential work on imageless thought, and Hermann Ebbinghaus made the study of learning and memory quantitative and experimental.

The new German psychology was experimental, elementistic, and associationistic. It made much reference to physiology and concentrated particularly on receptive processes. Vitalism was out and scientific materialism was in, and quantification had become an end in itself. It was mostly a psychology of mental content, but the seeds of an act psychology were also sprouting—in Brentano's formulations and in the Darwinian **evolutionary psychology** of Galton and others.

U.S. psychology before William James came on the scene had been moralistic and philosophical. James, soon joined in this task by many other people from the United States who had gone to Leipzig to study with Wundt, carried the new psychology to the United States, where it took on a different, more functional flavor. James stressed the role of habit, developed a theory of emotion, and presented an influential description of the stream of consciousness. U.S. psychology grew rapidly; many laboratories of experimental psychology were founded in the United States in the last two decades of the 19th century. Within a few short years the new approach was firmly entrenched in U.S. psychology, and psychology was institutionalized in the United States with the founding of the American Psychological Association in 1892. The APA gradually grew and prospered, until by early in the 21st century it had become a huge organization, partly scientific and largely professional, publishing many journals, sponsoring mammoth conventions for the exchange of psychological knowledge, and with extensive programs intended to use psychological methods and knowledge in an effort to promote human welfare.

PART III

PSYCHOLOGY IN THE 20TH CENTURY

CHRONOLOGICAL CHART: BEYOND 1900

Some Landmarks and People in World History	Approximate Date	Some Landmarks and People in Psychology's History
		Woodworth
Trans-Siberian railroad		Pavlov
Einstein's theory of special relativity		Angell
		Binet and Théophile Simon
		Sherrington
		Yerkes
		Beers
Ford Model T automobile	1910	Washburn
Amundsen reaches South Pole		Wertheimer
Titanic sinks		McDougall
Panama Canal		Adler
World War I		Jung
Russian Revolution		Watson
League of Nations		Lashley
		Köhler
		Rorschach
radio broadcasting	1920	Koffka
Lindbergh: first solo trans-Atlantic flight		Carr
		Psi Chi founded
Great Depression		Tolman
New Deal	1930	Lewin
Hitler		Stevens
World War II	1940	Piaget
atomic bomb		Horney
United Nations		Skinner
Israel founded		Maslow
Communist control of China		information theory
Korean War	1950	May
Elizabeth II of England		Rogers
Hillary and Tenzing climb Mt. Everest		Herbert Simon
Sputnik		Chomsky
		Psychonomic Society founded

first human orbits earth	1960	Hubel and Wiesel
commercial television		licensure and certification
Martin Luther King assassinated		Neisser
Visa and MasterCard started		cognitive science
Chinese Cultural Revolution		computer modeling
environmental movement		
U. S. involvement in Vietnam War		
first human on the moon		
email invented	1970	PET scans, CAT scans, fMRI
		health psychology
personal computers	1980	
Tienanmen Square		APS founded
cell phones	1990	neuroscience and other
Soviet Union breaks up		specialized fields
Google and social networking	2000	

CHAPTER 9

The Age of Schools

The psychology of the 20th century was a direct outgrowth of the trends considered in Part I and Part II. Several of these coalesced during the first decades of the 20th century into cohesive schools, but by the middle of the century most of the schools had lost their function as foci for research and for theoretical controversy. By the time the age of schools had come to an end, there had developed a general acceptance of the empirical method, which was extended to nearly all corners of psychology's subject matter and which had an increasingly quantitative orientation. Psychology also left the university to enter the field of public affairs, and psychologists engaged in large numbers in clinical practice and other human-service work. By the end of the century, though, economic troubles began to beset both academic psychology and the practice of psychology in applied settings.

The Great Schools of Psychology

During the second decade of the 20th century, five major points of view became foci for psychologists' dedicated theoretical commitment; each of these schools had its own particular convictions about the definition of psychology, the task of psychology, and the methods appropriate to the fulfillment of that task. For a while each seemed to be convinced it was right, and all the others were wrong. This chapter considers the schools briefly and comparatively by way of introduction, and the next four chapters examine each a bit more fully. It might be worthwhile to read the present chapter twice, first to obtain a preliminary overview of the schools and then once more, after having read the next four chapters, to help pull the material together. The two summary tables in this chapter (Table 9.1 and Table 9.2) are apt to be more meaningful after one is somewhat acquainted with the details of the schools' positions.

Titchener's *structuralism* wanted to find out about the content of the mind and studied it by **introspection.** *Functionalism* was more concerned with adaptation; that is, what are the various activities of the mind for? There were two centers of functionalism: (1) the Chicago school of Angell, Carr, Dewey, and Mead and (2) the Columbia school of Cattell, Thorndike, and Woodworth. *Behaviorism* insisted that psychology should study behavior and not experience; it claimed that objective experimentation is the only legitimate method. The leading early figure here was Watson; later prominent behaviorists include Hull, Guthrie, Spence, and Skinner. The *Gestalt psychologists*, Koffka, Köhler, and Wertheimer, and later Lewin and others, disagreed with the other three schools; they maintained that both experience and behavior are legitimate areas for the psychologist to study and that one should use whatever method is appropriate to the problem—as long as one is careful to avoid an artificial or arbitrary cutting up of the phenomenon that is being examined. The fifth major school, *psychoanalysis*, did not really flourish in the scientific arena; the first four were sparring with one another, but psychoanalysis was in a different ring, one closer to psychiatry, the medical specialty dedicated to the alleviation of psychopathology. The pioneer here was Freud; among the more influential later theorists were Jung and Adler. Psychoanalysis, using the methods of **free association** and of **dream analysis,** attempted to understand the fundamental processes of the conscious and especially of the unconscious mind and the dynamic forces composing the personality.

Some Issues on Which the Schools Differed

Table 9.1 presents a capsule overview of where the five schools stood on some of the important questions of the time. As the first row in the table indicates, structuralism and behaviorism attempted to reduce psychology to fundamental elements (mental elements in one case; stimuli and responses in the other), while the Gestalt approach was against an atomistic, elementistic approach and for the structural analysis of naturally occurring wholes, arguing that the whole is different from the sum of its parts;

functionalism attempted reduction to adaptive processes as well as to structural elements. Psychoanalysis did not really have much to say on this issue, yet it did try to get at processes via a kind of mental elements or problem experiences: what areas, what particular experiences, are disturbing to the person?

TABLE 9.1 The Schools of Psychology and What They Stood For

School (and Representative Adherents)	Structuralism (Titchener)	Functionalism (Angell, Carr, Thorndike, Woodworth)	Behaviorism (Watson, Hunter, Hull)	Gestalt Psychology (Wertheimer, Koffka, Köhler)	Psychoanalysis (Freud, Jung, Adler)
Unit of study	Mental elements	Mental elements and adaptive processes	S–R elements	Natural wholes or Gestalten	Elements and processes?
Subjective or objective	Subjective	Mostly subjective	Objective	Both subjective and objective	Subjective
What should psychology study?	Content	Mostly function, but also content	Content and function	Content and function	Content and function
Preferred method	Introspection	Introspection; later, behavior observation, too	Behavior observation	Phenomenology and behavior observation	Free association and interpretation
Purpose: pure or applied?	Pure	Pure and applied	Pure and applied	Mostly pure	More applied than pure
Nomothetic or idiographic?	Global laws (nomothetic)	Some individual differences (idiographic) but mostly global laws	More global laws than individual differences	Both global laws and individual differences	Mostly individual differences but also global laws
Physiological explanation	Physiological connections	Physiological why or what for	Physiological connections	Physiological fields	Biological drives?

TABLE 9.2 How the Schools of Psychology Exemplified the Eight Trends

School	Structuralism	Functionalism	Behaviorism	Gestalt Psychology	Psychoanalysis
Physiology	A bit, for explanation	Yes: adaptive processes	Yes: neural connections	Yes: brain model	Not really
Biology	Slightly	Yes: strongly evolutionary	Yes: behavior and evolution	A little: living systems are Gestalten	Somewhat: the id drives
Atomism	Yes: mental elements	Yes, some	Yes: S's, R's, and S–R bonds	No: antielementism	Maybe: traumatic experiences?
Quantification	Yes, some	Yes	Yes	Yes, mostly	No
Laboratories	Yes	Yes	Yes	Yes	No
Critical empiricism	Yes	Yes	Yes	Yes	Yes, loosely
Associationism	Yes	Yes	Yes	No: antiassociationistic	In a way: free association
Scientific materialism	Some	Yes: study of the organism	Strongly: objectivism	Yes: brain model	Not really

Second, the schools differed on whether psychology should be subjective or objective. Structuralism, early functionalism, and psychoanalysis were all frankly mentalistic; but behaviorism was explicitly antimentalistic, while Gestaltists were willing to accept mentalistic or behavioral information, depending on the nature of the problem being investigated.

Structuralism maintained that psychology should study the content of mental experience; functionalism was more interested in the functioning or operation of these contents. The remaining schools were interested in both content and function.

The method of choice of the structuralists and the early functionalists was experiment and systematic introspection, whereas the behaviorists argued for the exclusive legitimacy of the observation and experimental study of behavior; Gestalt psychologists used phenomenology, or "naïve introspection," and also observation and experimental study of the behavior of both animals and people. The psychoanalysts had their own particular form of "introspection"—free association.

While the structuralists, and most of the Gestaltists, were primarily interested in trying to develop an understanding of psychological processes for their own sake, functionalism extended its inquiry to educational psychology and other applied problems: what do the various psychological processes achieve for the organism? Behaviorism was concerned both with "pure" problems and with the application of psychological knowledge to real-life situations; psychoanalysis focused mostly on the applied problem of helping the troubled individual but also tried to understand mental processes for their own sake.

While structuralism wanted to establish global laws that would hold for all people (what Gordon Allport called the **nomothetic** approach), functionalism was also interested in individual differences. The remaining three schools worked on both, with psychoanalysis somewhat more concerned with attempts to understand the psychological processes within particular individuals (Allport's **idiographic** approach) than with establishing general laws.

All five schools believed that psychology could profit from knowledge of physiology, but in different ways. The structuralists and behaviorists looked for physiological events and connections to account for psychological or behavioral events, whereas the functionalists were more concerned with the physiological adaptive processes presumed to underlie behavior. The Gestalt psychologists, too, sought physiological explanations of psychological events but looked to neurological and electrical "fields" rather than to the neural circuitry of the structuralists and behaviorists. The psychoanalysts did not make the same kind of direct explanatory use of physiological concepts as did the other four schools but held that the roots of behavior and experience lie in powerful biological drives.

How the Schools Related to the Eight Trends

Table 9.2 attempts to show in a nutshell how the five schools were related to the five scientific and the three philosophical trends considered in Part I. The entries in the first column of the table are to be read as though each cell raised a question. Thus, in the upper left cell, the question would be, "Did structuralism manifest the physiological trend?" In the fourth cell down in that column, the question would be, "Did structuralism manifest the trend toward quantification?" The answer to the first question, as the table indicates, is a qualified positive in that structuralism did hold that physiological concepts can serve an explanatory end. To the second question the answer is again a qualified yes, because although there was some attempt at quantification there was also much concern with the nonquantified but accurate qualitative description of the mental elements yielded by careful introspection.

Structuralism, then, displayed the physiological and quantitative trends to some degree. It was not strongly biological but was atomistic and associationistic in its interest in mental elements and their compounding. The emphasis on experimental work accounts for the conclusion that the laboratory founding and critical empiricist traditions too were evident in structuralism. Finally, although the structuralists tried empirically to pin down psychological processes, the strongly mentalistic flavor of structuralism precludes the judgment that it was very scientifically materialistic.

Functionalism displayed all eight of the trends. Its evolutionary interest in adaptive processes exemplified its biological and physiological antecedents. It was empirical and laboratory oriented, associationistic, and elementistic. Somewhat more quantitative, perhaps, than structuralism, it was basically materialistic in its concentration on the organism.

Behaviorism too evidenced all eight trends, being most insistent of all the schools in regard to scientific materialism: objectivity was its fetish. Thus, the behaviorist's elements were not the mental ones of the structuralist and early functionalist but were the behavioral ones of stimuli and responses; the question of association was recast into the language of conditioning, and neural bonds were assumed to underlie the behavioral ones. Behaviorism had a biological, evolutionary tinge and strongly advocated quantified laboratory investigation.

Gestalt psychology's very existence as a separate school depended on its objection to two of the eight trends. It was militantly antiatomistic and antiassociationistic; wholes, it held, are not composed of inert elements arbitrarily hooked together. Gestalt notions were also applied to the presumed operation of the brain and other living systems, so in its own somewhat different way the Gestalt movement exemplified the physiological, biological, and scientific materialist interests of preceding times. As dedicated to quantitative, controlled laboratory studies as behaviorism, it therefore also fitted into the traditions of quantification, critical empiricism, and laboratory founding.

As for psychoanalysis, the basic difference between it and the remaining schools shows up in that none of the eight trends really characterized it directly. True, the libidinal drive is viewed in some sense as biological, but psychoanalysis is not physiological or scientifically materialistic although it is fully deterministic. The laboratory atmosphere was essentially alien to it, as was quantification. Possibly one could argue that the traumatic experiences of childhood, considered responsible for later pathology, might in a way be seen as functionally elementary experiences, thus slightly reflecting the atomistic trend. Comparably, one might stretch the associationistic tradition to encompass free association, using it to trace the associational network in an analysand's mind, but the parallel might be little more than verbal. To the extent that psychoanalysts did try to observe without bias rather than just spinning speculative, deductive webs, psychoanalysis might be interpreted to have been at least tinged with the spirit of critical empiricism.

The Decline of the Schools

During the 1920s all five schools vigorously pursued their respective goals, although structuralism and classical functionalism were already receding into history at the end of that decade. By the middle of the 20th century, the Gestalt movement had lost its identity as a major separate school, structuralism was essentially dead, and functionalism no longer existed as a movement. However, much of U. S. psychology by then was tinged with functionalist thought. Only behaviorism and psychoanalysis continued as powerful schools. All in all, it was primarily the second and third decades of the 20th century that can be considered the age of schools. As was mentioned in the preceding chapter, though, there were vestiges of a "school" tendency in the middle of the century, as in Carl Rogers's client-centered counseling (a major rallying point among clinical and **humanistic psychologists),** in the factor analysis of workers such as Raymond B. Cattell and Hans-Jürgen Eysenck, or in the objective **behavioristics** of the followers of B. F. Skinner.

In the 1930s, 1940s, and 1950s, psychologists became generally somewhat more tolerant of one another perhaps because of the growth and evident success of psychology; they became less insistent about legislating what other psychologists can or cannot do. Unquestioning devotion to and reverence for figures such as Wundt, Titchener, and Watson subsided substantially. There was a growing recognition that maybe the other person's work is not totally useless after all; maybe different viewpoints, each in its own way, do have something valuable to contribute to the understanding of psychological issues. Although the middle of the 20th century still witnessed occasional outbursts of psychologists telling others how they should go about their work, a kind of "live and let live" philosophy seemed gradually to pervade the Zeitgeist. The prevailing attitude became that my road to the truth is, of course, better than yours, but you have a right to follow your (misguided) approach, and, who knows, it might even yield something worthwhile. Nothing is apt to be lost by attacking a problem simultaneously from several different angles and with several different methods or by attacking different problems.

During the second half of the 20th century, psychology was anything but a unified discipline. It fragmented not into a new and different set of schools but into a bewildering mixture of dozens of only modestly interrelated different foci of inquiry, each with its own methods, values, concepts, and issues. This proliferation, evident in the enormous variety of the APA divisions listed in Table 8.1, will be touched on again in the last three chapters.

CHAPTER **10**

Structuralism and Functionalism

S
tructuralism and functionalism were the first two schools to emerge; both were flourishing before the end of the 19th century. To a large extent, each of them defined its identity by contrast with the other. Consider first Titchener and his structuralist school.

Titchener

One of Wundt's most distinguished students, Edward Bradford Titchener (1867–1927), reinterpreted the experimental part of Wundt's psychology in his own systematic way (Figure 10.1). He brought this attempt to understand the structure of the mind to the United States, where it never took firm root, although it soon served as a foil for all the other four schools; it seems to have died with Titchener. It will be summarized here quite briefly.

Titchener developed the fundamental distinction, made earlier by James and Dewey and elaborated later by Angell, between structuralism and functionalism; structuralism is curious about the "is" of the mind, whereas functionalism wonders about its "is for." Titchener called himself and Wundt structuralists; he was a highly systematic disciple of Wundt's experimental psychology—as Boring put it, he out-Wundted Wundt. Titchener had a tight group of devoted followers, but his influence did not extend far beyond this group, nor did structuralism live long after Titchener's death—although he did leave important students, among them Karl Dallenbach and Edwin G. Boring and important students of students such as Boring's student S. S. Stevens.

FIGURE 10.1 Edward Bradford Titchener (1867–1927).

Born in England, and British in his habits throughout his life, Titchener studied philosophy at Oxford and then went to Leipzig in 1890. Obtaining his PhD under Wundt in 1892, he went in the same year to Cornell and stayed there until his death 35 years later. In Titchener's work the problems and methods of Wundtian experimental psychology were transmuted into what was hoped would be a natural science of the structure of the mind, using experimental methods and systematic introspection.

Somewhat isolated from other U.S. psychologists, Titchener did have a few close friends among his students. He was not particularly active in organized U.S. psychology; although he did join the American Psychological Association, he soon engaged in a controversy about reaction times with Baldwin, who was somewhat brusque in his criticisms of Titchener, and Titchener as a result resigned from the APA. In 1904 he created his own society, a small, closed group largely composed of his own students. He wanted to call it the **Fechner Club,** but the charter members would not go along with that; it never had a regular name until after Titchener's death. People referred to it as the Experimentalists or even Titchener's Experimentalists. Named the **Society of Experimental Psychologists** in 1928, it has been a self-conscious, select, and exclusive club and continues to flourish as of the present writing. Meeting annually, its membership has been by invitation only and was until recently limited to 50; only the most prominent experimental psychologists have been included among its members.

A highly ritualistic man, Titchener always lectured in his Oxford master's gown; his lectures were very carefully prepared, and his entire staff attended all his lectures. They filed dutifully into the lecture hall before the professor entered and sat in special seats, regularly reserved for them, in the front of the room.

Titchener wrote a great deal, turning out a brief *Outline of Psychology* in 1896 and a *Primer of Psychology* in 1898. In 1901 he began publication of manuals of experimental psychology; each manual was accompanied by a comprehensive instructor's guide. There was one manual for qualitative analysis and a second for quantitative analysis; the parallel with chemistry is by no means accidental. By 1910 he had published an experimental psychology of feeling and emotion and another on the thought processes; the latter, incidentally, provided a fair, balanced presentation of the research of Külpe and his Würzburg school, even though Titchener's own position was radically different from Külpe's. In the same year appeared the *Textbook of Psychology*, Titchener's most systematic work. About 1912 he began a still more systematic treatise that he never completed himself, which appeared as four articles during Titchener's lifetime in the *American Journal of Psychology* and which was published after Titchener's death as a book, edited by H. P. Weld, in 1929.

Titchener's Structuralism

Structuralism holds that psychological wholes are compounds of elements; psychology's task is to discover the elements and the manner in which they compound. One must begin with the atoms or elements; science goes from the part to the whole. The elements are conscious mental contents. The method of choice is systematic introspection by highly trained observers.

Titchener divided psychology into human, animal, social, child, and abnormal psychology; in practice, however, he was most sympathetic to what he called human psychology: the main task of psychology is to understand the structure and content of the adult human mind, well trained in systematic introspection. This preference of his was apparently shown in his and his coeditors' editing of the *American Journal of Psychology* in that papers reporting studies on participants other than adult humans were usually rejected.

That Titchener tried steadfastly to remain true to Wundt's experimental tradition does not mean that he did not make a number of innovations. For example, while the Wundtian elements were sensations and feelings, Titchener renamed feelings and added a third class: his elements were sensations, images (elements of memory), and **affections.**

Another elaboration was Titchener's vehement insistence on the necessity of avoiding the **stimulus error;** introspective descriptions must be carefully limited to the contents of the experience being analyzed and not be contaminated by knowledge of the nature of the stimulus responsible for the mental contents. Thus, a proper psychological description of an apple must include material on its color, shape, smell, weight, taste, and the like, but it would be a mistake to describe it as an apple, which we know to be an edible fruit.

Related to concern about the stimulus error—in that avoidance of this error necessitates, according to Titchener, avoidance of meanings if there is to be a genuine psychological description of introspective material—is Titchener's fairly influential "context theory of meaning": Each experience has an elemental core and a meaning-providing context. Perceptions have sensory cores and ideas have imaginal cores. The context can be sensory (as in the kinesthetic accentuation of rhythm) or imaginal (as in recalling the name of a familiar face). It is the associated context that gives meaning to any experience.

Psychology was conceived by Titchener to be the study of mind, which is the sum total of human experience considered as dependent on the experiencing person. Psychology should strive to answer the what, the how, and the why. What is the task of analysis—into the simplest components; why is the task of synthesis of the complex out of the elements; and how is the question of the laws of connection of the elements, arrived at by analysis. Systematization and explanation occur via the nervous system; Titchener was a psychophysical parallelist, who argued that explanation via processes in the nervous system brings unity and coherence to the study of psychological processes: the description of mental contents alone is not enough. Physiological concepts, then, provide a kind of how, an explanation and a systematic approach, but, Titchener commented, they do not “add one iota” to the introspective data, the what, which are the primary data of psychology.

The Impact of Structuralism

Titchener’s Cornell laboratory was an active, exciting place to be during Titchener’s days there. The traditional Wundtian experimental problems were being pursued zealously, and some students who were to become important in later years were deeply inspired by Titchener’s rigor and enthusiasm. With Titchener’s system, there seemed to be a possibility that another 40 or 50 years of diligent research might bring psychology to the state of an essentially completed science—all the important problems would have been solved by that time, and only a little refined clean-up work would remain. Clearly, though, that is not how later psychology developed. From the perspective of about a century later, the chief longer-term historical significance of Titchener’s structuralism might be that it constituted a clear and highly systematic point of view with which other schools and orientations could contrast their own positions.

The Functionalist Orientation

Functionalism flourished primarily at two major universities: Chicago and Columbia. At Chicago it was an explicit and self-conscious system; at Columbia it was not all that self-conscious but was, rather, a kind of ambient attitude. This attitude soon permeated most of the United States, which could be one reason its offspring, behaviorism—very self-conscious—soon displaced it, spreading rapidly from The Johns Hopkins University all over the country. At both Chicago and Columbia the concern was with the why of experience and behavior, but for the functionalists this did not mean, as for Titchener, the synthesis of experience out of mental elements; rather, it meant an examination of the adaptive functions of mind for the organism. The predecessors of the functionalist movement, therefore, include not only James with his concern about the "what for" but also Brentano with his act psychology, Spencer and Darwin and their evolutionism, and Galton. Functionalism was an explicit psychological outgrowth of evolutionary theory.

Chicago Functionalists

Dewey

Well known for his educational philosophy of **learning by doing**, John Dewey (1859–1952) was most renowned as a philosopher and educational theorist, although many of his contributions were significant for psychology proper as well (Figure 10.2). He was at Chicago from 1894 until 1904, when he went to Columbia. He published a textbook of psychology and a small volume on thinking, both of which were influential; his book on thinking, *How We Think*, viewed the process as an adaptation to a novel problematic situation. Thinking occurs if the organism is thwarted in its desires and ceases when the desires are fulfilled.

Dewey's most significant contribution to psychology, however, might have been his 1896 article in the *Psychological Review* on the reflex arc concept. Dewey here was against elementism in psychology and physiology and severely criticized the atomistic approach of writings like William James's analysis of habits. Dewey argued that one cannot split up a piece of behavior into arcs and the arcs into stimuli and responses; the distinction between a stimulus and a response, furthermore, is a purely functional one—one cannot have a response without a stimulus and vice versa. The two are correlative, and the arc must be considered as a whole, a purposeful, adaptive, useful whole. Dewey's point here is almost indistinguishable from those in some of the later writings of the Gestalt psychologists.

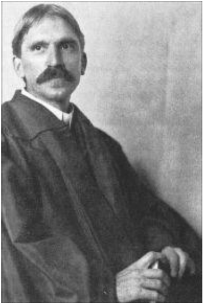

FIGURE 10.2 John Dewey (1859–1952).

Angell

James Rowland Angell (1869–1949) studied under James at Harvard and abroad but never bothered to complete the requirements for his doctoral degree by translating his dissertation into German. His career, which included the supervision of many doctoral theses, demonstrated that one need not have *PhD* after one's name to be creative, original, and productive. He, like Dewey, arrived at Chicago in 1894. Remembered by his students as an impressive man who gave an excellent course in the history of psychology, Angell wrote a textbook in psychology that was much less philosophical than Dewey's. Its title was *Psychology: An Introductory Study of the Structure and Function of the Human Consciousness;* particularly in the first chapter, it stressed *the function* of consciousness.

Angell was elected president of the American Psychological Association in 1906, and he chose "The Province of Functional Psychology" as the title for his presidential address. In this essay he distinguished sharply between structuralism and functionalism. Structuralism studies conscious content, whereas functionalism studies the operations of consciousness. Structuralism attempts analysis into elements, whereas functionalism is concerned with the nature and functions of mental processes, with emphasis on how these processes work. Functionalism conceives of consciousness not as just a passive receptacle for experience but as typically engaged in "an adaptive reaction to a novel situation."

Angell had a successful academic career, including a profound influence on many students, such as the later functionalist Harvey Carr; the behaviorists John B. Watson, Walter S. Hunter, and Karl F. Muenzinger; and the pioneer industrial psychologist Walter van Dyke Bingham. His text remained popular for a long time. As has happened as well to other able academics, he was persuaded to leave the laboratory and the study to undertake administrative work in his later years, serving as director of the Carnegie Corporation before becoming president of Yale University.

Carr and Mead

Harvey Carr (1873–1954) obtained his bachelor's and master's degrees at the University of Colorado and then went to Chicago, where he was to stay for the remainder of his professional life. He completed his PhD under Angell in 1907, with a study of visual illusions. An accomplished experimentalist, Carr continued to study perception and then animal behavior for many years, working with mazes, discrimination boxes, and problem boxes. Very much of an empiricist, he was relatively little concerned with theory and did not get around to publishing his textbook, based on notes he had used for many years, until 1925: *Psychology: A Study of Mental Activity*. An unabashed pragmatist when it came to theory and practice, in his 1926 presidential address to the American Psychological Association Carr reflected that when he was dealing with animals, he was a behaviorist, but when dealing with humans he was a mentalist.

Carr's theoretical contributions to functionalism were mostly incidental by-products of his experimental work. Carr held that the subject matter of psychology is mental activity, and mental activity is adaptive ("the organism adapts"). Mental activity is manipulation of certain experiences to attain certain ends. Every **adaptive act** involves six aspects, according to Carr: there are a motive and a motivating stimulus, which provides direction; a sensory situation, which is perceived or cognized; an incentive; a response, which alters the situation in such a way that the motivating conditions are satisfied; and the association between the stimuli (the motivating stimulus and the sensory situation) and the response. Organisms never act randomly; behavior is always relevant to the situation; all behavior is motivated.

George Herbert Mead (1863–1931), though a professor of philosophy, gave courses and seminars in the scientific method in psychology, social psychology, and the psychology of language and was closely associated with the functionalists in the psychology department at Chicago. Among his contributions was a **functional definition of meaning:** the meaning of an object depends on its function. Thus a pencil, for example, can be a noisemaker, spear, roller, prop, bookmark, writing tool, and so forth, depending on the way it is used.

Columbia Functionalists

At Chicago, functionalism grew in protest against structuralism, which was Titchener's reinterpretation of Wundt's experimental psychology; it was also profoundly influenced by the writings of William James. Functionalism at Chicago served as the bridge between structuralism and behaviorism; the concern with the adaptive properties of behavior characteristic of the functionalists was taken over as a major concern of the behaviorists. Columbia functionalism also developed in the same directions. It started a little later than Chicago functionalism and was soon strengthened by Dewey's coming to Columbia in 1904. At Columbia there was also James McKeen Cattell, already mentioned in Chapter 8, who was very much interested in individual differences and in applied psychology; two other major figures were Thorndike and Woodworth.

Thorndike

Edward L. Thorndike (1874–1949) was trained at Harvard and then Columbia (Figure 10.3). He undertook his dissertation research on animal intelligence, studying how dogs, cats, and chicks learn to get out of a puzzle box. At Harvard, the authorities were leery of permitting smelly animals to be kept in the hallowed halls, so the preliminary research for Thorndike's doctoral thesis was done in the basement of William James's graciously offered Cambridge home. Thorndike's PhD thesis, submitted to Columbia, was published as a monograph in 1898. In it, he reported that he had found a slow, continuous increase in the efficiency of behavior during problem solving and argued that learning occurs mechanically, with the gradual elimination of wrong responses. Behavior in a new problem situation, he said, is initially random. The random behavior and its consequences lead eventually to mechanical connections between stimuli and responses; learning is by blind trial and error. This point of view led him to his highly influential formulation of the law of effect: that in a given stimulus situation any act followed by a satisfier will be stamped in, whereas any act followed by an annoyer will be stamped out. That is, reward stamps in the stimulus–response (S–R) connection or bond, and punishment stamps it out.

FIGURE 10.3 Edward L. Thorndike (1874–1949).

In 1932, shortly before his retirement, Thorndike proposed the **truncated law of effect;** experiments had shown that the function of punishment is not as straightforward as he had first thought—punishment does not weaken connections in the same way that reward strengthens them. Accordingly, he dropped the second half of the law concerning punishment.

Thorndike's approach remained central to the Ortgeist of the U.S. psychology of learning for many years; it became extremely influential in U.S. educational theory and practice. The reinforcement formulations of Hull, Skinner, and Spence, to mention just a few important later workers, were essentially more sophisticated restatements of Thorndike's law of effect. His influence on the behaviorists suggests that one might consider him a behaviorist almost as readily as a functionalist.

Employed by Columbia immediately after completing his PhD, Thorndike was considered the outstanding psychologist at Teachers College there for many years. A forceful, down-to-earth man, Thorndike had many followers. He was one of the early great U.S. experimental educational psychologists, and his doctrines dominated U.S. educational practice for decades. He was very prolific. Among his works were a three-volume educational psychology (later condensed into one) and books on the theory of measurement, on learning, and on educational policy; after his retirement he went into sociology, writing on such issues as the characteristics of a good community. Throughout his career he called himself a connectionist, because he focused on how bonds between stimuli and responses are developed—a concern that he had acquired while working with James at Harvard, before he earned his PhD at Columbia.

Woodworth

Robert Sessions Woodworth (1869–1962) had a long life and a long, distinguished career in psychology. He collaborated early on a book in physiological psychology (i.e., experimental psychology) with Ladd and later produced his own editions. In 1901 he and Thorndike performed a famous experiment on transfer of training, defeating the educational philosophy of formal discipline by demonstrating that mental skills are not, like muscles, strengthened by training but that only identical elements are transferred from one learning activity to another. Woodworth also wrote a well-received history of psychology (*Contemporary Schools of Psychology*) that he revised later and that came out in a third edition, with Mary Sheehan's coauthorship, shortly after Woodworth's death. His *Experimental Psychology* (first published in 1938 and later revised by Harold Schlosberg and still later by Kling and Riggs) proved to be the standard text in its field for several decades until it was largely replaced by Charles E. Osgood's almost equally monumental book in the same field in the early 1950s.

In much of his work, Woodworth's functional orientation led him to what he called a dynamic view, which emphasized the importance of motivation in the understanding of behavior. He held, for example, that **mechanisms can become drives;** that is, well-trained patterns of behavior can carry with them their own motivation. He also argued that one must consider the *organism's* contribution to its behavior and inserted the organism into the behaviorist's S–R formula, rewriting it S–O–R. His systematic book, *Dynamic Psychology*, published late in his career, was a fitting capstone to his many contributions to his discipline. He was active and sprightly to the end. The present writer remembers with pleasure and some degree of awe being among a group of Woodworth's students and interested followers walking between hotels at an APA convention that was held after Woodworth's 90th birthday. Most of the group were huffing and puffing, having a hard time keeping up with the nonagenarian's pace, both intellectually and on foot.

The Mental Testing Movement

Although it was not explicitly associated with the school of functionalism as such, the rise and spread of individual psychological testing was consistent with the functionalist program. Here was an application of psychology that could clearly benefit the individual as well as the society.

Modern psychological testing began with late 19th-century attempts to use standard, relatively simple psychophysical and reaction-time measures to assess individual differences in "sensitivity"; Cattell, Calkins, and others hoped to measure intelligence this way. It didn't work very well. When Binet and Simon came up with an age-graded battery of puzzles and thought tasks (1905) more directly representative of "general intelligence" in an effort to identify children who were likely to experience difficulty in school, the movement was launched. Binet and Simon's approach worked. Soon Lewis M. Terman at Stanford University translated their French text and adapted it to the scene in the United States, giving rise to the widely used Stanford-Binet.

One of Binet and Simon's innovations was the concept of **mental age,** or MA. A child has an MA of 6 if that child performs on the test like an average 6-year-old. If the child's chronological age were, say, 8 years, then that child's mental age lags 2 years behind its chronological age. William Stern suggested taking a *ratio* of MA to CA rather than subtracting the former from the latter, yielding the familiar **intelligence quotient** or IQ:

$$IQ = MA/CA \text{ (times 100, to remove the decimal point)}$$

Mental testing was given substantial impetus during World War I, when a committee chaired by Robert M. Yerkes developed a sophisticated group intelligence test for screening army recruits; two versions, the Alpha for those who could read and the Beta for illiterates, were used extensively. David Wechsler designed a succession of individual intelligence tests, using a different statistical basis (actual distributions of scores in the norming group) for assigning "IQs" than the Stern ratio. Separate scales for adults (the Wechsler Adult Intelligence Scale, or **WAIS**) and for children (the Wechsler Intelligence Scale for Children, or **WISC**) were soon developed and have been revised several times. A large number of group intelligence tests have been constructed since the second decade of the 20th century. By later in the 20th century, theories and tests for different relatively independent kinds of intelligence and creativity became prominent.

While early mental testing was devoted chiefly to the measurement of intelligence, this objective was soon broadened substantially. Anne Anastasi, a pioneer in this development, published several influential books that helped establish the field, including *Differential Psychology* (1937; new editions in 1949 and 1958), *Psychological Testing* (1954; fifth edition 1982), and *Individual Differences* (1965). Tests of personality included questionnaire inventories such as the Bernreuter and the later **Minnesota Multiphasic Personality Inventory** (MMPI) and **projective** techniques such as the **Rorschach** Inkblot **Test** and the **Thematic Apperception Test** (TAT). Vocational interest tests such as the Kuder-Richardson and the

Strong were developed, as were tests for various vocationally relevant aptitudes and abilities. By the middle of the 20th century there was a wide range of tests that could be used for such purposes as fitting job applicants to the requirements of particular openings, helping students choose vocational goals, deciding who is most qualified for further training in a particular field, selection of airline pilots, predicting reading readiness of preschoolers, measurement of mental retardation, identification of organic brain damage or psychosis, and many other functions. While earlier efforts to measure individual differences were often plagued by problems of their questionable validity, by the 1970s test construction had become a highly sophisticated and technologically impressive field.

The Impact of Functionalism

Early functionalism, then, concerned itself with mind in use—mind as an adaptive mechanism. Chicago functionalism began within the introspective tradition, but, especially at Columbia, later research concentrated on "the adaptive processes of the organism." Thus, functionalism served as a bridge to behaviorism, placing great emphasis on learning (an orientation that was to continue to be characteristic of mid-20th-century U.S. psychology); it also greatly furthered the cause of applied psychology.

It might well be considered characteristic of functionalism that it followed its own precepts, adapting itself to the changing scene of psychology so efficiently that it essentially adapted itself right out of existence as a separate school and merged successfully into mid-20th-century U.S. psychology. It did its job so well that a functional orientation has continued to be a major hallmark of U.S. psychology. Indeed, by the end of the 20th century there was a new surge of interest in **evolutionary psychology,** concentrating on how the mechanisms of adaptation can be used to explain a broad range of human and animal behaviors, from social processes through cognitive functions to psychopathology. The functionalist legacy remained unmistakable.

CHAPTER 11

Behaviorism

Antecedents of Behaviorism

While behaviorism perhaps can claim to rival functionalism as the most peculiarly American of the schools, some of its predecessors were from Europe rather than the United States. True, it was John B. Watson, whose approach was very characteristic of the United States at the time, who popularized the school, but many others before him had propounded the doctrines that were later to become central to it. The core idea—an emphasis on behavior rather than mind—has a long tradition in experimental biology, particularly in the objective study of animal behavior. Elementism (atomism, reductionism) had been in the air for centuries, as was the concern with compounds (associationism); in later behaviorism, this took the form of an intense interest in discrimination and in conditioning, the most important early work on which was done in Russia (although the Russian work was not really discovered by U.S. psychologists until about 1913). The mentalistic associationism of early philosophers and psychologists was turned by the behaviorists into S–R associationism; antimentalistic biases had been around for a long time in the scientific materialism movement, and the emphasis on objectivity had many antecedents.

Scientific Materialism

Behaviorism fits perfectly into the tradition of scientific materialism. The influential evolutionary biologist Jacques Loeb, mentioned briefly in Chapter 4 as a later representative of this point of view, in 1890 published some of his work on tropistic, mechanical behavior in animals; in 1912 he published *The Mechanistic Conception of Life*, an outstanding restatement of scientific materialism in the tradition of Descartes and the French materialists. Then there were the objective Russian physiologists or "reflexologists," particularly I. M. Sechenov (1829–1905), Ivan P. Pavlov (1849–1936), and Vladimir Bekhterev (1857–1927). As early as the 1860s, Sechenov was experimenting with reflexes and maintaining that the proper way to study psychological processes is via the physiological investigation of reflexes.

Although Russian reflexology, then, can be said to have begun with Sechenov, it is Pavlov who is best known in this area. After winning the Nobel Prize for his study of digestive secretions, he turned the attention of his laboratory to what he called "conditional reflexes"; almost all students know about his famous study of salivation in dogs. The prototypic experiment showed that an originally neutral stimulus, such as a bell, which does not produce salivation, will do so after repeated pairing of the bell and the presentation of food powder. Pavlov and his colleagues undertook extensive systematic experiments on this phenomenon, recognizing its importance for the objective analysis of psychological processes.

Bekhterev in 1910 published *Objective Psychology* and a few years later a book on human reflexology; in both of these, he took a thoroughgoing antimentalistic position, and devoted himself to the careful description of behavior.

Then there was Max Meyer (1873–1967), a Swiss who obtained his PhD under Stumpf and then immigrated to the United States and who published in 1911 *The Fundamental Laws of Human Behavior*, in which behavior was defined in a completely objective fashion. In 1921 he published *The Psychology of the Other One*, in which he argued that to be objective, psychologists must avoid all introspection and make statements and observations concerning only the behaviors of other people. It might be argued that Meyer was actually the first true "behaviorist" but that behaviorism's popularizer, John B. Watson, somehow got the credit that Meyer should have received.

McDougall

Already mentioned in Chapter 7, William McDougall was an Englishman who settled in the United States. He published several important books early in the 20th century; in 1912 *Psychology: The Study of Behaviour* appeared, in which he asserted that psychology should not be the study of the mind, as in structuralism and in early functionalism, but rather the study of behavior or conduct. Fundamentally different in orientation from most later behaviorists, especially of the Watsonian variety, he proposed a radical instinct theory and a purposive behaviorism or "hormic" psychology: behavior, said McDougall, objectively demonstrates purpose; that is, behavior does not occur in a vacuum but aims at some specific goal. The similarity of this view to some of the tenets of act psychology and of functionalism shows how much the concern with adaptation was in the Zeitgeist. Its emphasis on purpose was also to be taken over, in modified form, by the later "purposive behaviorist" Edward C. Tolman and his students. As indicated in Chapter 7, though, McDougall took pains later to dissociate himself from what he considered the misguided behaviorism of Watson and his followers. A 1924 debate between Watson and McDougall before the Psychological Club of Washington, DC, was published as a small book in 1929.

Animal Behavior

Also leading into the development of behaviorism was the long tradition of interest in animal psychology in England, the United States, and elsewhere, which was examined briefly in Chapter 7. The study of animal behavior was particularly congenial to behaviorism because one cannot ask animals what their mental states are like and expect a coherent answer in one's own language. If objective observations can be used to understand the psychological processes of animals, Watson was to ask later, why can't one do the same with human beings?

Among the important workers in this tradition were the tropists, such as Loeb, and the workers under the Darwinian influence, such as Romanes, Lloyd Morgan, Jennings, and Lubbock, briefly alluded to previously. And of course there was Thorndike, with his 1898 *Animal Intelligence* (which came out in 1911 in a second edition). In 1901 W. S. Small of Clark University published the first study of the behavior of rats in a maze, introducing the maze method in the study of animal intelligence and learning; this method was to be used in thousands of experiments in subsequent decades. Robert

M. Yerkes (1876–1956), a distinguished Harvard comparative psychologist who had a long, productive career and who was mentioned in the preceding chapter in connection with his catalytic role in the testing movement, published in 1907 *The Dancing Mouse*, a report of a wide variety of experiments using discrimination apparatus, mazes, and problem boxes. This was but an early one of many significant contributions of Yerkes to the rapidly growing field of comparative psychology; he worked with crabs, turtles, frogs, worms, pigs, doves, monkeys, and apes, among other species.

Titchener's first doctoral student, Margaret Floy Washburn (1871–1939), published *The Animal Mind* in 1908; by that time she had attained the chair of the psychology department at Vassar College. This successful book went through four editions; doubtless it helped her to become the second woman ever to be elected president of the APA (in 1921). The title of the book, incidentally, was a concession to structuralism and functionalism; it actually was concerned solely with animal *behavior*. Among the issues it discussed was the question of whether animals *have* minds, in the sense of memory images. It was this issue that led Carr later to suggest to his and Angell's student Walter S. Hunter that he study **delayed reaction** to measure **symbolic processes** objectively.

Watson, in his *Behavior: An Introduction to Comparative Psychology* (1914), surveyed much of the prior animal experimentation. Animal psychology remained a major interest of U.S. psychologists throughout the 20th century. It is congenial to functionalism as well as to behaviorism because the observation of animal behavior almost inevitably requires attention to the use or function of the behavior or the act.

Watson

Watson's Life and Work

John Broadus Watson (1878–1958; Figure 11.1), handsome, extreme, systematic, somewhat superficial, and very influential, was behaviorism's main popularizer. He obtained his PhD in 1903 at Chicago, with a thesis in which he studied the function of the various sensory cues that rats use in learning to run through a maze. He eliminated one sensory modality after another and found that the rats were, by and large, still able to run the maze reasonably well, showing that several modalities were simultaneously involved in the learning. Watson was put in charge of the animal laboratory at Chicago immediately after he obtained his degree and taught there until 1908, when he went to Johns Hopkins, where behaviorism really began its existence as a separate school. He became involved in some personal problems at Hopkins in 1920 and, leaving his wife and academia, remarried and became an executive in a large New York advertising firm.

FIGURE 11.1 John Broadus Watson (1878–1958).

Watson proved himself as adept in his new career as he had been as a psychologist; he was soon vice president of the company. Retiring from advertising and psychology, he spent the last years of his life on a farm not far from New York City. During his advertising career, he published a few additional popular books on behaviorism, based on his earlier thought; in 1957, one year before his death, the American Psychological Association honored him with a special award that pleased him tremendously, although his health was too poor to permit him to accept it in person. He had put his skills of persuasion to good use both in psychology and in the world of business.

Watsonian Behaviorism

The first major statement of the behaviorist position was Watson's article in the 1913 *Psychological Review*, "Psychology as the Behaviorist Views It." In the same year, in a paper in the *Journal of Philosophy*, Watson identified imagery with movements of the larynx and feeling with glandular secretions, proposing behavioral substitutes for these previously purely subjective concepts. In 1914 he published his *Behavior: An Introduction to Comparative Psychology*. This book and the *Psychological Review* article soon caused a major stir among U.S. psychologists. Initially, Watson's radical behaviorism met with strong resistance from the senior members of the psychological "establishment." His main early supporters were younger psychologists, many of whom had conducted animal research for their dissertations. His most systematic book, *Psychology from the Standpoint of a Behaviorist*, was published in 1919. Books on child psychology and on the development of personality were published after this time.

Watson's *Behaviorism* (1925) contained the famous passage that shows how extremely environmentalistic his view was. Conditioning was the key to the understanding of behavior, and its potential was considered limitless. The rapid popularity of his position might at least in part be due to how well it fitted with the U.S. political ideology that all people are created equal and that anyone can achieve success. The passage claims that if one were to give Watson a dozen healthy infants, well formed, and Watson's own specified world to bring them up in, he would guarantee to take any one at random and train that infant to become any type of specialist Watson might select—doctor, lawyer, artist, merchant-chief, and, yes, beggar and thief, regardless of the infant's talents, tendencies, abilities, vocations, and the "race" of its ancestors. The later behaviorist B. F. Skinner, with his demonstration of the great power of reinforcement contingencies in shaping behavior, might well have been willing to endorse Watson's statement in full.

Watson's *Psychology from the Standpoint of a Behaviorist* has a very systematic outline. First it considers the problems and scope of psychology and psychological methods; then it follows the traditional, typical structuralist sequence, which behaviorism inherited from functionalism and functionalism from structuralism: receptors and their stimuli, neurophysiological bases of action, the organs of response (muscles and glands), hereditary modes of response (instincts), emotions, the organism at work, personality, and abnormal behavior (the last three topics doubtless included largely because of functionalism).

In his system, Watson argued that the subject matter of psychology is human and animal activity and conduct; psychology's aim is to predict behavior, to formulate laws about behavior, and to control behavior. Consciousness is not a legitimate subject for scientific study; only study of overt behavior is scientifically defensible. To be consistent, he went so far as to hold that thinking is verbal behavior; it consists of **subvocal speech,** or minute movements of the vocal cords and tongue. The units of behavior are reflexes, or S–R connections, whether inborn or conditioned. Habits are overt or explicit (easily visible in behavior), or they are covert or implicit (more subtle internal processes); comparably, there are explicit hereditary reflexes and implicit hereditary reflexes. Although one can raise the question of whether implicit overt behavior might not be an oxymoron, Watson argued that implicit behavior can often be measured as, for example, by electrodes on the larynx during thinking or subvocal speech; furthermore, verbal report can be used as an index of implicit behavior. Fundamentally, all responses can be classified as glandular or muscular; ultimately, in a sense, all that organisms can do is secrete and contract.

The chief method of psychology is the study of the conditioned reflex, although other techniques for the observation of overt behavior, with or without the aid of instruments, are also appropriate. Thinking, as first suggested by Washburn and later developed by the behaviorists L. W. Max and E. Jacobson, can be studied by electrophysiological methods; the **motor theory of thinking**—that thinking is implicit movements—was enthusiastically defended on the grounds that careful experimental work was indeed able occasionally to detect appropriate small muscle potentials during thought and during dreaming.[1]

Reflexes can, according to Watson, be classified into emotions, instincts, and habits; all are patterns of reflex arcs. The fundamental unit, the stimulus–response (S–R) connection or reflex arc, is combined with others and compounded into one of these three categories of behavior—a conception rather similar to James's notion of habit and representing a version of the elementism so characteristic of early associationism as well as of later structuralism. Emotions involve the unstriped muscles; instincts involve the striped muscles. Emotions are internal activities, while instincts include the external situation; thus, the emotions have a smaller scope than the instincts. Both are hereditary modes of action, sequences of chained reflex arcs, that unfold serially. Habits are learned modes of response, learned patterned concatenations, acquired arrangements of reflexes. The difference between a habit and an instinct, then, is that while both are complex sets of reflexes that function in a serial order, the instinct is inherited but the habit is acquired.

This simple systematic approach, with an emphasis on the boundless explanatory power of conditioning, was applied by Watson to experimental and theoretical work on fear in childhood and to other aspects of developmental psychology, child psychology, and personality and abnormal psychology. Indeed, he was convinced that his system could handle all the problems of psychology, and better than the prior—and contemporary—misguided subjective approaches. This, again, is a conviction that B. F. Skinner later held about his own particular version of behaviorism and passed on to his many enthusiastic followers.

Later Behaviorism

Although Watson might have been the chief systematizer and proponent of behaviorism, there were others who made more important experimental contributions. Several neobehaviorist positions, such as those of Hull, Tolman, and later, Skinner, became highly visible in U.S. psychology.

Hunter

Walter S. Hunter (1889–1954), a student of Angell's and Carr's, spent many productive years at Brown University and was one of the first to investigate the "symbolic processes" objectively. He concentrated on the study of delayed reaction and of performance in the **temporal maze.** In the first, a stimulus indicating the correct response (such as a light over one of a series of three doors that leads to a reward) is presented to the organism and then removed, and the organism is restrained from responding for some time, to see how long it can retain a memory of the stimulus, as demonstrated by a capacity still to be able to make the correct response, that is, to go to the correct door. The temporal maze was so constructed that either a right or a left turn eventually led back to the choice point, so that the only cue the organism had at the choice point was its memory of its preceding response; this device forced the animal to "count" the number of turns and also permitted the study of patterns of alternation. Both the delayed reaction strategy and the temporal maze were used by Hunter and then by others in hundreds of experiments. It turned out that pigs are remarkably intelligent in dealing with delayed reaction tasks, and that rats can, with a great deal of practice, learn to count up to three or more in the temporal maze.

Lashley

A major figure was Karl S. Lashley (1890–1958), the distinguished neuropsychologist who was previously mentioned briefly. Lashley studied with Watson and with Shepherd I. Franz (1874–1933), who trained Lashley in surgical techniques. As a result of his ablation studies, Lashley concluded in 1917 that learning is *not* a series of chained reflexes. He found that the amount of impairment in the performance of a learned habit in rats is directly proportional to the amount of brain tissue removed—it did not seem to make much difference *what* part of the brain was cut out. It was this finding that led Lashley to his concepts of mass action (i.e., the brain acts as a whole) and equipotentiality (i.e., different parts of the brain can take over similar functions) and turned him into a skeptical critic of behaviorism—after he had been a relatively loyal adherent.

Hull and Tolman

Clark L. Hull (1884–1952) and Edward C. Tolman (1886–1959), both behaviorists, albeit very different kinds, were the learning theorists around whose formulations and controversies U.S. psychology revolved in the 1940s and 1950s. Hull (Figure 11.2) self-consciously employed a hypothetico-deductive method in his **drive-reduction theory** of learning. That is, he formulated explicit postulates about learning—such as that reinforcement, in the sense of the reduction of a drive, is essential for any learning to occur—and theorems from these postulates, and then tested the validity of the theorems by experimental studies in the laboratory, mostly with rats. His influence on the field of learning was very great, and he acquired many avid followers.

Tolman (Figure 11.3), not as systematic as Hull, was less concerned with the bonding of stimuli and responses than with more molar response patterns and the learning of what he called "sign-Gestalt-expectations," by which he meant, roughly, what is a sign for what, or what leads to what. He disagreed with Hull on the necessity for drive-reducing reinforcement in learning and believed that what is learned is the characteristics of the environment, the consequences of various actions, and the like. His was a more cognitive form of behaviorism, explicitly influenced by Gestalt theory. Some psychologists view Tolman as anticipating a variety of issues that became prominent in the "cognitive revolution" of the last third of the 20th century.

FIGURE 11.2 Clark L. Hull (1884–1952).

FIGURE 11.3 Edward C. Tolman (1886–1959).

Guthrie and Skinner

Edwin R. Guthrie (1886–1959), professor and later graduate dean at the University of Washington, proposed a theory of behavior based on a single law: anytime a response occurs, it is linked forever with each of the stimulus elements attended to at the time the response is made. This influential formulation was later used as part of the assumptions of some early mathematical models of learning. Guthrie also showed how it could be used in the analysis of social phenomena and personality and could be applied in educational psychology. He based his theory in part on an extensive experiment on cats in a puzzle box, patterned after the work of Thorndike and performed some 10 years before Guthrie by Karl F. Muenzinger at Colorado. Muenzinger, too, published a highly systematic small volume, *Psychology: The Science of Behavior*, in 1939.

B. F. Skinner (1904–1990), who has been alluded to often, proved to be the most objective and, in the second half of the 20th century, by far the most influential behaviorist—and perhaps the most influential psychologist of his time; he was unwilling to admit any concept of implicit behavior or even any hypothetical constructs (Figure 11.4). Using a strictly operationalized definition of reinforcement (anything is a **reinforcer** if it changes the probability of a preceding response), he produced a simple and powerful, pure, descriptive behaviorism and amassed a wide and enthusiastic following. His approach had a profound impact on teaching machines and programmed learning, among other areas, and is basic to many techniques of **behavior modification** or the application of objective principles of behavior to the alleviation of a wide range of human problems—from prison reform to treatment of adjustment problems to maintenance of a positive learning atmosphere in school classrooms. His highly popular novel, *Walden Two*, showed how his system can be used to construct a utopian society. Several popular books by Skinner in the 1970s and 1980s helped to provide him with a very large audience in the United States and internationally. Skinner's behaviorism became almost a cult; several communities were set up following the principles of Skinner's utopian *Walden Two*. With Skinner's death, psychology lost its last great charismatic figure; no single individual has been identified since then as the quintessential U.S. psychologist.

FIGURE 11.4 B. F. Skinner (1904–1990).

Skinner has been perhaps the most visible psychologist of the second half of the 20th century. He viewed human (and animal) conduct as almost totally determined by the environmental consequences of that conduct. His work has often been misunderstood as implying a George Orwellian society, in which the authorities use conditioning and reinforcement to impose their will on a community. What Skinner actually argued was not that one *should* control people's behavior to some political end but that, since environmental consequences *do* control behavior, societies should try to set up environmental contingencies in such a way as to maximize fulfilling, constructive, productive behavior and the actualization of each individual's, and the society's, positive potential.

Other Post-Watsonian Developments

Fundamentally, there were two kinds of behaviorists: (1) the **molecular**, concerned with muscular reactions, as Watson, Hull, Spence, and Guthrie; and (2) the more **molar**, concerned with larger purposive reactions, as McDougall, Tolman, and to some extent Lashley. For the molecular behaviorist the prime unit was the reflex or the S–R connection, an atomistic, elementistic conception; for the molar behaviorist the fundamental unit was the molar act. The molecularists generally inclined toward a reinforcement view, whereas the molar behaviorists tended more to favor a **cognitive map** view—in other words, that behavior is determined by how the organism cognizes its field. Skinner in a way bridged the gap, being interested in the contingencies relating acts and consequences (or reinforcements) in specific settings. Behaviorists generally were concerned with the use of behavior, much as the functionalists were; most behaviorists, both molecular and molar, tended to be associationistic and mechanistic in their psychological and neurological concepts.

The physicalistic, elementistic trend of mid-20th-century learning psychology is only one of several developments that grew out of Watsonian behaviorism. That trend had developed from his concern with habit; later workers also further developed his doctrines of emotion and of instinct. Max Meyer began a tradition in U.S. psychology of banishing emotions as inappropriate for objective study; during the 1930s and 1940s hardly any self-respecting psychologists permitted themselves to use the term. The same happened to the concept of instinct, which Knight Dunlap (1875–1949) attacked.[2]

Interest in instinctive behavior, however, came back into fashion in the late 1940s and 1950s. Leaders in **ethology**—biologists studying animal behavior, typically in the natural habitat—were Konrad Lorenz and Nikolaas

Tinbergen, who undertook ingenious studies of the complex behavior patterns of lower organisms. They investigated the stimuli and situations that trigger these patterns as well as certain critical age periods in the learning or imprinting of certain complex behaviors such as a duckling's following of its mother.

The Impact of Behaviorism

The fundamental tenet of all behaviorism is strict objectivity; one must study overt behavior and leave out consciousness. The use of objective observation rather than some version of introspection as the method of preference became widespread by the middle of the 20th century among U.S. psychologists; the vast majority tended in this direction, and in this sense the U.S. psychology of the time became behavioristic.

The behaviorism of the early part of the latter half of the 20th century could perhaps be characterized as a kind of physicalism, in part influenced by the logical positivist movement in philosophy, which in turn arose out of the critical empiricist tradition. It was commonly argued that the description of psychological data should be in **cgs** terms—that is, one must make measurements in units like centimeters, grams, and seconds; only in this way can psychology be a true science. The need to objectify the phenomena one is studying came to be accepted by almost all modern psychologists, whether they considered themselves behaviorists or operationists or physicalists or logical positivists.

But the strict behaviorism of mid-20th-century U.S. psychology died out during the last 4 or 5 decades. As computer modeling of human information processing came into vogue, simplistic accounts based on concatenated S–R bonds, strengthened by reinforcement, gave way to quasi-mentalistic analyses emphasizing encoding, storage, and retrieval processes that acknowledge the central importance of meaning, interrelations of complex ideas, an active search to make sense of things, and several categories of memory, from **iconic** or "photographic" through **short-term** to **long-term.** By 20 years after Watson's death, his simple behavioristic system was no longer viable. While Wilbert J. McKeachie was able to speak of "cognitive behaviorism” in his 1976 APA presidential address, implying a kind of bridge between behaviorism and the new cognitive psychology, by the late 1970s and the 1980s behaviorism was of little more than historical interest. Experimental and theoretical psychology had become dominated, as was previously mentioned, by what is now called cognitive science. From being banished as inherently unscientific during the heyday of behaviorism in the third and fourth decades of the 20th century, cognition took the discipline by storm; it captured the allegiance of people from a wide range of research fields and theoretical persuasions.

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[1] This could be viewed, incidentally, as an instance of uncritical belief in the face of rather obviously fallacious reasoning: just because something like muscle potentials (A) is sometimes observed to go along with something like thought (B), this in no way demonstrates that A is identical to B, causes B, or even is a necessary concomitant of B. Partly because of this fallacy, nobody past the middle of the 20th century took this kind of motor theory of thinking very seriously.

[2] Incidentally, according to both Dunlap’s and Watson’s chapters in *A History of Psychology in Autobiography*, it is claimed that Dunlap formulated the principles of behaviorism and that Watson got them from him; Watson recognized that the systematic structure of behaviorism came from Dunlap. This bit of information, which came to the present writer from Julian Jaynes of Princeton via E. G. Boring of Harvard after the manuscript for the first edition of this book was completed, suggests that Dunlap should receive more credit in discussions of the history of behaviorism than he has heretofore. Another psychologist who deserves more credit as an early behaviorist is the Frenchman Henri Piéron who, even before McDougall’s emphasis on conduct as the proper subject matter of psychology, argued in 1907 that psychology should be viewed as the study of the activity of beings and their sensory–motor relationship with their environment.

CHAPTER 12

Gestalt Psychology

Antecedents of Gestalt Psychology

The German word *Gestalt* itself is hard to translate; Titchener suggested the term *configuration*, but this did not catch on. Possible other translations are *form*, or *pattern*, or *structure*, all of which give some impression of the meaning of the word but none of which alone exactly captures the meaning of the German term. Thus, the word *Gestalt* has become part of the technical vocabulary of psychology. Long before the formal development of the Gestalt school in psychology and philosophy, Goethe had used the term and concept in a manner that to some degree anticipated its later use by the Gestalt psychologists.

There were also other anticipations and antecedents of Gestalt psychology, as has been pointed out repeatedly in previous chapters. Although they were not direct anticipators, John Stuart Mill, with his idea of mental chemistry, put forth a similar notion; William James emphasized that the stream of consciousness is a whole, a totality; John Dewey's criticism of the reflex arc concept was holistic; and even Wilhelm Wundt had emphasized the process of creative synthesis. The philosopher–physicist Ernst Mach used phenomenology much in the way the later Gestalt psychologists did. And indeed other "holistic" psychologies were emerging about the time Gestalt theory was beginning to mature—at Hamburg with William Stern, for example, and at Graz.

Ehrenfels and Gestaltqualität

The university at Graz, in Austria, became the center of the ***Gestaltqualität*** school, mostly in the person of Christian von Ehrenfels (1859–1932) but leavened also by the leader of the "Graz school," Alexius Meinong (1853–1920). In 1890 Ehrenfels published a paper in which he insisted that

Wundt's psychology had neglected a very important element: the form quality, or *Gestaltqualität*.

Form quality, for Ehrenfels, is an element over and above the elements composing a whole. A melody played in a given key is not just the sum of the notes but is, in addition, their total configuration. Change the relations among the elements, and the whole changes. But you can transpose the melody—that is, put it into a different key and thus change all the elements yet still retain the melody itself, the *Gestaltqualität*—as long as the *relations* among the individual elements or notes remain the same. Dependence on relations among elements and transposability are the essential properties of such form qualities. Thus, form qualities include, in addition to melodies, such properties as triangularity, roundness, or the quality of the phoneme that corresponds to the letter *b*. The emphasis on transposition was also to engage Gestalt psychologists later in transposition experiments with children and animals; research participants, including animals, tend to respond not so much to absolute brightness or size as to relations like relative brightness, being the largest item in a set, and so forth. Learned relationships among objects can be transposed to new sets of objects.

Phenomenology

The phenomenological method was basic to Gestalt psychology. The term *phenomenology* has several meanings in philosophy and psychology; in the present context, it means the unbiased description of subjective experience. Among the phenomenological predecessors of the Gestaltists in addition to Mach were Edmund Husserl and Carl Stumpf, the latter of whom directly influenced all three of the leading early Gestalt psychologists, Wertheimer, Koffka, and Köhler. David Katz (1884–1953), a student of G. E. Müller at Göttingen, undertook a detailed phenomenology of color perception. Edgar Rubin (1886–1951), another student of Müller, wrote his PhD dissertation on the distinction between figure and ground, which was later picked up by the Gestalt psychologists (the study itself was performed several years after the Gestalt movement had become firmly established). Harry Helson (1889–1977), who obtained his PhD with Boring at Harvard, examined the antecedent and contemporaneous Gestalt trends in detail; this work, as was previously mentioned, was published as a series of articles by *the American Journal of Psychology* in 1925 and 1926 and as a monograph.

The Founders of Gestalt Psychology

The founders of the Gestalt school were Max Wertheimer, Kurt Koffka, and Wolfgang Köhler. Wertheimer made the original statement, and the other two accepted and elaborated it. A fourth adherent, somewhat younger than the other three, was Kurt Lewin. All emphasized the principle of **relational determination:** that is, properties of parts depend on the relation of the parts to the whole; part qualities depend on the place, role, and function of the part in the whole. They also held that in most configurations the whole does not equal the sum of its parts, nor is the whole simply *more* than the sum of its parts. A whole is a dynamic system that is fundamentally different from *any* kind of sum or summative, accidental concatenation. The whole is in an important sense *prior* to its parts in that its characteristics determine the nature of the parts and of their interrelationships. Central to their thinking was Wertheimer's law of ***Prägnanz***, which states that the organization of any whole is as good as the prevailing conditions allow.

Wertheimer

Born in Prague when that city was part of Austria-Hungary, Max Wertheimer (1880–1943) obtained his PhD summa cum laude from the University of Würzburg under Külpe in 1904, after having vacillated among careers in law, philosophy, and psychology (Figure 12.1). He was at the Frankfurt Academy in 1910, went to the University of Berlin in 1916, took the chair at the University of Frankfurt in 1929, and in 1933 came to the United States, where he taught at the New School for Social Research in New York until his death 10 years later. A deep and fiercely independent thinker, a gentle, warm man with a walrus moustache, he also happened to be a close friend of the physicist Albert Einstein.

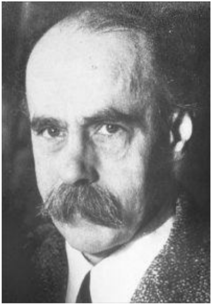

FIGURE 12.1 Max Wertheimer (1880–1943).

In 1910 Wertheimer realized the major systematic significance of the fact that discontinuous, static visual stimulation can yield the perception of continuous movement—the percept does not correspond point for point with the physical stimulus but is organized as a whole—a whole that is not just the sum total of the stimuli or sensory elements composing it. Wholes can be, indeed often are, logically and "genetically" prior to their parts and provide meaning to the parts: properties of wholes typically determine what the parts are. The paper in which this material was presented, on experimental studies in the perception of movement, was published in 1912.

The story goes that Wertheimer was on the train from Vienna for a vacation on the Rhine when he got the idea of the relation of phenomenal movement to a full-blown Gestalt orientation to all of psychology. He was so excited that he got off the train at Frankfurt, where he had not intended to get off. He went to a toy store and bought a little **stroboscope** and began tinkering with it in his hotel room. He called on Friedrich Schumann at the Frankfurt Academy (soon to become the University of Frankfurt), was shown the newly constructed Schumann tachistoscope, was invited to stay, and went to work. Köhler and Koffka already were at Frankfurt and stayed there until the work required for the 1912 paper was finished, serving mostly as participant observers. According to Koffka (via Boring), he and Köhler did not realize the significance of Wertheimer's work until it was done, when Wertheimer told Köhler and then Köhler told Koffka.

A bit earlier in 1912 a paper by Wertheimer on the thinking of indigenous non-European peoples appeared, in which he argued that thought is not associationistic but configural and "makes sense." Other early publications were also on the psychology of thought.

In 1923 Wertheimer published an influential paper on the **organization of perception,** arguing for a nonempiristic view of how percepts arise out of the punctiform activity of neural elements on the receptor surface. Those parts of the perceptual field are organized together, are perceived as belonging together or as forming a unit, which are similar and close to each other, or which move together or constitute a "good" form. In 1925 three of the early fundamental papers were published together in book form; another brief paper on Gestalt psychology, summarizing the work up to that date, was published in the same year.

Later writings showed the breadth of applicability of Gestalt principles, with analyses of philosophical issues such as the nature of ethics, freedom, truth, and the concept of democracy. ***Productive Thinking***, a small volume that presented in detail the Gestalt approach to thinking and problem solving, was published posthumously. A problem exists when something is not clear, does not fit together, has a gap; this disturbance produces a striving to resolve the lack of clarity, and the solution results in everything fitting together and making sense.

Koffka

Kurt Koffka (1886–1941) obtained his PhD under Stumpf and then taught at the University of Giessen in central Germany (Figure 12.2). In 1922 he published the first article in English on Gestalt psychology, in the *Psychological Bulletin;* its title, which began a long tradition of misunderstanding of the significance of perception in Gestalt psychology, was "Perception: An Introduction to the *Gestalt-Theorie*." Gestalt theory was primarily concerned with thinking, philosophical questions, and learning; the main reason the early Gestalt psychologists concentrated their systematic publications on perception was the Zeitgeist. Wundt's psychology, against which the Gestaltists initially rebelled, had obtained most of its support from studies of sensation and perception, so the Gestalt psychologists chose perception as the arena to attack Wundt in his own stronghold—sensory and perceptual processes. The paper elaborated especially on the central thesis that the **constancy hypothesis** (i.e., that the relationship between local stimulus and percept is constant) is untenable, citing many experimental findings to support this attack and providing a solid experimental base for the principles of the new school.

FIGURE 12.2 Kurt Koffka (1886–1941).

In 1924 Koffka came to the United States; a few years later he accepted a professorship at Smith College, where he stayed until his death, undertaking many experimental studies with his students. Together with Wertheimer and Köhler, he founded the journal *Psychologische Forschung* (later continued a s *Psychological Research*), the primary outlet for the research of the Gestalt psychologists in the 1920s and 1930s. In 1921 he published an influential book on child psychology, later translated as *The Growth of the Mind*. The only fully systematic major Gestalt psychological treatise, *Principles of Gestalt Psychology*, was published by Koffka in 1935.

Köhler

Wolfgang Köhler (1887–1967), like Koffka, obtained his PhD under Stumpf at Berlin; he remained there for several years after his degree (Figure 12.3). He and Koffka came to the Frankfurt Academy just before Wertheimer began his experiments on the perception of movement; both he and Koffka, as previously mentioned, served as participants in these experiments.

In 1914 Köhler was marooned by the First World War on Tenerife, one of the Canary Islands, where the Prussian Academy of Science had asked him to set up an anthropoid station. He remained on the island, working with the chimpanzee colony, through the entire war. Thereafter he returned to the University of Berlin. In 1917 the German version of the book later translated into English as *The Mentality of Apes* appeared; the original German title of the book is more adequately rendered as *Intelligence Tests with Anthropoid Apes*. This highly readable volume was based on a series of lectures about his experiments on the chimpanzees in the colony at Tenerife, which showed the importance of **insight** and understanding in problem solving. Recently it was proposed that Köhler might also have engaged in espionage activities for the German war effort while he was on Tenerife, but the evidence for this claim remains meager and circumstantial. Even if the claim is true, such activities could be viewed as patriotic and therefore as perfectly honorable.

FIGURE 12.3 Wolfgang Köhler (1887–1967).

In 1920 Köhler published a difficult but significant book, which has never been translated into English: *The Physical Gestalten at Rest and in a Stationary State*, in which he described physical Gestalten in chemistry, electricity, and biology and argued that the Gestalt fields that occur in physical phenomena should also occur in brain processes. His work of later years elaborated further on this doctrine of **isomorphism,** first presented in Wertheimer's 1912 paper on movement; specifically, isomorphism holds that psychological phenomena and the brain processes underlying those psychological phenomena have a similar functional (topological) form, that is, show similar Gestalt properties. Here, finally, was a physiological alternative to the neural connections that had dominated thought in physiological psychology for centuries. But experimental work by Karl Lashley, Roger Sperry, and others during the 1950s produced results inconsistent with Köhler's theory of isomorphism, and the theory is rarely taken seriously by modern cognitive or visual neuroscientists.

In 1934 Köhler came to the United States after having written a daring letter against Nazism to a newspaper; the prestige of a Berlin professorship was insufficient to prevent his harassment when the Nazis came to power, so he left. He lectured at Harvard, then went to Swarthmore College in 1935, and stayed there for many years in spite of a number of efforts to entice him elsewhere. Among his other books were *Gestalt Psychology* in 1929, *The Place of Value in a World of Facts* in 1938, and *Dynamics in Psychology* in 1940—all systematic developments of the Gestalt position. In the 1940s and 1950s he published extensive experimental work on **figural aftereffects,** a class of perceptual illusions that was implied directly by his isomorphic theory. Köhler loved New England and spent many summers on Mt. Desert Island, off the coast of Maine. On his retirement he made Dartmouth College his headquarters and continued his research and writing; he also spent several semesters teaching at European universities, both in Scandinavia and on the Continent.

A fastidious, meticulous man with the highest personal standards, Köhler loved to be impeccable in everything he did. The present writer remembers seeing Köhler, bent on recreation, spending a Sunday afternoon during the mid-1940s chopping firewood in his back yard—using a razor-sharp, well-polished axe and dressed in a spotless white suit with white shirt and tie.

The Tenets of Gestalt Psychology

The Gestalt movement can be dated from 1910 when Wertheimer conceived his stroboscopic motion experiment and performed it on his two research participants, Köhler and Koffka. Ehrenfels had said that the whole is more than the sum of its parts; the Gestalt psychologists went beyond this and held that the whole is different from the sum of its parts. The whole quality is not just one more added element. Wertheimer's insight was that what happens in the experiment on stroboscopic movement is typical of almost all experience and behavior; indeed that Gestalt principles hold in virtually every field of philosophy, art, and science. The qualities of the whole determine the characteristics of the parts; what a part has to be is determined by its place, role, and function in the whole of which it is a part. The law of *Prägnanz*, to repeat, holds that the organization of any whole will be as good as the prevailing conditions allow.

Bare associations are rare limiting cases of psychological processes. To be sure, one can associate telephone numbers and people, but this kind of association is atypical. What usually happens, argued the Gestaltists, is a much more dynamic unfolding of events such that the nature of the things connected is at least in part affected by the connection and in turn affects the connection. Most psychological processes and events are not senseless agglutinations (*sinnlose Und-Verbindungen*) or hookups (*Kuppelungen*) that come about through blind connections as between phone numbers and people's names. Most acts are "organized from the inside," as it were; they make sense, are meaningful.

This formulation involved a radical reorientation: the nature of the parts is determined by the whole rather than vice versa; therefore, analysis should go "from above down" rather than "from below up." One should not begin with elements and try to synthesize the whole from them but should study the whole to see what its natural parts are. The parts of a whole are not neutral and inert but are structurally intimately related to one another. That parts of a whole are not indifferent to one another is illustrated, for example, by a soap bubble: a minute change of one part, such as pricking it with a pin, can result in a dramatic change in the entire configuration. This approach was applied to the understanding of a wide variety of phenomena in thinking, learning, problem solving, perception, social psychology, personality, and philosophy, and the movement developed and spread fairly rapidly, with violent criticisms against it from outside as well as equally vehement attacks on the outsiders from inside.

The militancy of the position, and what it was militant about, is evident in some of the arguments in Köhler's *Gestalt Psychology*. Köhler held that the "orthodox" viewpoints in psychology, as he called introspectionism (i.e., Wundtianism and structuralism) and behaviorism, are wrong in assuming **and-connections** in behavior and in the brain. Relations among parts are conditioned by the properties of the parts and are not empty, stringlike connections such as are implied by use of the words *plus* or *and*. Field processes are widespread.

Köhler provides examples from physics: the planetary system depends on certain self-distributing gravitational forces in dynamic relation. The forces of steam are similarly not machine-like; they have more than one degree of freedom. True, they can be channeled into artificial, prearranged pipes or pathways, as in a steam engine, but in its natural state the force of steam is not restricted to a single direction. If one places a drop of oil or mercury in water it becomes a spheroid by its own dynamic properties, not by any mold into which it is poured. The **dynamic self-distribution** of forces results in the spherical form of the globule: these forces come from within.

Such an orientation is in sharp contrast to the machine model that was at least implicit in associationism, structuralism, functionalism, and behaviorism; the dynamic model of the Gestaltists argues that physical forces, when released, produce not chaos but their own internally determined organization. The nervous system, similarly, is not characterized by machine-like connections of tubes, grooves, wires, or switchboards, but the brain too, like almost all other physical systems, exhibits the dynamic self-distribution of physical forces. Köhler argued that mind–body parallelism requires that such self-determination also display itself in experience and behavior.

The contrast of dynamic self-distribution with machine theory is, incidentally, also evident in the contrast between the ancient Aristotelian notion of crystal spheres that hold the planets and the stars in place and the later less machinelike notions of post-Renaissance astronomers. The machine theory explanation of the order of the universe, with its artificial mechanical restraints, gave way to the modern one based on inertia, gravitation, and revolution, an explanation in terms of dynamic self-distribution; the field of forces, rather than some mechanical crystal spheres, holds the planets in their orbits. The similarity between Einstein's field formulations in physics and some of the Gestalt ideas is no accident but can be traced in part to many long conversations between Einstein and Wertheimer, especially during the second 2 decades of the 20th century.

Köhler also contrasted the Jamesian and Watsonian notion of concatenations of reflexes with his Gestalt explanation of his chimpanzees' behavior during problem solving; the dynamic explanation, which Köhler espoused, used the concept of insight. It is not blind trial and error or rewarded S–R connections that explain the behavior; rather, the animal understands the structure of the problem situation and acts accordingly. The main point he made so successfully and so forcefully is that it is possible to achieve an understanding of the genesis of order rather than chaos, not only through the constraint of machine ideas but also via the free play of orderly forces—that is, via dynamic self-distribution—without necessarily being "vitalistic." It was his genius to draw convincing demonstrations from soap films, electrical fields, and the like as well as from psychological phenomena.

Lewin and Later Gestalt Psychology

While the founders of Gestalt psychology had concentrated on cognitive processes such as learning, thinking, intelligence, and perception, Kurt Lewin (1890–1947) applied the principles of dynamic self-distribution of forces, the restructuring of the field, and insight primarily to motivation, personality, and social processes (Figure 12.4). His later work on small groups, from which the rapidly spreading field of **group dynamics** (the empirical study of interaction within groups, and of group productivity as a function of group structure) arose, and his analysis of child behavior made ingenious use of the dynamic Gestalt principles, which some later writers rechristened **field theory** in line with Köhler's earlier use of the term, to characterize the Gestalt approach. Lewin tried to understand persons and their situation as the persons themselves see it, in terms of their **life space,** with its psychological barriers and valences, the persons' likes and dislikes of objects, people, and activities. He put these concepts, together with tensions (such as that produced by an unresolved problem) and vectors (such as an impulse to see a movie or go to a concert) into topological symbols with the hope of being better able to understand them theoretically and practically in this form.

FIGURE 12.4 Kurt Lewin (1890–1947).

Considered a friendly, outgoing, and warm person by almost everyone who came in contact with him, Lewin obtained his PhD at the University of Berlin, then served in the First World War, and returned to Berlin as the equivalent of an assistant professor. He came to the United States several times and in 1933 decided to stay; after some minor appointments, including one at Cornell University, he was made full professor at the University of Iowa, where he worked primarily in child and social psychology. In 1945, having become renowned through his work on small groups, he was asked to head a new Research Center for Group Dynamics at the Massachusetts Institute of Technology (MIT). He went there with a group of students, and it was at MIT that the school of group dynamics flourished, although he lived only 2 more years. Lewin had strong disciples, primarily at MIT, the University of Kansas, and the University of Michigan, who carried on his approach after his death. The group dynamics work soon was known throughout all of the United States and led to sensitivity training, leadership institutes, and the like and spread rapidly in business, managerial, and institutional circles, primarily in the 1960s. Lewin published a number of influential books, including *Dynamic Theory of Personality*, and several on his topological and vector psychology; he also contributed chapters to several handbooks.

Lewin's influence spread rapidly, and many psychologists, especially in the United States, were much indebted to him and his teachings. But the more traditional Gestalt approach also had its later adherents. There was Hans Wallach, who devoted most of his work to perception, and Solomon Asch, who developed in detail Wertheimer's insights into the social psychological implications of a Gestalt orientation. Kurt Goldstein's work in neurology played a somewhat ancillary role in the early development of Gestalt theory, and his organismic and personality theory were much influenced by Gestalt principles; with Martin Scheerer he also studied thinking disorders in people with brain injuries, using a Gestalt approach. Abraham Maslow, too, developed a Gestalt-oriented theory based on Goldstein's concept of **self-actualization** and applied the approach to motivation and personality in a somewhat different way than Goldstein or Lewin. Harry Helson's influential **adaptation-level** theory was an outgrowth of Gestalt theory, elaborating how the relationship between a current stimulus and the adaptation to past similar stimuli determine the perception of the current stimulus. Erwin Levy, a student at Berlin and then a physician in New York, applied Gestalt thought to the practice of psychiatry. Mary

Henle, a distinguished second-generation Gestalt psychologist, carried on the Gestalt tradition at the New School for Social Research in New York. Abraham Luchins, another second-generation Gestalt psychologist, began his career with frequently cited studies under Wertheimer of the effect of set on problem solving, branched out into clinical and social psychology, and continued his interest in more classical areas. Rudolf Arnheim developed the implications of Gestalt theory for esthetics (and was named to a professorship specifically in the psychology of art at Harvard University), and Herman Witkin used a Gestalt orientation in his extensive studies of individual differences. There has already been occasion several times, too, to refer to the influence of Gestalt thinking on Edward Tolman's approach to learning. In Europe, centers of research on perception that were affected by the Gestalt approach flourished under Lajos Kardos at Budapest, Wolfgang Metzger at Münster, Kai von Fieandt at Helsinki, Albert Michotte at Louvain, and Lothar Spillmann at Freiburg, among others. Incidentally, while Frederick Perls, originator of the Gestalt therapy that was popular during the 1960s, did hear one lecture by Wertheimer and admired him very much, there is essentially *no* conceptual relationship between Perls's neo-Freudian "Gestalt psychotherapy" and Gestalt psychology in the sense of the Wertheimer–Köhler–Koffka theory.

The Impact of Gestalt Psychology

When Gestalt psychology came to the United States, it was received with interest, sometimes with politeness, and sometimes with suspicion; it has been conjectured that the U.S. attitude toward Gestalt psychology was tinged with the same xenophobia that was hinted at in the U.S. reception of Titchener, McDougall, and Münsterberg. The attitude toward Freud doubtless also partook of this suspicion of foreigners. Koffka, Wertheimer, and Lewin were never fully accepted by organized U.S. psychology, but Köhler was; in his late years, he received the American Psychological Association's Distinguished Scientific Contribution Award and was elected president of the American Psychological Association in 1958.

The Gestalt movement played a significant role in the revolt against structuralism. Its objections to elementism went beyond its critique of structuralism, however, and were applied to S–R behaviorism as well. Gestalt psychology called attention to the usefulness of field concepts and to various problems that might otherwise have been ignored, such as insight in animals and humans, the organized nature of perception and experience, the richness of genuine thought processes, and the utility of dealing in larger, molar, organized units, taking full account of their nature and structure. Wholes should not be analyzed arbitrarily into predetermined elements, since such analysis, the Gestaltists argued, and most psychologists now recognize, can do violence to the intrinsic meaning of the whole.

Although the Gestalt school no longer existed as a major self-conscious movement after the middle of the 20th century, the issues it raised in opposition to the prevalent oversimplified S–R psychology typical especially of U.S. associationistic behaviorism continued to be central in psychological thought. The Gestalt school had done its job well, leaving a lasting mark on the discipline; in the psychology of cognition, perception, thinking, and learning; and in motivation, personality, and social psychology —indeed in almost all fields. But the Gestalt approach has been rediscovered especially in recent years by cognitive scientists working on problem solving and information processing and by neuroscientists working on visual perception.

CHAPTER **13**

Psychoanalysis

Antecedents of Psychoanalysis

The psychoanalytic movement was not really part of the same set of developments that led to the other schools; while it maintained that "abnormal" behavior holds the key to the understanding of "normal" behavior, it focused primarily on abnormal behavior and what to do about it and hence asked quite different questions than the other schools. Its historical beginnings must be sought elsewhere. Although it was influenced by Darwin's concept of evolution, it had no real roots in physiology. Freud did write a rather elaborate neurophysiology to support his early hydraulic model of mind and behavior that turned out to be quite wrong, but it was only distantly, if at all, atomistic and had little to do with laboratories, scientific materialism, or the quantitative approach. There was perhaps a minor hint of associationism and only a dim relation to critical empiricism. Rather, one might relate psychoanalysis more to the romantic tradition and the history of medical and clinical psychology. The work on hypnotic phenomena of such men as Friedrich Anton Mesmer, James Esdaile, James Braid, and later Ambroise-Auguste Liébeault and Jean-Martin Charcot had a direct influence on Sigmund Freud's thinking.

Then there is the long history of concern with the mentally ill. An early highlight is the ***Malleus Maleficarum***, or "hammer for witches" (a remarkable descriptive psychiatry written in the late 15th century by two monks). While this work contains some perceptive material on psychopathology, its chief aim was to specify criteria for diagnosing people —mostly young women (but also older wealthy widows)—as witches. It has been estimated that between 100,000 and several million individuals were put to death because, using this work as a guide, they had been branded as witches. The study of "abnormal behavior" has a long history, initially conceiving of it as various forms of "evil" in prescientific psychology, changing later to a serious kind of disease. One must mention Philippe Pinel, who pleaded late in the 18th century that people suffering from mental illness are not possessed by demons, are not incurable, and should not be morally censured but are sick and need help. Similar pleas on behalf of people afflicted with psychopathology were made by Dorothea L. Dix in the 19th century and by Clifford W. Beers early in the 20th century. There has already been occasion to refer to Kraepelin's careful classification of the mental disorders late in the 19th century. These people and the ideas they developed would require a whole book to themselves to treat them thoroughly.

Since almost every student is at least to some extent familiar with Freud and psychoanalysis and because many excellent secondary sources are available—and since psychoanalysis is largely unrelated to traditional academic psychology—this chapter will do no more than touch briefly on some of the more central concepts in psychoanalytic theory. It is an entirely different way of thinking than what usually goes by the name of scientific psychology and is a vastly complex specialty.

Freudian Psychoanalysis

Psychoanalysis includes a theory of personality, a philosophy of the nature of humanity, and a procedure for psychotherapy. The intellectual giant who developed this approach was Sigmund Freud (1856–1939; Figure 13.1). Basing his approach on the conception of an active unconscious mind of the kind hinted at by Shakespeare, Goethe, Brentano, Fechner, Herbart, and Nietzsche, Freud went far beyond his predecessors. He must be considered one of the path-breaking geniuses in the history of psychology, changing profoundly the way modern humans think about themselves as conscious beings with powerful unconscious dynamics at work.

FIGURE 13.1 Sigmund Freud (1856–1939).

Freud

Freud spent most of his life in Vienna; while he was in medical school, he was deeply influenced by the professor of physiology at the University of Vienna, Ernst von Brücke (1819–1882), an MD who had been a colleague of Helmholtz. Freud began his medical career with work in neurology but soon devoted himself exclusively to psychopathology and personality. Early in his career he worked with Joseph Breuer (1842–1925) in the application of hypnotic techniques to the treatment of hysteria, following Pierre Janet (1859–1947), whose ideas of unconscious processes and the traumatic etiology of psychopathology also profoundly affected Freud; then he studied hypnosis with Jean-Martin Charcot (1825–1893) in Paris. It was Charcot, it seems, who first planted in Freud's mind the idea that sexual problems play a decisive role in the etiology of neurotic disorders.

After his sojourn in Paris, Freud returned to his practice with Breuer, and together they gradually worked out the therapeutic technique of free association, in which patients are required to talk without any censorship about anything and everything that comes into their minds. Breuer soon felt uncomfortable about the strong attachment (**transference**) that patients developed for the therapist with this new technique and about Freud's growing conviction concerning the importance of sexuality, so Freud continued on his way alone.

Freud further developed the method of free association and began to make use of dream interpretation; a major early book, *The Interpretation of Dreams*, appeared in 1900. He published many other influential works, and his theory continued to evolve until his death. Gradually, from the turn of the century on, Freud's ideas attracted first a small and then a continuously wider group of devoted followers, and by the second decade of the 20th century the psychoanalytic movement was broadly international in scope.

Freud's Theories

The appeal of the movement was primarily to medically trained psychiatrists, although psychoanalysis also soon developed a wide popular audience. Indeed, even to the day of the present writing, many people tend to equate psychology and psychoanalysis. But psychology as an academic discipline, as indicated previously, has been relatively little influenced by Freudian thought—except that much practice and theory in clinical psychology by the middle of the 20th century had become to some extent Freudian.

The lack of interest in psychoanalysis on the part of traditional academic psychology can be traced at least in part to Freud and his followers dealing with a different kind of problem than what had been sanctioned as psychology by Wundt and the early experimental psychologists. It is also interesting to speculate that possibly one contributory reason U.S. psychology of the first decades of the 20th century all but ignored psychoanalysis might be in part an accidental mistranslation: Freud's core concept of *Trieb* was rendered into English as "instinct" rather than "drive," with which the German word is actually linguistically related and whose English meaning is probably closer to Freud's use of *Trieb* than "instinct" is; the Ortgeist in the United States was decidedly anti-instinct during the first half of the 20th century. Furthermore, experimental psychologists' lack of interest in Freud's theories is probably related to the rise of positivism and operationism during the 20th century (see Chapter 14). These doctrines tended to look askance at Freud's methodology—which typically involved creative speculations about details from patients' clinical histories.

As already indicated, Freud's views continued to evolve during his long and fruitful career. Nevertheless, we will consider a few of the more important concepts and principles he proposed to provide a brief review of the nature and flavor of psychoanalytic thought.

Freud taught that every act, every thought, is motivated; the fundamental human moving force is the **libido,** a blindly selfish, aggressive sexual drive that constitutes the **id,** literally the "it," of the personality. All of us have in ourselves a creative, sexual force (**eros**) and a destructive, aggressive push toward death (**thanatos**). Early in life the infant discovers that having a drive does not necessarily lead to its satisfaction; one must somehow come to terms with the world and manipulate it in such a way as to satisfy one's desires. This leads to the growth of the **ego,** literally the "I," which mediates between the pleasure principle of the id and the **reality principle** that dominates interactions with the environment. The child's parents attempt the almost hopeless task of socializing the id, trying to tame the selfish impulses that constitute the infant's inborn drives; this leads to the development of a **superego,** literally an "over-I," a kind of conscience, which makes the person feel guilty any time an id impulse is permitted to express itself.

The ego is charged with the difficult task of trying to make peace between the id, which screams, "I want," and the superego, which says, "I shouldn't," as well as having to mediate between both of these and the relentlessly realistic outside world. In trying to do so, the ego sees to it that the id remains totally unconscious, and the superego remains almost entirely so; even the ego itself is only in part conscious. The ego is forced to employ complex but ingenious techniques for keeping unacceptable impulses from rising into consciousness, using **defense mechanisms** such as repression, **sublimation,** and other forms of distortion and self-deception. The **Oedipus complex,** an unconscious desire for the death of the parent of the same sex and physical union with the parent of the opposite sex, is among the quandaries that the ego must somehow try to handle.

The task of the ego, according to Freud, changes, since early in the individual's development the primary focus of the libidinal drive moves from one part of the body to another. Characterized as polymorphous perverse infantile sexuality, libidinal satisfaction is first obtained primarily through the oral zone, with the pleasure that the infant derives from feeding. With toilet training, the anal region becomes the primary erogenous zone; next there is the phallic stage, followed, after a latent period in which sexuality is totally repressed, by maturity or the genital stage, in which libidinal gratification is obtained through adult heterosexual union. The individual can become fixated at any of these **psychosexual stages,** and even the mature, reasonably well-adjusted adult typically is considered likely to have some immature vestiges of earlier psychosexual development. It was one of Freud's most influential teachings that there is a continuum from normal to abnormal, that the two are not qualitatively different.

Freudian Psychotherapy

The process of psychoanalysis attempts to uncover and "defuse" the unconscious, irrational determinants of behavior, which are usually to be found in intensely emotionally tinged childhood experiences; it involves primarily free association and dream analysis. In free association, the patient reports whatever comes to mind, attempting to circumvent the ego's censor. Dreams are, according to Freud, "the royal road to the unconscious"; their symbolic material provides hints about unconscious processes for both analyst and analysand, particularly if the patient free associates to the important elements of the dream. Psychoanalysis maintains that knowing the truth about ourselves will set us free; to the extent that we become aware of the forces in our unconscious, we become less their unwitting prisoner and can lead a more rational, satisfying, and productive life.

Jung, Adler, and Later Psychoanalysts

Two major early offshoots of Freudian psychoanalysis were the **analytical psychology** of Carl Gustav Jung (1875–1961; Figure 13.2) and the **individual psychology** of Alfred Adler (1870–1937; Figure 13.3).

The analytical psychology of Jung, with his concept of the archetypes (fundamental modes of experience, like that of religious awe, the sense of evil, and so forth), his emphasis on **introversion** and **extraversion,** and his mental functions of thinking, feeling, sensing, and intuiting, was based on a rich ground of scholarly knowledge of comparative symbolism and mythology and of a large, sensitive clinical practice. Jung's is a highly intricate system, placing less emphasis on sex than did Freud's but fully as complex, if not more so, in its ingenious ramifications.

FIGURE 13.2 Carl Gustavjung (1875–1961).

FIGURE 13.3 Alfred Adler (1870–1937).

Adler's individual psychology, with a smaller number of quite powerful concepts and principles, is somewhat simpler than either Freud's or Jung's theories. The young child is inevitably weak in comparison with adults, and this has the effect that throughout the remainder of life everyone strives to overcome the **inferiority feelings** engendered by these early experiences. The will to power is produced in everyone, as an attempt to compensate for early inferiority. Ultimately all individuals develop their own particular **style of life** for overcoming inferiority and handling the problems of interpersonal interaction. At its best, the style of life is, according to Adler, a creative, positive approach permitting individuals to devote their energies to constructive pursuits.

There were other important later figures in psychoanalysis. Otto Rank (1884–1939) tried to understand people's problems in terms of the trauma of birth and emphasized humanity's basically creative nature. Sandor Ferenczi (1873–1933) attributed many neurotic problems to the need for mother love. Karen Horney (1885–1952), Erich Fromm (1900–1980), and Harry Stack Sullivan (1892–1949) all pointed to the interpersonal and social origins of neurotic conflicts and were influential in the development of what has been called neo-Freudian psychoanalysis. A major emphasis of the neo-Freudians has been ego function, with a relative decline of interest in intra-personal id processes; the id, no longer a purely sexual and destructive force but a general source of psychic energy, became far less important. For many of them, the aim of psychoanalytic work is to provide patients with an ego strong enough to assist them in coping with the inevitably anxiety-producing problems inherent in interpersonal interactions and to make it possible for them to make full productive use of their particular unique human endowments. Among the later prominent workers in this tradition have been Anna Freud (Sigmund Freud's daughter), Melanie Klein, Hans Kohut, and Mary Ainsworth and John Bowlby; Ainsworth's and Bowlby's theories concerning the attachment or bonding between infant and parent are among the few psychodynamic approaches that have generated a substantial body of empirical research.

Psychoanalysis and Clinical Psychology

The lay view of psychology sometimes confuses psychoanalysis with psychology, and often the distinctions among psychiatry, psychopathology, psychodynamics, psychotherapy, and psychology are blurred as well. Psychiatry is a medical specialty devoted to the treatment of mental disorders; a psychiatrist is an MD trained to treat people with mental problems. Psychopathology is a branch of behavioral science that studies mental disorders; both psychologists (with PhDs or PsyDs) and psychiatrists (with MDs) work in this field. *Psychodynamics* is another term for Freudian and neo-Freudian psychoanalysis. Psychotherapy is the attempt to treat psychological problems with psychological (as distinguished from physiological or pharmaceutical) means, such as by one-on-one interaction between a client or patient and a trained therapist or by interaction of a group of clients or patients with a therapist. As mentioned earlier, psychoanalysis is both a theory of personality and psychopathology (specifically Freud's) and a particular psychotherapeutic procedure (specifically Freud's). *Psychology*, the broadest of the terms, has been variously defined as the science of mental life, as the study of behavior, and in many other ways; study or treatment of mental disorders is but a small subarea of the entire discipline of psychology.

Clinical psychology as a specialty was first proposed near the end of the 19th century by Lightner R. Witmer (1867–1956), primarily an experimental psychologist, who tried to apply the "new" psychology to the alleviation of human suffering. His aim included relieving the problems of young children in their adjustments to school and their relations with parents and peers. His approach was entirely independent of Freudian psychoanalysis, yet during the 20th century, when clinical psychology (and such related specialties as consulting psychology, marriage counseling, vocational guidance, and counseling psychology) mushroomed into an enormous field, many training programs included in their curricula "dynamic theory," which often had a distinctly psychoanalytic tinge. Training specifically in psychotherapy also frequently was at least in part informed by psychoanalytic theories and practices. The relationship between clinical psychology and psychoanalysis during the 20th century has been complex and changing; the two specialties are by no means synonymous. The development of clinical psychology is touched on further in the remaining chapters of this book.

The Impact of Psychoanalysis

The theories of Freud and his colleagues and successors have had an enormous effect on Western thought during much of the 20th century. Psychoanalytic concepts were used extensively in literary criticism, and they became part of everyday life in journalism and "popular psychology." Almost every educated adult in Western society was at least to some extent familiar with it. But by late in the 20th century it had become clear that the psychoanalytic model was hard to test empirically or did not do well in empirical tests that were performed on it. And objective evaluations of the effectiveness of psycho-therapeutic practices based on the psychoanalytic model rarely showed that they worked better than other methods. By the end of the 20th century, psychodynamic treatment methods were largely supplanted by cognitive-behavioral and pharmacological techniques.

CHAPTER 14

The Immediate Postschools Era

An Overview

Psychology, particularly U.S. psychology, during the 20th century became a huge, self-respecting, diverse endeavor almost unrecognizably different superficially from its earlier counterpart. Yet in many respects the assumptions and methods of the later psychologists were not so different from those of their earlier colleagues. The eight trends reviewed in Part I were still discernible.

As for the scientific trends, many psychologists, from comparative psychologists through cognitive and behavioral neuroscientists using sophisticated brain scanning techniques to behavioral geneticists, were working on *biological, physiological* correlates of behavior. *Atomism* remained there in, among other places, factor analysis and in the study of the single cell, the conditional response, and the behavior of the computer. Competence in *quantitative* methods, statistical techniques, and complex mathematical models grew at a rapid rate. Many *laboratories* and institutes were *founded* by colleges, universities, foundations, and government agencies.

The philosophical trends were clearly still there too. *Associationism* was perhaps somewhat weaker but could still be discerned in learning theory, the field of verbal behavior, connectionist models of cognitive processes, and some approaches to perceptual learning. *Critical empiricism* was everywhere, with constantly more refined and sophisticated methods and techniques for obtaining clean, uncontaminated data about every aspect of behavior one could imagine. And finally, many psychologists were vigorously pursuing *scientific materialism*, that is, were thinking in terms of an “empty organism” or “neuromythology,” the CNS or “conceptual nervous system,” and real or fanciful underlying physiological processes; scientific materialism remained very much alive. In a way, it later metamorphosed at least in part into the new specialty of cognitive neuroscience.

The characteristics of the immediate postschools era in psychology suggested that psychology was leaving its stormy adolescence and becoming somewhat more mature. There was less of the militant insistence that psychology is a science; there was less rebellion against psychology's parent, philosophy; there was less interschool derision. A major trend was the quiet but inexorable onslaught of objective empirical method, entering on complex terrain that had never been studied scientifically. This trend was greatly strengthened by the vast sums of money that foundations and government agencies made available for behavioral research—indeed, such research became big business, and one could call the middle of the 20th century the age of sponsored research. Much of this work cut across traditional disciplinary boundaries; psychologists collaborated with physiologists, mathematicians, anthropologists, sociologists, physicists, molecular biologists, psychiatrists, engineers—perhaps, then, one could also call this the era of interdisciplinary research.

Aside from the growing diversity of areas studied empirically, which was perhaps the most significant trend, two other major developments were the spread of the practice of psychology and the growing importance of quantification in psychology. A very substantial fraction of U.S. psychologists were clinical or counseling psychologists, but there were many other people also engaged in the practice of psychology as well: industrial and organizational psychologists, advertising agents, **human engineers,** pollsters, military psychologists, **evaluation researchers,** management consultants, and still others. Psychology fully achieved professional status as well as being an academic discipline. And the trend toward quantification, which grew gradually during the 18th and 19th centuries, received a major impetus with the advent of the high-speed electronic computer: what previously had been prohibitively tedious, lengthy, and complex computations were reduced to ready feasibility. The computer also spawned the research field that was to dominate the experimental psychology of the 1970s, 1980s, and 1990s, cognitive science.

Let us briefly examine each of these three trends—the development of new empirical approaches, the service aspects of psychology, and quantification—in turn, commenting also about humanistic psychology, which captured the allegiance of many psychologists and which can be seen as basically opposed to much traditional scientific psychology—and specifically to quantification and to a mechanistic empirical approach. Along the way, three other developments warrant attention: the emergence of active models of behavior to complement the passive ones that had dominated the field, the fragmentation of the entire discipline, and psychology's attention to ethical issues in all aspects of the field from scholarship and research through practice. But first, it is appropriate to step back in history a bit and consider the logical positivist movement and operationism, for particularly the second of these played, at least implicitly, a major role in the growing power of empirical method in psychology.

Operationism

Logical positivism was a philosophical movement started in Vienna during the second decade of the 20th century; one of its founders was Ernst Mach. An outgrowth of critical empiricism, it concerned itself with trying to determine what it is that one can be sure about or, in other words, what information can be used for the founding of an epistemology. In a sense it was a kind of negativism, in that the older logical positivist position denied the reality of phenomena that are not directly observable; it tried hard to avoid falling into an examination of "pseudoproblems," which no information could possibly resolve.

Related to logical positivism is the operationism of Percy Bridgman (1882–1961), a physicist who held that the meaning of any concept is the set of operations required to demonstrate that concept. It was primarily S. S. Stevens (1906–1972) who developed operationism in psychology; just as is true of any other scientific concept, he held, any psychological phenomenon is synonymous with the corresponding set of operations. Both logical positivism and operationism combined with behaviorism in an effort to objectify psychology by stating everything in cgs (centimeters, grams, seconds) terms.

By the 1940s and 1950s, operationism became differentiated into two rather distinct phases. One was *philosophical* or **prescriptive operationism,** a continuation of the earlier trend and of the positivism of the previous century. It involved full espousal of the strong meaning of the term *operational definition,* in the sense of a genuine identity between concept and operation. Thus, for Bridgman in 1927 there was, for example, no real meaning to the idea of the other side of the moon, but nowadays there is one, since it has been defined by being photographed and otherwise explored. This brand of operationism, while initially fairly popular among some research psychologists, soon was viewed askance by both philosophers and physicists. It has very few adherents today. The other branch, of more concern to psychology proper, might be called **methodological** or ***descriptive* operationism.** It does not commit itself on the question of identity between concept and operation in a logical sense but accepts the need for operational definitions—or better perhaps, operational characterizations or operational specifications—of concepts if one is to work with them empirically. Concept and operation might not be identical, but at least the operation must "fit" the concept to some extent. Virtually all psychologists who engaged in empirical work accepted this kind of operationism whether they knew it or not, since an operational "handle" is needed for research concepts if they are to be worked with empirically.

A related development is the notion of **converging operations** or **operational triangulation**—that is, using several simultaneous operational characterizations of the "same" concept. As long as one accepts that a concept can have a kind of "surplus meaning" over and beyond its definition by a given operation, it becomes reasonable, as it were, to zero in on the concept simultaneously from several different directions. None of them is then considered to be exhaustive, to be *the* definition of the concept, but each taps the concept in a slightly different way. Rather sophisticated techniques, most of them using correlations among different measures of presumably the same underlying trait, dimension, or concept, were developed in the middle of the 20th century by such methodologists as Wendell R. Garner, Donald T. Campbell, and Donald W. Fiske.

The Spread of the Empirical Method

It was generally believed that progress occurs in psychological research when an operation is invented to measure a concept that could not previously be specified. The early experimentalists had devised methods for measuring and manipulating the "basic processes" of sensation, perception, reaction, and memory. Later, what Wundt had called the "higher mental processes," as well as other complex phenomena, were subjected to empirical investigation. Consider a few selected examples of empirical progress in some of the more complex areas of psychology.

Empirical inroads into the field of personality were first made by the late 19th-century psychologists interested in individual differences—Hall, Cattell, Galton, and others, and at least one of the roads was paved by Alfred Binet's (1857–1911) and Lewis Terman's (1877–1956) thorough development of the concept of an intelligence test. The projective methods, in the hands of Hermann Rorschach (1884–1922), a Swiss Jungian psychiatrist who shortly before his early death developed the inkblot test to tap the structure of personality, and of Henry A. Murray (1893–1988), a U.S. psychologist who a decade or so later with Christiana Morgan (1893–1967) devised the Thematic Apperception Test to get at its contents, grew into vastly popular techniques for the assessment of intricate, subtle aspects of personality. During the 1940s Robert R. Sears (1908–1989) and others tried to restate some psychoanalytic concepts, such as projection, into empirically clear-cut operations and performed ingenious experiments that almost succeeded in bringing parts of the psychoanalytic theory into the mainstream of experimental psychology.

The complex field of cognition and thought, particularly as it develops in childhood, was cultivated for more than a half century by Jean Piaget (1896–1980), an inventive Swiss investigator who devised many ingenious experimental situations designed to discover whether a child is capable of using various concepts such as transposition, the conservation of mass, and the like; he worked out a theory of developmental stages, such that a given concept cannot be used unless the child already understands some ontogenetically and logically prior concept. Despite some criticism of his "clinical" method and his unrepresentative sampling techniques, Piaget's work had a profound influence, especially on developmental psychology and educational theory and practice. Developmental psychology as such, for that matter, soon expanded from a focus on study of the infant and child, fostered by the child study movement and Seashore's Iowa Child Welfare Station, to concern with all ages; the new orientation was to **life span development.** The psychology of thought had come under empirical study in the work of the Würzburg school and the Gestalt psychologists. Concept formation became a major focus for experimental work after the pioneer efforts of Clark Hull and of Edna Heidbreder (1890–1985); later it merged with the area of verbal learning, an outgrowth of Ebbinghaus's work, and continued to attract large numbers of devoted researchers. As has been mentioned several times already and will be further elaborated shortly, by the early 1970s the vast new field of cognitive psychology became the center of experimental psychology. And Amos Tversky and Daniel Kahnemann proposed an influential theory of decision making, opening up a rapidly expanding new research area.

Perhaps historians of the future will be able to write that David McClelland (1917–1998) pioneered a genuinely empirical approach to human motivation. Using Murray and Morgan's Thematic Apperception Test, McClelland and his students developed crude but reasonably reliable quantitative techniques for measuring such complex human motives as the needs for achievement, affiliation, and power and manipulated them experimentally. In this way, motivation and personality were brought into the laboratory rather than remaining in the clinic or in the armchair.

A similar development was brought about in the study of meaning by Charles E. Osgood (1916–1991), a prolific systematic psychologist within the behavioristic experimental tradition. He developed the **semantic differential,** an ingenious yet simple method for measuring connotative meaning, opening up to quantitative empirical investigation an area that before had remained in the province of the philosopher or the linguist, and helping to reestablish the interdisciplinary research area of psycholinguistics.

Social psychology too became empirical. Sophisticated techniques for the measurement of attitudes were developed by Louis L. Thurstone (1887–1955), Rensis Likert (1903–1981), and others, and such processes as the influence of group pressure on individual opinion were taken into the laboratory by Solomon Asch (1907–1996), Muzafer Sherif (1906–1988), and Richard Crutchfield (1912–1977), to name only a few. The fields of prejudice, social perception, the authoritarian personality, and group interaction, structure, and dynamics, partly through the impetus of the followers of Kurt Lewin, each became a major research focus.

Physiological psychology also developed along new lines, with some exciting discoveries that the historian of the future may well come to consider major landmarks in psychology's evolution. David Krech (1909–1977) and his collaborators studied the relation between chemical events in the brain and various aspects of behavior, particularly learning and intelligence. The role of DNA and RNA in the neural correlate of learning also generated much excitement but did not lead to any significant breakthroughs. James Olds (1922–1975) discovered that electrical stimulation of certain parts of the deep brain can be reinforcing, leading to a modern experimental and physiological version of the ancient hedonistic question of the nature, causes, and concomitants of pleasure. D. H. Hubel and T. N. Wiesel in the early 1960s found cells in the visual brain that respond not to brightness as such but to complex stimulus characteristics such as the angle of a line and its direction of motion. And later in the 20th century positron emission topography (PET) scans, computed tomography (CT) scans, and functional magnetic resonance imaging (fMRI) procedures became the methods of choice in the rapidly evolving field of cognitive neuroscience. All of these reflect the renewed interest in the relation between processes in the central nervous system and behavior, and there has been significant progress in identifying activation in different parts of the brain that is involved during various psychological processes, from visual discrimination through mental arithmetic to different kinds of problem solving. This has in recent decades become a major focus of modern neuroscience. Other major contributions late in the 20th century were Jane Goodall's lifelong work with chimpanzees, Charles Brewer's extensive and far-reaching improvements in the teaching of psychology, Martin Seligman's advocacy of positive psychology, and Florence Denmark's influence on international psychology and the psychology of women.

These are, of course, only a few selected examples. Overall, the conquest of ever wider terrain by the empirical method wrought a major change in the 20th-century image of the behavioral sciences. At the beginning of the 20th century, when the term *behavioral sciences* did not yet exist, psychology was mostly limited to the study of simple sensory processes, memory, and reaction time, but by the middle of the century such humanly "charged" areas as learning, thinking, language, cognition, motivation, personality, abnormal behavior, and social phenomena were being taken away from the philosopher's study, the physician's consulting room, and the minister's pulpit to be subjected to the impartial scrutiny of the quantitative, objective scientist. It had become atavistic to characterize some subpart of psychology as "experimental"; experimental psychology no longer existed as a separate field. Empirical methods had begun to invade just about *all* areas of psychology.

Professionalism

The trend to professional practice resulted in a major, rapid change in the identity of the psychologist. About 1930 almost all people who considered themselves psychologists were still in an academic position, but by 1950 more than half of all psychologists were working outside university settings. Most of the nonacademics were in some form of human-service work—and the first psychological clinic had been founded only as late as 1896 by Lightner Witmer at the University of Pennsylvania.

Clinical psychology was given a nudge during World War I with the need to develop tests for recruits and an even larger push during World War II, both with the further development of tests and with the call for treatment of psychological casualties. Soon the American Psychological Association saw the need to formalize and regulate the rapidly growing practice of clinical psychology and set up the American Board of Examiners in Professional Psychology (later called just the American Board of Professional

Psychology) to examine and award diplomas to qualified practitioners. The U.S. Department of Veterans Affairs, state hospitals, community clinics, and other institutions created more positions for clinical psychologists than the rise in the number of trained clinical psychologists could cope with. For a time, this generated a surge in the number of trainees admitted to graduate training programs in clinical psychology, and it even spawned a number of free-standing graduate programs in professional schools of psychology. Soon large numbers of doctoral psychologists were trained for the practice of clinical psychology. But by later in the 20th century, the supply seriously exceeded the demand.

A new problem for those who wished to engage in the practice of clinical or counseling psychology emerged late in the 20th century. The advent of "health maintenance organizations" and "managed care" resulted in insurance companies becoming reluctant to fund lengthy courses of psychotherapy or counseling, placing the psychotherapy industry into financial jeopardy. This threat had become critical by the end of the 20th century.

But the service functions of psychologists were not limited to clinical and counseling work. Industrial psychology produced human factors specialists, who helped in the design of devices so that they will fit the characteristics of the human operator or consumer; management consultants, who worked with problems of labor relations, employee personnel, industrial organization, and executive placement; advertising consultants; attitude change experts; and other specialists. Survey research became a major enterprise, with efforts to predict everything from election results to consumer reaction to a new product or the success of a new advertising appeal. Military psychologists engaged in personnel work, creation of training methods, practical studies of leadership, and psychological problems created by the space age, such as the study of small-group interaction under conditions of long-term confinement in a limited environment as well as research on human behavior under entirely new ecological circumstances such as weightlessness. And there are still other ways psychologists used their particular training, perspective, and experience in the service of society, in, for example, consultation to government, applied problems of animal behavior, consultation to the schools, the understanding of the special problems of disabled people, and facilitating interaction between people and computers. This trend is further examined in the next two chapters.

Quantification, Cognitive Psychology, and the Computer

Psychology became increasingly quantitative in its orientation. The use of statistical methods for the evaluation of empirical results by virtually everyone in the field hardly needs mention. Quite aside from the mental testing movement and the ubiquity of statistics, there was a strong and growing tendency to construct theories having the precision of mathematical formulations. Major impetus was given this development by the invention of **information theory** by communications engineers like Claude E. Shannon and mathematicians like Norbert Wiener; information theory, or concepts akin to those in the theory, were applied to a wide variety of problems in sensation, perception, and learning by people like George A. Miller and Fred Attneave. Sensation, already quantitatively approached by investigators a century earlier, became again a major focus of mathematical thought in psychology with the development of sensory scaling by S. S. Stevens, W. R. Garner, J. G. Beebe-Center, and others. There was also much interest in mathematical learning theory, beginning perhaps with Clark Hull (although the trend can be traced back at least to Herbart) and the construction of mathematical models of learning by Robert Bush and Frederick Mosteller, William Estes, Frank Restle, and many others. Decision theory was applied to human problem solving and troubleshooting by individuals such as Ward Edwards. In social psychology a variety of **balance models** were proposed by people such as Helen Peak, Fritz Heider, and Theodore Newcomb. One version of balance theory holds, for example, that if A and B like each other and A and C dislike each other, then the structure of the trio A, B, and C will be relatively stable if B and C dislike each other but unstable if they do not.

The technical breakthroughs in computer technology had a profound impact on psychology. Statistical analyses that used to take an inordinate amount of time to do by hand could be performed very rapidly, and complex analytical calculations that were too laborious to be practically feasible fell easily within the capability of even relatively modest high-speed computers. As a consequence, the degree of sophistication in the analysis of the data from typical empirical studies was substantially enhanced. Factor analyses, analyses of variance and covariance, parameter estimations, autocorrelation functions, curve fitting, and other advanced statistical procedures that used to take days or weeks on a desk calculator could be performed routinely by an accomplished computer in minutes or seconds.

But more profound than the increased efficiency of statistical calculations on research data as such was the impact that the computer had on the psychology of thinking and problem solving in particular and of information processing in general. It is probably no exaggeration to claim that the modern computer generated the entire new field of cognitive science, including both what is called **artificial intelligence** (AI; computer programs that are, typically, superior to any real human expert in speed and accuracy in diagnosing disease within a circumscribed domain, flying an aircraft, finding water or oil, or predicting the weather) and the **computer simulation** of higher mental processes. Little progress occurred in cognitive psychology (indeed, to repeat, the words *cognitive* and *cognition* were generally viewed with derision by behavioristically oriented psychologists) during the decades immediately following the Gestalt work on insight by such workers as Köhler and Wertheimer. But by the late 1950s and early 1960s Noam Chomsky had proposed his transformational grammar, and Herbert A. Simon and his colleagues had invented computer programs that could solve problems in propositional logic; elaborations on these programs, which soon not only successfully simulated the steps that college students take in solving logic problems but actually also generated some of the great discoveries of 18th- and 19th-century natural science, won Simon a Nobel Prize in 1978. This work became the foundation for the huge and popular field of cognitive psychology.

Among many landmarks in cognitive psychology were Ulric Neisser's mid-1960s book of that title, *Cognitive Psychology*, which helped to establish the field; the sophisticated work of Walter Kintsch and his associates on the processing of text materials; and the attempts of James Greeno and his colleagues to simulate the learning of geometric proofs with genuine understanding. A major strategy in the field was an effort to describe precisely the mental representation of a problem and of the knowledge domain relevant to it, including how this representation is organized. The hope appeared to be that theoretical work that is as concrete and rigorous as that required to write such computer programs whose outputs are superior to, or are indistinguishable from, the behavioral output of living, learning, and thinking human research participants, would lead to a better understanding of such complex and fascinating psychological events in people.

The strictly precise quality of computer models of psychological processes fit well with the earlier behaviorist emphasis on objectivity. Computer programs as heuristic representations of cognitive processes have typically been consistent with the mechanistic orientation of behaviorism, tempered by operationism. They can be viewed as a modern continuation of early trends of scientific materialism, quantification, and usually atomism and associationism as well.

Active Models of Human Nature

Behaviorism and psychoanalysis, the most prominent orientations at the time that the age of schools began fading, viewed humans at least implicitly as passively molded either by environmentally controlled learning or conditioning or uncontrollable unconscious urges and early childhood experiences. The Gestalt theorists had already argued that perception and cognition are not processes of passively registering sensory input but involve the active construction of meaningful representations of the individual's world. This perspective soon grew into a **systems approach,** which began to permeate many different fields in the discipline; the overarching theoretical model concentrated on the interdependence between the organism and its environment in almost all psychological processes, including learning, development, perception, cognition, and social phenomena. In developmental psychology, for example, Jean Piaget argued that the child and its surroundings jointly generate the complex of stages of development; the child is not a passive learning machine but an active agent in its own psychological and physical growth. It was recognized that cognitive and emotional processes change with the changing needs of the growing organism and that the infant is not caught up in a world of buzzing confusion (as William James had supposed) but is a complex, capable organism—indeed, the newborn is already highly competent in certain perceptual functions, even if the infant's motor skills are rudimentary. The view of animal behavior too has been informed by the systems approach; ethological theory showed that many animals are active participants in their interactions with their natural ecology rather than simple purely reactive robots.

Leon Festinger's theory of **cognitive dissonance** became a prominent active perspective in the middle of the 20th century. It maintains that individuals strive to minimize inconsistencies in their conceptions of objects; for instance, something will be valued more highly if it has a high cost to the individual (in commitment, effort, or funds) than if it is obtained cheaply. The implications of the theory were explored in motivation, social psychology, personality—and in applied areas such as advertising, marriage counseling, and professional development. Albert Bandura's **social learning** theory emphasized that people imitate and learn from others, seeing what consequences follow from others' actions, especially others who are perceived as powerful; among other areas, social learning theory was applied to the understanding of the massive effects of the media, especially television and violent computer games and movies, on children. Fritz Heider's work on attribution generated a large volume of research on how people cognize or perceive one another, the field of **person cognition** or attribution theory; here, too, it became evident that cognition is a constructive, active process.

Contrasting somewhat with such active perspectives were two research reports that attracted widespread attention both within and outside the psychological community. Stanley Milgram demonstrated that research participants will follow orders that have harmful, even disastrous, consequences for other individuals if the orders are given by authority figures, providing frightening insight into such processes as the development of totalitarian movements. Philip Zimbardo found that individuals who were asked to play the roles of prison guards and prisoners soon adopted behaviors—and attitudes—consistent with the roles to which they were assigned; the demand characteristics of social institutions can have a profound effect on human conduct.

Fragmentation

Near the end of the 19th century, the new discipline of psychology was relatively unified—even if there were already disagreements between structuralism and functionalism about exactly what psychologists should study and how they should study it. Even during the first half of the 20th century there was still a widespread consensus that *general psychology* consists of concern with the basic processes of perception, motivation, and learning, the three cornerstones of the field. But by the middle of the century, psychology—even experimental psychology—was no longer unified. Even the APA had broken itself down into special interest groups or divisions by that time, divisions that came in a bewildering diversity, and the number of divisions soon more than doubled. Some were focused on psychology as a natural science (e.g., divisions of experimental psychology, physiological and comparative psychology, or psychopharmacology), some on psychology as a social science (e.g., personality and social psychology, psychology of women, or community psychology), many on the practice of psychology (e.g., counseling psychology, psychotherapy, or clinical psychology), and some on a miscellaneous variety of specialties that no single rubric can characterize (e.g., teaching of psychology, psychology and the arts, state psychological association affairs, psychology and law, or history of psychology). Psychology was no longer a unified field but was a loose conglomerate that one observer, Sigmund Koch, claimed should be called "the psychological disciplines." The variety of problems, issues, methods, and aims became so sprawling and fragmented that different subfields had little or nothing in common; specialists in one field typically found it difficult or impossible to communicate with specialists in other fields. While some commentators continued to argue that psychology should strive to reunify itself, many others pointed out that any vigorous, growing research area tends to become specialized and that such specialization is a sign of growth and maturation. Indeed, fragmentation has not been peculiar to psychology; it characterized other thriving sciences, such as biology, as well. The one common conviction shared by almost all psychologists from the beginning of the 20th century to its end was a commitment to the empirical method: data, not faith or argument or authority, should be relied on to answer the important questions about human (and animal) conduct. This point is elaborated a bit in the next two chapters.

Psychology Addresses Ethical Issues

The American Psychological Association established a Committee on Scientific and Professional Ethics in the 1930s. Forces both within the psychological establishment and outside it led to extensive concern with ethical issues in psychological research and in the practice of psychology. Codes were developed and repeatedly revised for protecting participants in psychological research projects, students of psychology, clients receiving the services of practicing psychologists, and animals used in psychological experiments. Major boards and committees within the APA maintained constant oversight over ethical issues that might arise in every facet of psychological research and practice. The documents that were generated not only underwent a number of revisions but also remained under continuing scrutiny. Among the codes are ones on the conduct of research with human participants, the care and use of animals, standards for providers of psychological services, standards for educational and psychological tests, and ethical guidelines for high school psychology teachers. During the postschools era organized U.S. psychology faced and dealt with many complex ethical issues that psychological scholarship and practice entail, and psychology's vigilance about these issues continued unabated into the 21st century.

Humanistic Psychology

The institutional attention to ethical issues in psychology was insufficient for a small group of scholars early during the post-schools era, who argued that the entire psychological enterprise was flawed, in that the "scientific method," with its focus on determinism, objectivity, and mechanical cause-and-effect analyses, ignores the dignity, value, and inherent goodness of human nature. This movement, which had its roots in the theology of Søren Kierkegaard and later Martin Buber as well as in the existentialist philosophy of Jean-Paul Sartre, was a self-conscious rebellion against the passive, reactive, and largely negative image of humanity implied by behaviorism and psychoanalysis. Prominent humanistic psychologists such as Carl R. Rogers, Rollo May, and Abraham Maslow pleaded for recognition of the validity of the subjective interpretation of individual experience and of such phenomena as choice, responsibility, autonomy, and self-fulfillment. They argued that humans are free and capable of deciding their own destinies and that psychology should devote attention to such human qualities and potentialities as love, creativity, growth, spontaneity, and the search for meaning. People face the quandary that they must constantly make choices and decisions, typically in the absence of sufficient relevant information; the knowledge that one is and does what one chooses to be and do can be a source of deep anxiety—as well as of exhilaration. The journal *Humanistic Psychology* began publication in 1961, and the Association of Humanistic Psychology, founded in 1962, was established as a division within the APA in 1971.

Psychologists outside the humanistic movement soon argued that humanistic research was at best a rather vague program or proposal for the future, having accomplished very little so far and that various practices associated with humanism such as encounter groups, self-enhancement procedures, and growth groups were advocated and used too uncritically; they have not been demonstrated to have the positive effects that their proponents claimed for them. Some mainstream psychologists, disturbed by humanistic attacks on verifiability, evidence, and objectivity, accused humanistic psychology of being so vague that its idealistic assertions are not verifiable and cannot be objectively tested—that is, that they are outside the scope of generally accepted scientific method. Yet few psychologists objected to humanistic psychology's plea that one must be careful not to forget what it is that is distinctively human when engaging in psychological research or theory construction.

CHAPTER **15**

The Last Half of the 20th Century

T
he many trends and individuals mentioned in the preceding chapter that became prominent in the postschools era continued to influence the field through the rest of the 20th century. But there were other developments as well in that half-century, some of which will be touched on in this chapter. Other authors would doubtless have chosen different people and themes to emphasize, and future historians will have to decide whether these people and themes actually deserve the attention they receive here. Writing about recent events is always hazardous in historical accounts, but for the sake of bringing the present account to completion, Chapters 14 and 15 provide at least one perspective.

Psychology at the end of the 20th century was partly a natural and partly a social science and also an attempt to apply the psychological knowledge that had been gained (or hoped for) to the improvement of human welfare. As had been true since more than a century earlier, psychology was still frequently confused by some laypeople and sometimes by the media with psychiatry, psychoanalysis, parapsychology, psychopathology, and "pop" psychology.

A half-century before, most psychologists had been natural scientists doing research on and teaching about "general experimental psychology," by which was meant the problems of perception, motivation, and learning, but the social-science approach was also already reasonably well established, although the practice of applied psychology was still in its early stages (primarily in the form of industrial and organizational psychology and clinical psychology). During the last half of the 20th century, fields associated with or growing out of general experimental psychology flourished, but the social-science aspects of psychology also grew rapidly.

Yet the greatest growth of all occurred in the number of people engaged in the professional practice of psychology. During the mid-1930s most of the 2,000 or so members of the American Psychological Association identified themselves with the academic or research orientation. They were no longer in the majority by the middle of the century, and by the end of the 20th century far more of the more than 150,000 members and affiliates of the APA reflected the professional or practicing orientation than the academic or research orientation. Depending on what criteria are used for categorizing individual members of the APA as *practicing* or as *academic* psychologists, the practicing members outnumbered the academic members of the APA by between 3 and 6 to 1. Other organizations, both general ones such as the Psychonomic Society and the **American Psychological Society** (later the Association for Psychological Science) and specialized ones such as the Society for Research in Child Development, the American Educational Research Association, and the Society for Neuroscience, had been established and won the allegiance of many research or academic behavioral scientists—but many of them nevertheless retained their membership in the APA (although they typically did not encourage their graduate students or postdoctoral associates to join the APA). Quite aside from the proliferation of specialized societies and membership counts for the various associations, by the end of the 20th century practicing psychologists far outnumbered research or academic psychologists, and within the research community a few more individuals were engaged in social science (assessment and correlation) than in natural science (experiment and intervention) research.

Another major development was the internationalization of psychology. By the end of the 20th century, psychology was no longer primarily a North American phenomenon. European psychological societies had grown, especially in the application of psychology and in professional practice. Psychology also grew in Asian countries and in South Africa and other parts of Africa as well as in Central and South America, especially in Brazil. Not surprisingly, each of these psychologies has been profoundly influenced by its Ortgeist and Zeitgeist. The International Union of Psychological Science (IUPsyS), founded early in the second half of the 20th century, was flourishing by the end of the century, and the APA had a small but highly effective Office of International Affairs.

As mentioned in the preceding chapter, the field as a whole had become exceedingly diverse and fragmented—but the strong evidential, empirical orientation continued to characterize most psychologists' approaches, and almost universally so within the research or academic community. A high level of sophistication about inferential statistics had become typical within this community, that is, about the mathematical tools used for drawing inferences about populations of people or animals from data on samples that were systematically selected from those populations for close observation, measurement, or experiment. The basic logic of the inferential statistics that were taken for granted by most psychologists during most of the last half of the century, the effort to disprove the **null hypothesis** (e.g., that there is no difference in central tendency between two populations, that there is no correlation between two particular variables in members of a population), though, came under attack before the end of the century. Alternate strategies (e.g., **path analysis**) for evaluating the data obtained from empirical research (whether in experiments or in assessment studies) were being proposed.

Tens of thousands of reports of the results of empirical research in the behavioral sciences were published in hundreds of journals every year, so it became impossible for any individual to keep up even with the major recent findings in any fairly broad area. Another consequence of this volume of output was that often there were slightly different studies of similar phenomena or of the same phenomenon, sometimes with somewhat different or even conflicting findings. This led to a need for a reasonably objective method for integrating the findings of diverse studies within a common field. By the late 1970s a new technique, **meta-analysis,** had been devised; it systematically combines the findings from large numbers of controlled studies of the same phenomenon to yield a single statistically generated rational conclusion. The method was productively applied to such socially significant research areas as the effectiveness of psychotherapy and the effects of class size on the measured academic achievement of elementary school pupils.

External Influences Shaped Psychology

Like all other academic and institutionalized disciplines, psychology has been profoundly shaped by its social, intellectual, and political context; it has inevitably been a product of its time and place. This process remained as evident during the last half of the 20th century as it had been during psychology's history before that time. During much of the entire century, for example, among differences in place, European psychology tended to emphasize the influence of genetic determinants of behavior, including psycho-pathology, while U.S. psychology tended to emphasize the role of learning. Such Ortgeist differences diminished somewhat during the latter part of the century, as psychology became increasingly international—in part because of the surge in communication technology that made interactions among behavioral scientists in different geographical locations almost instantaneous and very inexpensive. Global communities of people with common interests were no longer dependent on travel or on the relatively slow information dispersal of technical publications in journals or even by conventional mail but could be formed on the sole basis of common interests and the capability of using email, the Internet, and other forms of electronic connectivity.

The impact of the First and Second World Wars on psychological testing and clinical psychology has already been mentioned. The Second World War also helped strengthen applied experimental psychology, with such fields as human factors research or human engineering (designing equipment so that human operators could use it effectively with a minimum of errors) and training research (comparing the effectiveness of several different training programs intended to teach, for example, troubleshooting in repairing failures in complex electronic equipment or use of a sophisticated new computer program). The war also gave a significant impetus to applied differential psychology and "mental testing," in efforts to place people into jobs that best fit their abilities and interests. Clinical psychology too received a major boost as the U.S. Department of Veterans Affairs mounted massive programs to deal with the physical and mental health needs of returning veterans.

Federal funding for research and training in psychology increased dramatically during the 1950s and 1960s, largely for complex political reasons, but declined rather sharply again in the 1970s. Research in biological psychology, social psychology, the psychology of information processing and cognition, clinical psychology, and other fields flourished and declined with these changes in funding patterns, and the kinds of problems studied by behavioral scientists fluctuated with changes in national priorities about research on **gerontology,** learning to read, crime and urban problems, poverty, computer literacy, and other foci as the shifting winds of politics made massive funds available to study them but then withdrew those funds again several years later. Community mental health centers became the temporary recipients of substantial infusions of federal monies during the Kennedy administration. Soon concern about the effectiveness of such intervention programs led to the growth of a new field, evaluation research, focused on the measurement of program effectiveness—which in turn received further impetus from a national concern for "accountability" during the 1970s.

Many other external factors have also affected the course of psychology. The needs of business, industry, and the educational establishment have had a strong effect on psychological testing, industrial and organizational psychology, social psychology, and the psychology of cognition (especially learning and memory) as people outside the field came to appreciate that some specific psychological knowledge could be applied productively to the solution of concrete problems they faced in their everyday work. One obvious recent area has been human–computer interaction: how should computer programs and manuals be designed for maximal **user friendliness,** and what are the most effective techniques for teaching users to take advantage of new software programs? Another is pollution and energy conservation; programs have been instituted that successfully use behavior modification procedures to reduce energy use in communities, to conserve water, and to encourage efforts to recycle glass, plastics, paper, and metal.

The effects of several powerful external factors were not as directly related to psychology's subject matter but were profound nevertheless. At the beginning of the 20th century, almost all psychologists and students of psychology were male, but by the end of the century there were far more new doctorates in psychology who were female than new male doctorates—and there were far more females than males in the pipeline of graduate and especially undergraduate students of psychology. This "feminization" of the discipline led the APA to appoint a commission to study the "problem" late in the century. It also helped launch the psychology of women as a new specialty, a field that has grown tremendously within the last few decades. Women earlier were a rarity among journal editors and members of the governance of the APA, but by the end of the century a large proportion of such positions were being filled by women. The APA was, for that matter, one of the earliest organizations to ban the use of sexist language in any of its many publications, including its highly prestigious journals.

Though still to a lesser extent than in the recognition of the appropriate concerns of a female perspective, comparable developments have occurred recently in other areas of human diversity. Psychology began to realize that it must reflect not the "White Anglo-Saxon Protestant male" orientation alone but must, if it is to be truly relevant to the larger society that supports it—indeed if psychology is to survive—reflect the diverse society as a whole. As a result, psychology departments and the APA itself have become concerned that the diversity of the larger society must be represented in the discipline and its institutions as well. Efforts have been made to increase the diversity of psychology's student body, of psychology faculty, and of the staff of the APA's central office. Still in their infancy at the end of the century, though, were efforts to include appropriate curricular material on diversity in clinical and other training programs to prepare future practitioners to work effectively with the diverse populations that could benefit from their services, and especially in undergraduate courses in psychology, so that they truly reflect the psychology of the entire society. There is still a long way to go until the general undergraduate (and graduate) curriculum in psychology truly responds to the diversity of the population at large with regard to such dimensions as ethnicity, culture, linguistic background, age, gender, sexual orientation, and other characteristics that the larger society has begun to recognize. Interest in—and the availability of material and courses on—cross-cultural and multicultural issues also increased at least modestly during the last few decades of the 20th century, and there was a growing recognition that all psychological phenomena occur within specific social, cultural, and linguistic contexts that can have a profound effect on them.

The Technology of Psychological Testing

The effort to develop accurate devices for measuring individual differences, partly in response to pressures from outside the field, has had a major effect not only on psychology itself but also on society at large. During the 20th century, psychological tests became so ubiquitous that major steps in the course of many individuals' educational and professional careers were typically affected, and often altered, by their performance on standardized psychological tests. Widely used have been achievement tests in elementary, middle, and high schools; admissions tests for colleges and for graduate and professional schools; as well as licensing and certification examinations for professions and even trades. As mentioned previously, the technology of the measurement of individual differences received a substantial boost from both world wars. Many early tests were individually administered, but, partly for reasons of efficiency, later tests were devised mostly for group administration. The methods for measuring and for enhancing how well tests perform their intended purpose (i.e., their validity and their stability or reliability) rapidly became far more sensitive and sophisticated, and test construction and evaluation became highly technical specialties. These developments occurred not only in intelligence and aptitude testing but also in tests of interests, personality, and psychopathology. Among tests that have been prominent in the history of psychology during the last half of the 20th century, two with different histories stand out. The Rorschach inkblot test of personality and psychopathology was extremely popular in clinical (and research) use earlier in the century, but by the late 1950s a large corpus of empirical studies had raised serious questions about its validity, making clear that its use in individual diagnosis is problematic. Although empirically derived scoring systems have increased the reliability and validity of the Rorschach somewhat, its use remains controversial. The Minnesota Multiphasic Personality Inventory (MMPI) has had a more fortunate fate. A self-report inventory on which there is probably more substantial empirical information than any other, including carefully derived and monitored statistical norms, the MMPI has been used extensively during the second half of the century. It has been revised to become the MMPI-2.

Efforts have persisted throughout most of the 20th century to generate aptitude and ability tests, including tests of intelligence, that are **culture free,** that is, with no cultural bias. This goal has continued to elude experts in test construction; by late in the 20th century it had become evident that it could be impossible to write a test item without implicitly including in it a host of unintended cultural assumptions. Largely as a consequence, various subgroups tested within the United States have, on average, scored differently on particular commonly used tests. These findings raised the question of whether it is fair or equitable to use such tests in decisions about who will receive a particular job, be admitted to a particular training program, or be excluded from such privileges. The issue had such massive actual and potential social consequences that uniform guidelines for employee selection procedures were adopted by the U.S. Equal Employment Opportunity Commission in the late 1970s. The guidelines specified that no test can be used lawfully for selection purposes if it discriminates against identifiable subgroups of the general population—unless performance on the test can be demonstrated to be substantially related to actual performance on the task or job for which the selection is being made. The problem was still not fully resolved by the end of the 20th century.

The Emergence of Cognitive Science

Already mentioned several times was the emergence during the last half of the 20th century, from what earlier was called experimental psychology, of cognitive psychology. Two relatively independent forces led to this development: a growing dissatisfaction with the perceived narrowness of the behavioristic approach and the revolution in computer technology.

Behaviorism came to be seen as providing an impoverished account of the richness and complexity of human behavior. Far more significant, in that its impact has permeated almost all of Western culture, indeed cultures throughout the world, has been the computer. The sophisticated modern computer was eagerly adopted throughout society, transformed military, business, and social practices, and seemed to psychologists to offer a system that could serve as a fruitful analogy for human cognition. Computers and people are similar in that both receive information from their environments, store it and integrate it with other information in memory, and generate a response or outcome based on rules and strategies. With their information-processing paradigm, cognitive psychologists tried to answer questions about perception, memory, language, reading, problem solving, and decision making, among other cognitive processes.

The **cognitive revolution** was touched on in the previous chapter, so there is no need to go into it in further detail here. But it should perhaps nevertheless be mentioned that one unanticipated byproduct has been forcing those concerned with information processing to ponder the issue of problem domains that are not completely circumscribed. When psychologists program computers so that they will do what people do, it soon becomes evident that processes humans take for granted or do automatically and effortlessly can be very hard to mimic with computers. For example, one recalcitrant problem has been developing programs that can understand or unravel sentence structure, but playing highly competent chess with computers turned out not to be as hard. Computers are remarkably adept at dealing with specific problems in restricted domains, but it is exceedingly difficult to program them in ways that make it possible for them to handle problems in more open, less circumscribed domains. Cognitive psychologists have been forced to deal with the issue of representation (or how information is coded and stored), and the problem of the organization of representations has proven especially intractable.

Biopsychology and Neuroscience

The fragmentation that occurred throughout the discipline during the postschools era and that continued in the last half of the 20th century was particularly evident in what earlier had been called physiological psychology or biological psychology. By the end of the 20th century, it had been transformed into behavioral genetics, **sensory neuroscience,** microphysiology, cognitive neuroscience, psychopharmacology, **psychoneuroimmunology,** and other specialties. The inheritance of behavioral propensities, already explicitly recognized by Charles Darwin more than a century earlier, became the focus of research among a large group of scientists trained in molecular and statistical genetics, behavioral science, and often in neurophysiology and neurochemistry as well. What had been psychophysics was combined with visual and auditory neurophysiology, leading to the field of sensory neuroscience.

The electron microscope was used in the study of minute structural changes within nerve cells that accompany such behavioral phenomena as habituation and learning. Astonishingly accurate, if still quite expensive, procedures were developed primarily in medical settings to assess localized activity in various parts of the brain through scanning techniques such as positron emission tomography (PET) and functional magnetic resonance imaging (fMRI), permitting study of the detailed changes in localized brain activity in real time as human participants engaged in various cognitive tasks, helping generate the specialty of cognitive neuroscience. The computer was not the only technological development that had a profound influence on late 20th-century psychology. The burgeoning pharmaceutical industry generated dozens of new psychotropic drugs intended to deal primarily with psychiatric problems and needed to determine the behavioral effects (and side effects) of its new products, helping the area of psychopharmacology to flourish.

Soon after the middle of the century, a new phenomenon was identified that had extensive implications for many socially and psychologically significant areas: **learned helplessness,** or the idea that repeated exposure to a situation in which the organism has no control over aversive events can lead to inability to learn avoidance of or escape from a new unpleasant situation even if avoidance or escape is possible. Soon it was established that animals subjected to a learned helplessness–inducing procedure are more susceptible to physical disease and display poorer reactions of their immune systems than animals that have been subjected to the same aversive events but had control over them; the search for specific mechanisms responsible for such effects generated the new field of psychoneuroimmunology.

Study of animals and people with "split brains," that is, individuals whose **corpus callosum** (the massive bundle of fibers connecting the right and left hemispheres of the brain) has been severed, produced such findings as that one-half of the brain might functionally not know something that the other half of the brain has learned and that the two halves of the brain, to some extent, serve slightly different functions. This latter finding, unfortunately, was picked up by the media and resulted in some highly oversimplified popular misconceptions about so-called right-brain and left-brain functions. Altogether, though, the last half of the 20th century brought some remarkable progress in the understanding of perceptual events, fundamental mechanisms of motivation, neural correlates of learning, and many other psychophysiological processes.

Health Psychology

Psychoneuroimmunology, cognitive neuroscience, and other later developments demonstrated the intimate connections between mind and body, between behavior and physiology. Years ago, the psychiatric specialty of psychosomatic medicine was already assuming that psychological processes could have deleterious effects on physiology; widely believed, for example, was the theory that stress could generate excessive flow of gastric juices and that these acid secretions could damage the stomach wall, resulting in gastric ulcers. The relatively new field of **health psychology** (an APA division devoted to this area was established in the late 1970s) became distinct from clinical psychology and classic psychiatry, in that it concentrates not on mental health but on physical health and on discovering what behavioral interventions can help enhance physical fitness. Also called behavioral medicine, the field did not use psychological assessment, psychometric testing, or psychotherapy but focused on relationships between lifestyle and other behavioral characteristics and susceptibility to physical illness. Health psychologists studied such questions as the social and psychological correlates of cancer, heart disease, and stroke. Issues dealt with both in research and practice were salt consumption, weight control, cholesterol intake, exercise, alcohol use, and smoking, all of which were shown to have demonstrable health consequences. Biofeedback techniques and behavior modification were developed to help patients cope more effectively with chronic pain. Tense, highly competitive, and intensely motivated individuals were found to be at greater risk for coronary problems than less ambitious and more relaxed people. Hospital patients who could look out a window at a serene landscape were found, on average, to be able to leave the hospital sooner than those who could only stare at a blank wall. It became possible by the mid-1970s to demonstrate, using epidemiological statistics, that inclusion of psychologists in the health-care system reduces the average number of times that individuals visit a physician as well as the cost of medical services both to individual patients and to providers of health insurance. The recognition that psychological factors can contribute substantially to physical health led to rapid growth in this new specialty.

The Growth of Professional Practice

Perhaps the most visible change in psychology during the last 50 years of the 20th century, though, was the enormous surge in the practice of psychology. As pointed out earlier in several places, the number of practicing psychologists (in, e.g., clinical psychology, counseling, school psychology, industrial and organizational psychology, polling, health psychology, human factors engineering, consulting psychology, clinical neuropsychology, the human–computer interface) expanded at a much greater rate than the number of research or academic psychologists. While the practice of psychology included many different specialties, they all had in common a dedication to the enhancement of human welfare through the application of psychological knowledge.

By the middle of the 20th century, the doctorate was recognized by the APA as the minimum credential for a practicing psychologist, and several conferences were devoted to standardizing curricula among training programs, especially those intending to prepare clinical psychologists. An influential midcentury proposal was called the scientist–practitioner training model, since it combines a solid grounding in the knowledge base and empirical methodology of psychology with substantial practical training in clinical skills. During the 1970s and 1980s, programs were founded that diverged from this model; leading to either a PhD or a PsyD degree and housed either in university departments of psychology or in free-standing professional schools of psychology, they tended to reduce the emphasis on research and to increase the amount of practical clinical training.

The outpouring of graduates from the programs focused on the practice of psychology also affected the composition of the membership of the APA, as previously mentioned. A rift developed within the APA between those identified with the professional practice orientation and those identified with the research and academic orientation. Initially the practice members believed that the APA was too responsive to the scholarly community and not sufficiently attentive to practice needs; soon the balance reversed, and the academic members believed that the association was too focused on practice issues and no longer as relevant as it had been before to those whose primary interests were scholarly. Several efforts were made during the 1980s to generate a reorganization plan for the APA that would make it attractive to and relevant for both factions, but these efforts were unsuccessful—in part because a large proportion of the members considered themselves scientist–practitioners and were unwilling to identify themselves exclusively with one faction or the other and in part because the interests of the two groups were indeed to a large extent incompatible. The disaffected academics founded a rival association, the American Psychological Society (APS; now the Association for Psychological Science), which grew fairly rapidly, but membership in it remained far smaller than that in the APA. Whether the APA can realistically continue to speak for all of psychology and for all psychologists was a question that was unresolved by the end of the 20th century. (This issue will be further discussed in the next chapter.)

Psychology at the End of the 20th Century

Psychology at the end of the 20th century was a sprawling, fast-moving, and fragmented field that encompasses a wide variety of problems, issues, trends, aims, methods, and attitudes. Its foci were so varied that different subfields had very little in common with one another. Among the tens of thousands of psychologists, some did research with the methods of the natural sciences and some did research with the methods of the social sciences, but the majority tried to solve practical problems such as those of industry, the classroom, the military, intergroup tension, and especially the clinic. The number of psychologists, and the number of specialties within the discipline of psychology, grew enormously during the last half of the 20th century. There was appreciable progress in some problem areas, but other problem areas remained intractable. However, as will be elaborated in a moment, almost all research-oriented psychologists continued to be convinced that a dispassionate evidential approach to issues of human and animal behavior could help alleviate suffering and would be helpful in promoting the public welfare. And the rapid advance of computer technology began to change the system of information sharing. Journals began to be published electronically, and books became available either via "on-demand" publishing or in electronic form. Scholarly publication was undergoing rapid and fundamental changes.

Psychology itself had also been undergoing rapid changes. The prevalent theory of the day before yesterday became a historical curiosity yesterday; the ingenious new gadget of yesterday became a crude horse-and-buggy device today; and the exciting research field to which everybody flocked today looked like a somewhat misguided and outmoded fad tomorrow. Theories, instruments, research foci, and various subtle but far-reaching connotative aspects of the general psychological climate changed at a pace that perhaps seemed alarming, for what the individual psychologist had learned 30 or even 10 years ago was seen to be hopelessly out of date.

There had been a great deal of rapid change, yes. The methods, the orientation, the detailed problems, were constantly shifting. Yet in a sense the basic problem remained the same. People have always been interested in themselves. For thousands of years people have speculated about the nature of human nature. But it was only in the last century or so that the effects of a fundamental methodological revolution in the study of humanity had been clearly felt.

People were, of course, still interested in people, but they were no longer content only to spin long-winded subtle speculations. The study of behavior left the armchair and entered the laboratory; reliance on wise, experienced minds, equipped with oratory and quill pen and paper, gave way to reliance on impersonal scientists with their precise measurements, their cold numbers, and then their electronic computers.

Before the turn of the 20th century, ineffable, rich human nature was safe from the probings of the aseptic scientist; everybody knew that science could never penetrate the peculiarly human characteristics of human beings and degrade them to become nothing more than just another inert part of the world of the microscope and the slide rule. The dignity of humanity, the only possessor in the universe of the Cartesian unextended substance—soul—was unassailable.

The rallying cry of the revolution in 20th-century behavioral science was that nothing is holy. There is nothing about human beings to which the dispassionate empirical approach cannot be applied. Measurement, experiment, and formal prediction infiltrated virtually all areas. The person as a sensing, learning, motivated social being was wrested from the philosopher and theologian and dissected under controlled conditions by that 20th-century Darwinian mutation, the behavioral scientist. Disquieting though it was to those who wished to preserve an anthropocentric view of the universe, the conclusion gradually became inescapable: there is nothing about the deepest feelings, thoughts, values, and conduct of human beings that cannot be subjected to the scientist's no-nonsense scrutiny.

The revolution did not occur without strong opposition. It is safer and perhaps more pleasant to speculate comfortably from the podium, the armchair, or the pulpit than to risk one's convictions by examining them objectively, empirically. Argument can always be met with argument, but objective empirical data are relatively immune to wanton bias.

The revolution in behavioral science, like many revolutions, did not occur overnight. Rumblings can be found in the 18th and 19th centuries, and even earlier. The beginnings were modest, but the infiltration of the scientific method into new areas snowballed geometrically. The amount of new territory covered in the 20th century was truly awesome.

The distinctiveness of human beings in contrast with all other animals had already received a shattering blow in the Darwinian revolution, which pointed to a structural continuity between humans and other animals. It was not long before the Darwinian approach was applied to behavioral as well as to morphological characteristics. Comparative psychology began late in the 19th century and became a major endeavor during the 20th. Comparisons between people and other animals became a matter of measurement rather than conjecture, and humans did not always come off better in these comparisons.

In 1900, although the seeds of the revolution had already taken root, there was still room for the mystical humanist. To be sure, mental chronometry was well established, some rather elementary sensory and associational processes had been brought into the laboratory, and a few crude experiments had been performed on the problem-solving abilities of animals. These isolated bits of information were far from a full-scale invasion of the private domain of humans' essential humanity. But quietly, perhaps insidiously, this invasion occurred during the 20th century, and victory appeared close to complete.

Late 20th century behavioral scientists could claim that there is nothing human that is alien to them: They could study empirically virtually any aspect of human beings they wish to. The 20th century produced studies of social phenomena, personality, cognitive processes, subtle events in the brain, complex personality deviations, language use, psychotherapy, interpersonal attraction, dreams, parental behavior, and drug abuse. All were now studied not only in a literary or philosophical vein but also scientifically.

Some diehard humanists came up with the vague but strong feeling that all of this somehow does not really get at the essence of humanity. It might be quite interesting, but somehow tangential, irrelevant to an understanding of the true nature of human nature. Behavioral scientists replied by saying that they would like to know what it was about humanity that this approach misses. Specify what is lacking, and they could work on ways to get at it. As soon as it is specified, it becomes accessible to scientific investigation.

Perhaps the revolution in 20th-century behavioral science can, like the Renaissance, be characterized as an adoption of the **research attitude** rather than an attitude of venerating argument or authority. The research attitude means raising two questions with regard to any assertion. First, is it true? Second, and far more important, how can one find out if it is true? What kinds of measurements will get at the heart of the assertion, and test it validly? What kinds of operations can be used to check the statement? Faith, political pressure, precedent, authority, argument, and fad are out; they are much too subject to predilection, bias, and wishful thinking. Only an objective empirical investigation can give trustworthy results that will stay reasonably put. As indicated earlier, nothing is immune to the research attitude's questions: is it true? How can I find out if it is true? No phenomenon is off limits when it comes to the application of the scientific method.

The revolution in 20th-century behavioral science, then, seemed very nearly complete. The day of the armchair was past. Everything about human behavior, including how social, philosophical, and religious values develop, could be subjected to the scientist's impartial scrutiny. Maybe the role of philosophy, of humanism, and of religion is to raise important questions, but science is the method of choice for answering them.

Paradoxical as it might seem at first glance, it was argued, a dispassionate scientific approach is also the most humanitarian one. One will be in the best position to help people if one knows what works, what effects something has, when one is trying to help troubled souls get along in this world. The revolutionary modern behavioral scientist maintained that science is apt to be more helpful in this vital endeavor than is magic, wishful thinking, philosophy, or theology.

So here is the typical late 20th-century psychologist's impression of the state of psychology. Psychology had become a sophisticated, quantitative, empirical science, one that was growing rapidly and could be applied, at least tentatively, to help in the solution of many of society's practical problems. It was not a body of established truths, of clinical wisdom, of philosophical speculations but a complex, vigorous, powerful set of sophisticated methods for the discovery of fundamental relationships that can be of great significance for every human being, and a set of useful scientific generalizations—but each generalization has a probabilistic tag on it; none is absolute. Psychology had become an approach, a way of tackling problems and thinking about them. Psychology was making tremendous strides; it had become a tool that has already wrought much, and that had the potential for even greater accomplishment in the future.

Summary of Part III

The middle of the first half of the 20th century was the age of schools. The Wundtian experimental approach was transformed into the structuralism of Titchener. Functionalism, which was more concerned with the use of mind than with its content, developed both at Chicago under Dewey, Angell, Carr, and Mead and at Columbia under Cattell, Thorndike, and Woodworth. Behaviorism, which rejected the study of consciousness and concentrated instead solely on the study of objective, behavioral phenomena, grew out of functionalism, was popularized by John B. Watson, and matured with Lashley, Hunter, Guthrie, Hull, Tolman, and Skinner. The Gestalt school objected to the elementism of structuralism, functionalism, and behaviorism and emphasized the relational determination of psychological events; the leaders of this movement were Wertheimer, Koffka, Köhler, and Lewin. Growing out of a different tradition, psychoanalysis attempted a full understanding of the human mind in all of its complexity, with intricate theories developed by Freud, Jung, and Adler; the neo-Freudians emphasized the social determinants of deep personality phenomena.

The age of schools did not last beyond about 1940. By this time psychology had become an objective science, and people were concentrating on their own particular research areas. A new, practical operational methodology branched off from operational philosophy. Piaget studied children; new inroads were made on neurological correlates of behavior by Krech, Olds, and others; McClelland measured motivation, and Osgood meaning. Tens of thousands of psychologists engaged in human-service work to help alleviate human suffering and to help people actualize their potential. Psychology found itself being used by society in a wide variety of areas and became increasingly quantitative. The high-speed computer revolutionized experimental psychology and spawned the popular new field of cognitive science. If any pervasive philosophy was characteristic of the efforts of empirically oriented psychologists toward the end of the 20th century, it was that there is nothing about human behavior and experience that cannot be studied scientifically.

Part IV

PSYCHOLOGY'S PROMISING PAST AND ENIGMATIC FUTURE

CHAPTER **16**

An Evaluation

Psychology's Promising Past and Enigmatic Future

As the title of this closing chapter suggests, psychology's past was promising, but its future could be enigmatic.

In what sense was the past promising? Psychology in the 19th and 20th centuries was optimistic and surprisingly productive. The potential contributions of an empirical behavioral science to everyday human affairs and to the solution of some great societal problems appeared to be enormous. Psychology could inform and enhance educational practice from prekindergarten through graduate school—and beyond, in lifelong learning. The moral improvement of college students that was the focus of 18th and early 19th century psychology could now be based on sound empirical findings. By the first half of the 20th century, the application of the scientific method held enormous promise for the improvement of manufacturing procedures and of the morale of the workers whose productivity in turn would be enhanced. The technology of psychometrics could be applied to assure a better fit between people's interest and skill patterns and the jobs that they would work in, and also had immense potential utility for military purposes. Psychophysics left the pure science lab where it had already been so successful and entered the world of work and commerce even in such applications as the perfume industry and the production of whiskey.

The laws of learning being discovered in the laboratory where rats were running in mazes or pigeons were pecking at keys were going to revolutionize the whole almost limitless realm of human endeavor in which learning plays a role—and learning plays a huge role in almost all human activities. The science of psychology that had been started by such great pioneers as Gustav Theodor Fechner, Hermann Ebbinghaus, Wilhelm Wundt, William James, and later John B. Watson, B. F. Skinner, and Anne Anastasi was coming of age and would play a major role in the reduction of human misery and the fuller actualization of latent human potential. More recently, human engineering was reducing automobile and airplane accidents by inventing a bright red brake light at the top of the rear window in cars and making all the pointers on airplane cockpit dials point in the same direction if everything is okay—as well as training pilots to compensate for the common illusion that the angle of approach when landing at an airport appears less steep than it actually is, thus lowering the probability that the pilot would crash the plane into the end of the runway.

In personnel placement as well as in psychotherapeutic work, the World Wars, demonstrating the usefulness of psychometrics and clinical psychology, encouraged the federal government to devote extensive resources to the U.S. Department of Veterans Affairs and to training psychologists to help those returning home from the horrors of combat. By early in the second half of the 20th century, the gatekeepers of federal resources, including the National Science Foundation, the National Institutes of Health, and other massive programs, were convinced that the infusion of public funds into the behavioral sciences would help substantially in dealing with major challenges such as illiteracy, prejudice, poverty, and conflict. Funding decisions were beginning to be based on the realization that the way to solve societal problems is to apply the empirical method to the solution of these problems. It is also true, though, that the massive federal funding for behavioral research was unfortunately directed to some extent by purely political factors. Rather than having human and social needs, or researchers' own interests, drive decisions about what kinds of research to support, all too often not necessarily well-informed political factions made those decisions about which massive United States federal programs should be instituted and which ones terminated.

Meantime general theoretical psychology and its applications were making some promising strides. Skinner and his disciples developed an influential approach to the analysis of behavior that promised enormous benefits to society if it were conscientiously applied to such areas as teaching machines, animal training, practices in mental hospitals and prisons, classrooms, and even the design of effective communities. The theory of cognitive dissonance, the research field of learned helplessness, the new "positive" psychology, the insight that getting people to work together to achieve a common goal can produce remarkable group cohesion: all these could be applied to enhance human interactions and productivity—and happiness—and to reduce intergroup and interracial tensions and prejudice (and other major social problems). The emergence of cognitive and visual neuroscience, and even the American Psychological Association's recent emphasis on **evidence-based practice,** all boded well for the future of psychology as a useful empirical science that can be applied in numerous ways for the betterment of humanity.

Psychology's past held out enormous promise of all the wonderful things that psychology could do by way of research progress to deepen understanding of the human condition and to apply psychological knowledge, firmly based on sound empirical science, to the solution of many hitherto intractable human problems. Furthermore, practitioners and scientists were to collaborate on mutually beneficial projects; psychological practice was to be increasingly based on solid scientific findings; and scientists would devote at least some of their methodological skills and rigor to the kinds of significant problems that practitioners ran across in their everyday interactions with clients as well as to what 2008 APA president Alan Kazdin identified as "global challenges": pollution, overuse of nonrenewable resources, violence and conflict, environmental sustainability, and unhealthy lifestyles, to name just a few.

By near the end of the 20th century, psychology as a science was making substantial progress, and the practice of psychology as an applied behavioral science had begun to make impressive empirically based findings that could prove useful in dealing with significant worldwide problems. Although many clinical or counseling psychologists still held—and still hold—to the unnecessarily narrow view that the "practice of psychology" is primarily a one-on-one therapeutic activity that some iconoclasts have labeled "the purchase of friendship," applied research psychology, or applied behavioral science, had a strong case that its findings can be of enormous benefit to society—and not just in the arenas of mental health or even physical health.

Consider physical health for a moment. Decades ago Herbert Dörken and others demonstrated actuarially that involving psychologists in the health-care system dramatically reduces hospital admissions and the number of visits to physicians' offices, greatly reducing the cost of medical services. And today over two-thirds of the variance in physical health has turned out to be attributable to lifestyle variables, less than one-third to hospitals, physician interventions, pharmaceuticals, and the like. These lifestyle variables are behavioral variables, where applied psychology could make a huge difference: physical activity, overweight and obesity, exercise, use of alcohol and tobacco, irresponsible sexual behavior, substance abuse, injury and violence, environmental pollution, access to health care, compliance with medical prescriptions, and on and on.

It would be a mistake, though, to limit the potential contributions of applied psychology, or the practice of psychology, to only mental health and physical health. A few examples were presented earlier, but there is so much more to applied psychology than that. The practice of psychology is far broader. Consider a preliminary, incomplete list of some ways in which the practice of psychology goes beyond—and should go beyond—psychotherapy and health care.

The specialty area of industrial and organizational psychology has made huge contributions to personnel selection, testing, and fitting the worker to the job and the job to the worker; to training; and to the efficiency of organizational structure. Human engineering has improved equipment design, the legibility of highway signs, the usability of manuals for complex devices, the interface between people and computers so that computers are becoming more user-friendly even while they grow in complexity, and, as mentioned previously, the safety of road vehicles and airplanes. Social psychology has enhanced accuracy in polling, environmentally sound recycling practice, and the effectiveness of executive leadership and has also helped to reduce conflict, the overuse of nonrenewable resources such as oil and pure potable water, and prejudice in many forms: ageism, sexism, racism, xenophobia, homophobia, and religious intolerance.

Applied experimental psychology has contributed not only in such human factors areas as auto and aircraft safety and human–computer compatibility but also in the psychophysics of product quality, training for troubleshooting, and the applied psychology of learning, of perception, and of motivation. For instance, in the field of motivation it is now known that the inappropriate use of external reinforcement, or arbitrary rewards, can substantially reduce intrinsic motivation or the tendency to engage in productive activities for their own sake. And then there is the enormous variety of contributions of applied psychology to the military and to the National Aeronautic and Space Administration (NASA); sport psychology (in skiing, football, track and field, and numerous other competitive sports as well as in recreational activities); psychology and law (e.g., in jury selection, in the effects of presenting evidence in a particular order); school psychology in myriad ways, educational psychology, media psychology, marketing, psychoeconomics, applied psycholinguistics and sociocultural psychology, family planning; and, at least potentially, environmental preservation (including dealing with human contributions to climate change) and control of perhaps the most dangerous problem facing all of humanity today, overpopulation.

The promise of psychology seemed to be almost without limit. Apply the relevant findings of behavioral science in the right way at the right time and in the right place, or encourage further carefully focused behavioral research in areas which society considers most crucial but where the relevant behavioral research has not yet been done, and psychology can be of immense benefit to society. But psychology appears to have failed to get its empirically sound wisdom appropriately into the hands of policy makers and legislators in a form and in such a way that this wisdom actually gets used to the extent it could and should be in dealing with global problems. Furthermore, while psychology might have some good, empirically based recommendations about various past problems—even if many of those recommendations unfortunately remain largely unknown to the relevant political and purse-string decision makers—the world is changing so fast that it is impossible to predict what tomorrow's problems will be. Current knowledge is unlikely to be able to solve those as yet unformulated problems; dealing with those will require further focused research. Substantial funds and resources will be needed to support this research, to help behavioral science seek the answers to tomorrow's counterparts to the economic woes, foreclosures, unemployment, homelessness, environmental degradation, and unhealthy lifestyles of today.

Though psychology's past has been promising, its future is enigmatic in a number of ways. Consider just the American Psychological Association itself. In 2009 it faced a worse financial situation than it had experienced in many years. The U.S. nationwide, indeed, worldwide economic crisis did not leave the APA unscathed. In an effort to keep its financial house in order, the APA froze its staffing, salaries, and honoraria, and in 2009 it had more than 100 fewer employees than its 2009 budget had called for, due to a large extent to major cuts made to try to balance the budget. The APA was in trouble financially as well as in the question of the meaning and identity of the field of psychology as such. Not just the APA but also psychology itself appeared to be in trouble, which is why its future now seems to be enigmatic.

Psychology as an integrated, diversified umbrella discipline might have had its heyday in the middle of the 20th century, but that heyday appears to have passed. It would be comfortable to argue that, as in biology, physics, chemistry, and many other vibrant disciplines, there has simply been so much progress in the field that it has become fragmented. People identify with particular subfields and not with broad, general psychology anymore. Any lively, expanding field develops specialties, and psychology has not been immune to this development. Many splinter groups left their childhood home to spread their wings and develop their own identity. But in doing so, the splinters of what was the larger whole "psychology" have been dropping the term *psychology* from their names. "Social relations" did it at Harvard in the middle of the 20th century. Cognitive science, behavioral genetics, decision making, neuroscience, developmental science, and other subfields, while obviously offshoots of what used to be called psychology no longer maintain that genetic origin in their present self-image. The University of

Colorado at Boulder has gone halfway in this development; it was called just the Department of Psychology until 2010, when its name changed to the Department of Psychology and Neuroscience. Other universities, such as Duke, have taken similar steps. But some institutions have gone further. A major long-term Washington, D.C., lobbying group of some two dozen associations relevant to what used to be called psychology changed its name from the Federation of Behavioral, Psychological, and Cognitive Sciences to the Federation of Associations of Behavioral and Brain Sciences. The adjective *psychological* is now gone from its name. This trend has not been limited to the United States; in 2009 the University of Passau in Germany closed down not only its substantial archives of the history of psychology (which fortunately were reopened at the University of Würzburg later that year) but also its entire Institute of Psychology (which has not been reopened).

An inexorable exodus from what has been called psychology has apparently continued despite the APA imploring psychologists of all stripes —practicing, research, consulting, scholarly—to reestablish psychology as a brand by emphasizing that they are psychologists, doing psychological work, engaged in a field based on solid empirical science. But the terms *psychologist, psychological*, and *psychology* have taken on a tinge of atavism, of being old hat, even of superficial "pop" lore, indeed of unscientific gobbledygook or perhaps well-meaning but bumbling voodoo or shamanism. Look in almost any book store in its psychology section. This problem has existed for decades, but it appears to be even worse now. Therapists and academics alike are scrambling to rid their identity of anything to do with that term "psychology," the meaning of which has deteriorated. Researchers and academics want to be seen as hard-nosed scientists; they do not want the public to think that they are in any way associated with what are all too often seen as soft-headed, unscientific "Rent-A-Friends" who sell their touted but untested "skill" in helping troubled clients. And one-on-one practitioners in turn strive to present themselves to the public as quasi-physicians and to believe that they are engaging in therapeutic activities based on hard science, when unfortunately sometimes it is difficult or even impossible to demonstrate any clear relationship between what they are doing and any well-established principles based on careful, objective, well-controlled empirical studies or, worse yet, even any reliable, objectively demonstrable results. Many practitioners without doubt base their practice and their clinical activities on sound, demonstrable empirical findings, but unfortunately by no means do all of them do so consistently.

The term "psychology" is thus in danger of losing any luster it once enjoyed. Its public image as a real science is tarnished. It is being eliminated from the self-image of those who used to identify with it, whether they are scholars or practitioners. Not only is the term disappearing from their titles and the names of the institutions they work for and the organizations they support or join, but also some of these institutions and organizations themselves are in trouble—and not only financially. The future of psychology has become indeed enigmatic.

The membership of the American Psychological Association, for instance, soared rapidly during the first half of the 20th century. But during the last few decades, that membership has stagnated. Many research psychologists, academics, and scholars have left the APA and recommended that their graduate students not join this organization, which they claimed has little, if anything, to offer them. Membership in its science-oriented divisions has plummeted, while membership in specialized non-APA societies, many of which shun the term "psychology" in their names, has grown. Furthermore, although more than 35,000 school psychologists were working in the United States in 2010, membership in the APA's Division of School Psychology as of 2010 was less than 2,000. And self-styled "practicing psychologists," those primarily engaged in one-on-one psychotherapy or counseling with clients (an activity that has been financially troubled for decades), who must pay a substantial annual assessment in addition to hefty annual APA dues, also questioned the value of what the APA does for them, and likewise left the organization or did not bother to join it. This trend is particularly disturbing because those people formed the core of what membership remained in the APA in 2010: some 70% of then-current APA members paid this "practice" additional assessment that year. It has even been suggested that perhaps, to have its name accurately reflect its membership, the APA should stop aspiring to be an umbrella organization for the entire discipline of psychology and should consider changing its name from "American Psychological Association" to something like "American Psychotherapy Association."

That might more accurately reflect what the APA had actually become as of 2010. But one could argue that what psychological organizations, including the APA, should be doing is help psychology regain the position it once had. Their task should be to show the society in which they find themselves how psychological research, and the applications of that research, can benefit society enormously. Political decision makers need to be convinced of the value of rigorous scientific research in dealing with the ominous global challenges facing humanity. There are so many areas in which behavioral science could help. In studies at the University of Utah, for instance, it was recently found that automobile drivers who use cell phones or engage in text messaging while driving are four times as likely to have an accident as are those whose attention is directed exclusively to the task of driving; for truck drivers, the astonishing statistic is that they are more than 20 times as likely to have an accident. Other empirical findings that have major potential social and even political implications are that abortion typically does not have deleterious effects on mental health, that the use of torture in interrogations usually yields information that is only unreliable and invalid, that children raised by same-sex parents are no more likely to develop psychological problems than are those raised by opposite-sex parents, and that most existing prison systems are serving only the goal of warehousing, not that of rehabilitation.

And there are countless additional issues to which behavioral research should be directed more than it has been so far. What are the effects of modern technology (e.g., cell phones, television, iPods) on human cognition and on human interaction patterns? How are modern techniques of communication and of travel affecting how people think and act? What is the effect of trivial or frivolous or violent television and movies, and of the disappearance of newspapers and responsible journalism, on how people in a democracy act—and vote? And what techniques of trying to convince people about something actually work, including the people who decide whether to support psychological research, what kinds of psychological research to support, and what kinds of public resources should be devoted to the application of which findings of behavioral science? These questions too are ones for which empirical research could help find answers. But there is little reason to be sanguine about their being addressed effectively soon. And that is why psychology's future remains enigmatic.

Clearly the last few pages include some iconoclastic—or at least controversial—statements. But what can one truly say about psychology's historical trajectory? The past has been pretty good, but its future at this point is enigmatic. Perhaps it need not stay that way—if psychologists and psychological associations concentrate more on showing society the potential benefits of rigorous behavioral research devoted to the solution of behavioral problems.

Glossary

The first time that each term in this glossary appears in the text of this book, it is in **boldface.** Terms used in the definition of an item that are listed in the glossary appear in *italics*.

Act psychology: Brentano's system, stating that all psychological processes are acts that refer to objects and that all psychological acts have *immanent objectivity*, meaning that the objects they refer to are immanent within the acts

Adaptation level: According to Helson's theory, the overall level to which a sensory system is adjusted on the basis of earlier stimulation

Adaptive act: According to the *functionalist school of psychology*, any behavior of any organism; all responses are presumed to facilitate the organism's adaptation to its *environment*

Adjustment: The key process in the *functionalist* system, which saw life as a continuous process of the organism's adjustment to its *environment*

Affections: Titchener's third kind of *mental elements*, in addition to *sensations* and images

All-or-none law: The doctrine that a neuron either fires with all its energy or does not fire at all, that there are no gradations in the activity level of a nerve cell

Analytical psychology: Jung's name for his neo-Freudian version of *psychoanalysis*

And-connections: A term that *Gestalt theorists* used to describe arbitrary connections, based on *contiguity* in space and time but indifferent to the nature of the items connected

Animism: The doctrine that souls or spirits inhabit everything in the world; compare *vitalism*

Anti-elementism: Denial of the *validity* of *elementism's* assumption that the only way to understand any complex totality is to decompose it into its elemental constituents

Aphasia: A neurobiological disorder in which the patient loses the ability to understand words or use them correctly

Apperception: According to Wundt, bringing objects into the *focus of consciousness;* according to Herbart, fitting items into the current contents of consciousness

Apperceptive mass: According to Herbart, the current content of consciousness, which determines what additional contents can become conscious

Archetype: A prototypic Jungian symbol in the collective unconscious, such as transcendent awe or the idea of evil

Artificial intelligence (AI): Computer programs that can carry out cognitive processes such as problem solving that, when engaged in by actual organisms, are deemed intelligent

Assimilation: According to Wundt, the combination of *mental elements*, not all of which are simultaneously present in consciousness

Association: Connection among various elements in consciousness or behavior

Association for Psychological Science: The later name for APS, originally the American Psychological Society; an organization for behavioral science founded late in the 20th century as a rival to the American Psychological Association (APA)

Associationism: The doctrine that the primary (or even sole) law needed to explain mental events or processes is the law of *association*, that is, connection via *contiguity* in space and time

Atomism: The effort to understand wholes by breaking them down into their elemental components

Attention: The process of bringing an item into the *focus of consciousness*

Balance models: *Social psychology* theories by Heider, Peak, and others that describe relations among interrelated subparts of social units and predict which ones will be stable and unstable

Behavior modification: The use of principles of *conditioning* to mold behavior

Behaviorism: One of the major 20th-century *schools of psychology*, characterized by the doctrine that psychology must limit itself to the study of objective behavior and avoid any reference to consciousness

Behavioristics: Skinner's term for the objective description of behavior and its determinants and control

Biofeedback: Procedures for monitoring typically unconscious *physiological* processes, such as blood pressure, to make them modifiable by *conditioning*

Categories: According to Kant, the filters of time, space, and cause and effect that the human mind imposes on all conscious experience

cgs: Centimeters, grams, and seconds, representing the physical dimensions of distance, weight, and time to which the objective, materialistic view of natural science aims to limit all scientific measurement

Chronological history: A *historiographic* strategy that uses time as the primary organizer of an historical account

Client-centered *counseling*: According to Rogers, a form of *psychotherapy* that during the course of treatment emphasizes clients' own perspectives

Clinical psychology: A specialty of psychology that deals primarily with the study and treatment of *psychopathology*

Cogito ergo sum: "I think, therefore I am"; Descartes's conclusion that because I am thinking I must exist

Cognitive dissonance: Festinger's theory proposing that decisions tend to be made in such a way as to be consistent with beliefs about the domain in which the decision is made

Cognitive map: Tolman's term for what organisms learn in problem situations such as mazes; the subjective conception of the problem situation that is built on the basis of experience with that situation

Cognitive neuroscience: The study of neurobiological correlates of cognitive processes

Cognitive revolution: The late 20th-century reorientation of research psychologists to concentrate on cognitive processes

Common sense: According to Aristotle, a superordinate sixth sense that complements and integrates the input from the first five: vision, audition, taste, smell, and kinesthesis

Complex ideas: Ideas that consist of the combination of multiple *simple ideas;* a concept found primarily in 19th-century *association* theory

Complication: According to Wundt, a *complex idea* composed of elements from different sensory modalities

Computer simulation: Computer programs that attempt to mimic real events, such as human performance in a problem situation

Conation: According to late 19th-century and early 20th-century British psychology, the third major component of psychological processes (in addition to cognition and feeling), having to do with motivation

Conditioning: The generation of a connection between a previously neutral stimulus and a response by repeatedly pairing the stimulus with a stimulus that already elicits that response

Connectionism: Thorndike's position that learning is a matter of forming connections between stimuli and responses on the basis of satisfiers or annoyers presented after the response is made

Constancy hypothesis: The assumption that physical stimuli always result in the same *sensation* irrespective of context, an assumption challenged experimentally by *Gestalt theorists*

Contiguity: Proximity in space and time; a primary principle of *association* since Aristotle

Contralateral representation: The sensory and motor *localization of functions* in the brain, opposite from their anatomical localization, such that the left side of the brain senses and controls the right half of the body and the right side of the brain senses and controls the left half of the body.

Contrast: In *associations*, the connection of an idea with its opposite;

in perception, enhancement of the difference between a stimulus and its background

Converging operations: A group of operational definitions intended to measure or specify the same underlying concept or dimension

Corpus callosum: A massive set of white fibers in the center of the mammalian brain, connecting the two hemispheres

Correlation: The statistical connection between two variables, such that knowledge of one of them enhances prediction of the other; usually expressed as a coefficient of correlation in the range from –1 to +1

Counseling psychology: A specialty in psychology that deals with helping individuals make decisions about their lives (e.g., career, marriage)

Creative synthesis: Wundt's doctrine that the combination of *mental elements* can generate a new compound whose attributes are not directly deducible from the attributes of the elements

Critical empiricism: One of the three philosophical trends that culminated in the founding of *experimental psychology* as a separate discipline, calling for the use of objective empirical methods as the preferred *epistemology*

Crucial experiment: According to Brentano, an experiment that decides a crucial theoretical issue; also called *experimentum crucis;* compare *systematic experiment*

Culture-free tests: Tests (of variables such as intelligence) that are intended to be uncontaminated by sociocultural variables

Defense mechanisms: In *psychoanalysis*, techniques such as *repression* or *sublimation* that the *ego* uses to keep unacceptable unconscious material out of consciousness

Delayed reaction: One of Hunter's methods for studying *symbolic processes*, in which the animal is prevented for some time from responding to a stimulus that was presented and then removed

Dependent variable: In *systematic experiments*, a variable whose value depends on the value of an *independent variable*

Descriptive operationism: The methodological approach of using various operations to specify a concept, without arguing that the concept is identical with those operations; compare *operationism*

Determining tendency: In studies by the *Würzburg school*, the mental predilection to come up with a particular kind of response on the basis of instructions or prior activity

Determinism: The doctrine that all events are caused; compare *free will*

Distributed practice: Distributing the time allotted to memorizing or learning something into several separated sessions; compare *massed practice*

Double-aspect monism: A position concerning the *mind–body problem* held by Spinoza and others, stating that mind and body are two sides of the same underlying reality

Dream analysis: Freud's "royal road to the unconscious"; the process of interpreting analysands' dreams, primarily by requiring the analysands to free associate to elements in their dreams

Drive-reduction theory: A major *behavioristic* theory (held by, e.g., Hull) claiming that the reduction of a drive after a response is made is necessary for the subsequent strengthening of that response

Dualism: A position concerning the *mind–body problem* stating that mind and body are two different realities, as in Descartes's *unextended* and *extended substance*

Dynamic psychology: Woodworth's psychological system, which gives motivation a central role; also, a 20th-century term for psychological treatments and theoretical analyses based on Freudian or neo-Freudian principles

Dynamic self-distribution: The *Gestalt* claim that systems in nature typically evolve due to internal forces and processes rather than externally imposed arbitrary and mechanical constraints

Ego: One of Freud's three components of the mind; the part of the human psyche that mediates between the unconscious demands of the *id* and *superego* and between unconscious desires and the real world

Eidetic imagery: An ability, described by Jaensch, to generate vivid veridical *memory* images of previously presented stimulus material

Eidola (singular: eidolon): In the early Greek theory of *sensation*, faint copies of themselves emitted by stimulus objects, to which the senses are attuned and which they are capable of receiving

Einstellung: *Determining tendency* (*set*), a process studied extensively by the Würzburg school

Elementism: The conviction that one can understand a whole only by first understanding the elements that compose it and then discovering how they combine to constitute the whole; that understanding any complex totality requires decomposing it into its elemental constituents

Empiricism: The *epistemological* doctrine that reliable and valid knowledge can be obtained only through empirical or experiential methods; compare *rationalism*

Empirism: The *epistemological* doctrine that all mental components are generated by experience and no knowledge is inborn; compare *nativism, tabula rasa*

Environment: The physical or psychological setting in which an organism exists

Environmentalism: The doctrine held by, for instance, Watson and Skinner, that *environmental* consequences are a major determinant of behavior

Epicureanism: An early Greek philosophy arguing that one should devote one's life to seeking pleasure; compare *hedonism, stoicism*

Epistemology: The domain of philosophy that deals with how humans can, and should, obtain reliable and valid knowledge

Equipotentiality: Lashley's doctrine that parts of the brain can take over functions typically performed by other parts, if those other parts are damaged

Eros: Freud's term for the sexual *instinct*, one of the two major *id* drives (see also *thanatos*); the sexual component of the *libido*

Ethnomusicology: The study of the music of different cultures and ages

Ethology: A branch of biology that studies the behavior of species in their natural habitat

Evaluation research: Use of empirical methods for obtaining objective evidence about the efficacy of various intervention practices such as *psychotherapy* or other programs for enhancing socially desirable outcomes

Evidence-based practice: The use of psychological or medical practices based on systematic objective evaluation of their demonstrable effectiveness

Evolution: The doctrine that species are not fixed and immutable but change over time in ways corresponding to changes in their *environment*

Evolutionary *associationism*: The doctrine that *associations* learned by one generation can be passed on to its progeny by heredity

Evolutionary psychology: An orientation concerning psychological theories that emphasizes the adaptive or evolutionary advantages of changes in behavior

Experimental esthetics: The empirical study of how the characteristics of objects determine esthetic judgments about those objects

Experimental psychology: The natural-science approach to the study of psychological phenomena, using experimental methods to determine their causes and processes

Extended substance: According to Descartes's *dualism*, the physical world; compare *unextended substance*

External history: A *historiographic* strategy that discusses historical events in the context of their sociocultural *environment;* compare *internal history*

Extirpation: The experimental removal of tissue; an empirical procedure for studying, in particular, the functions of parts of the brain

Extraversion: Jung's term for individuals' tendency to be gregarious and concentrate primarily on interpersonal social activities; compare *introversion*

Factor analysis: A statistical technique that generates a small number of factors that can, at least to some extent, account for the relationships among variables in a matrix of *correlation* coefficients

Faculties: Capabilities of the mind; according to the doctrine of *organology* or *phrenology*, the strength of a faculty corresponds with the size of the brain area that supports it

Family pedigree method: The study of the distribution of certain mental attributes (e.g., genius or feeblemindedness) within a family to determine the extent to which they are due to heredity

Fechner club: Titchener's initial name for what later became "Titchener's experimentalists" and then the Society for Experimental Psychologists

Fechner's law: The doctrine that the intensity of *sensations* is proportional to the logarithm of the intensity of the physical stimulus; expressed as $S = k \log R$

Feelings: One kind of *mental element* in Wundt's and Titchener's systems of psychology

Field of consciousness: According to Wundt and Titchener, the background of consciousness; the *ground* from which items in the *focus of consciousness* stand out

Field theory: A term for *Gestalt theory*, in particular Lewin's version; an orientation that emphasizes the interrelatedness of most psychological phenomena and processes with their context

Figural aftereffects: A kind of perceptual illusion studied by Köhler and others that results in distortions in figural patterns that are produced by prior stimulation

Figure: The configuration in the *field of consciousness* that receives *attention;* compare *ground*

Focus of consciousness: According to Wundt, the center of *attention;*

what is dominant in consciousness; compare *field of consciousness*

Forgetting curve: According to Ebbinghaus, the typically rapid decrease over time in recall or recognition of memorized items, usually dropping to a very low asymptote

Form: Shape or configuration; in Aristotle, the organizing principle that makes the *matter* of an object cohere; compare *matter*

Founding of laboratories: One of the five scientific trends that culminated in the founding of *experimental psychology* as a separate discipline; the establishment of institutions for performing scientific experiments

Fragmentation: The breakup of psychology into a number of relatively unrelated disciplines; typical of the last third of the 20th century

Free *association*: The Freudian psychoanalytic procedure that requires analysands to report whatever comes into their consciousness, often used together with the interpretation of particular memories or contents of dreams

Free will: The doctrine that human decisions are not predetermined by identifiable *independent variables* but are due to individual choice; compare *determinism*

Functional definition of meaning: Mead's definition of the meaning of items based on the functions those items are capable of performing

Functionalism: One of the major 20th-century *schools of psychology*, characterized by the doctrine of studying what the mind is for or what it does to enhance the organism's *adjustment* rather than studying the mere contents of the mind

Fusion: According to Wundt, the combination of several *mental elements* that never occur separately and in which the constituent elements are not readily discernible

Gerontology: The study of the psychological, social, and medical changes that accompany old age

Gestalt theory: One of the major 20th-century *schools of psychology*, characterized by the doctrine that wholes typically are totally different from any mere sum of the elements of which they are composed

Gestalt therapy: Perls's version of Freudian psychoanalytic practice and theory

***Gestaltqualität*:** Ehrenfels's term for an additional element over and above the elements constituting any whole; for instance, squareness, or a particular melody

Great individual: A doctrine in *historiography* holding that major historical events result from the actions of particular individuals; compare *Ortgeist, Zeitgeist*

Ground: In the *field of consciousness* or in perception, that against which a *figure* stands out

Group dynamics: Lewin's approach to the interactions within social groups and the influence of the individual on the group and the group on the individual

Health psychology: The study of the contribution of lifestyle variables to physical health and the application of that knowledge to the enhancement of physical health; also called behavioral medicine

Hedonism: The doctrine that pleasure and pain powerfully determine and explain conduct; compare *Epicureanism, stoicism*

Hering papers: A graduated series of gray squares ranging from white to black, used to measure perceived brightness

Higher mental processes: According to Wundt, psychological processes such as cognition or problem solving that are more complex than simple processes such as *sensation* or *association*

Historicism: A *historiographic* strategy that discusses historical events in their original historical sociocultural context; compare *presentism*

Historiography: The techniques, theories, and principles of strategy and presentation in historical scholarship

Hormic psychology: *Purposive psychology;* McDougall's system of psychology that considers all behavior to be purposive

Human engineering: The discipline of designing equipment so that human operators can use it effectively with a minimum of errors

Humanistic psychology: The school of Maslow, May, and Rogers, emphasizing the positive, creative, and optimistic side of human nature, which these theorists claimed was ignored by traditional *schools of psychology*

Hypothetico-deductive method: According to Hull, the method of natural science, in which hypotheses rigorously derived from scientific theory must be tested empirically in experimental studies

Iconic memory: *Short-term memory* of a stimulus pattern or event that precisely mirrors that pattern or event

Id: One of Freud's three components of the mind; the fully unconscious primal part of the human psyche containing the *libido*

Idealism: The metaphysical position, held by Berkeley, that fundamental reality consists of ideas rather than of the material world

Idiographic approach: Allport's strategy aimed at understanding the unique characteristics of an individual; compare *nomothetic approach*

Imageless thought: Thinking understood as consisting not necessarily of a series of elemental sensations, images, or ideas, but rather of processes involving direction, set, determining tendencies, and other factors, as reported in studies by members of the *Würzburg school*

Immanent objectivity: Brentano's doctrine that all mental acts have outside referents, that is, that outside objects are immanent in all mental events

Immediate experience: Experience that includes the observer's mental contributions to conscious events, as in the data of psychology; compare *mediated experience*

Independent variable: In *systematic experiments*, a variable, usually manipulated by the experimenter, whose value affects the value of one or more *dependent variables*

Individual psychology: Adler's term for his version of neo-Freudian *psychoanalysis*

Inferential statistics: Statistical procedures used to generalize the results obtained from a sample of a population to the entire population from which the sample was drawn

Inferiority feelings: According to Adler, debilitative challenges to the self-image inevitably generated by a youngster's recognition of the far superior skills, strengths, and abilities of adults

Information processing: A field of study generated by the advent of the modern computer, concentrating on the way humans, computers, and animals deal with information

Information theory: A mathematical theory developed by Wiener, Shannon, and others that deals precisely with the encoding, processing, and output performed by *information-processing* systems

Insight: Understanding of the essential features of a situation, problem, or stimulus, assumed by *Gestalt theorists* to occur during *productive thinking* and by *psychoanalysts* to occur when analysands understand the unconscious origins of their problems

Instinct: Inborn patterns of response to particular *environmental* conditions

Intelligence quotient (IQ): Stern's formula for quantifying intelligence by the ratio of an individual's measured *mental age* to that individual's chronological age

Internal history: A *historiographic* strategy that restricts its discussion to historical events in a particular discipline or field; compare *external history*

Introspection: The *structuralists'* preferred method for the study of mental phenomena, in which trained observers report on the conscious elements in the experience resulting from particular experimentally applied stimuli

Introversion: Jung's term for an individual's tendency to eschew social activities and concentrate instead on internal subjective concerns; compare *extraversion*

Isomorphism: A *Gestalt* doctrine holding that physiochemical processes in the brain and nervous system must have Gestalt properties similar to those displayed by the corresponding psychological processes

James-Lange theory: A theory of emotion arguing that subjective emotions are the effect, not the cause, of the *physiological* manifestations of those emotions

Just noticeable difference (jnd): In Weber's law, the smallest change in a stimulus that results in a change in the *sensation;* usually a specific fraction of the amount of stimulation already present

Law of effect: Thorndike's doctrine that a satisfactory result strengthens a preceding *S-R connection*, while a punitive result weakens it; compare *truncated law of effect*

Learned helplessness: A phenomenon in which organisms, on the basis of discovering earlier that they are unable to control unpleasant events, fail to learn how to avoid or escape from controllable noxious stimulation

Learning by doing: Dewey's proposal that active involvement in situations about which one is intended to learn is more effective than non-participatory activities such as merely hearing or reading about them

Libido: According to Freud, the powerful unconscious desire which strives for sexual gratification and aggressive dominance over all efforts to curb it

Life space: Lewin's topological representation of an individual's situation as viewed from the perspective of that individual

Life span development: Changes in perspective and behavior as a function of age, extending from birth through childhood and adolescence into maturity and old age

Lloyd Morgan's canon: A version of the principle of parsimony ("Occam's Razor"), stating that one should not explain a behavioral process by recourse to a more complex or higher capacity if it can be explained by a simpler or lower capacity

Local signs: Lotze's doctrine stating that places on a sensory surface obtain a relative spatial locus on the basis of past experience

Localization of functions: Identification of particular parts of the brain and nervous system that are involved in the performance of various psychological and behavioral acts and processes

Long-term memory: The encoded residue of events and stimuli after those events and stimuli have been processed in *short-term memory* and then placed in permanent mental storage

Malleus maleficarum: Literally, "hammer for female evildoers" (Latin); a 15th-century document constituting an early description of *psychopathology;* intended to explain how to identify and deal with witchcraft

Mass action: Lashley's doctrine that the brain acts to some extent as a whole rather than specific subparts of the brain performing specific, uniquely separable functions

Massed practice: Combining all the time allotted to memorizing or learning something to a single session; compare *distributed practice*

Mastery: One of Ebbinghaus's methods for the experimental study of rote memorization; counting the number of repeated trials required for the first complete correct reproduction of the memorized material

Matter: The lower level in Aristotle's metaphysical hierarchy; what is organized by *form;* compare *form*

Mechanisms can become drives: Woodworth's doctrine in his *dynamic psychology* that well-learned behavior patterns can contain their own motivation, that is, that organisms tend to enjoy engaging in habitual acts

Mediated experience: Experience with the subjective component removed, as in the data of physics; compare *immediate experience*

Memory: Stored residue of earlier experience

Memory drum: A device for exposing material in experiments on rote memorization

Mental age: A dimension determined in an attempt to measure intelligence; usually the average chronological age of individuals who perform at the same level on a cognitive task or puzzle as the person whose intelligence is being measured

Mental chemistry: John Stuart Mill's doctrine that, as in physical chemistry, mental compounds can display qualities that are not discernible in their constituent elements; compare his father's *mental mechanics*

Mental chronometry: Measurement of the time it takes to perform certain mental functions; the study of *reaction time*

Mental elements: In *associationism, structuralism,* and other perspectives, the basic component parts of complex contents of consciousness

Mental mechanics: James Mill's pure *associationism,* stating that mental compounds are the sum total of their constituent elements; compare his son's *mental chemistry*

Mental philosophy: The study of the domain of conscious events; in the 18th and 19th centuries in the United States, this domain typically included topics that later became part of the discipline of psychology

Mental testing: A field that grew rapidly during the 20th century, consisting of standardized methods for measuring intelligence and a wide variety of other psychological dimensions that vary among individuals

Meta-analysis: A technique that systematically combines the findings from large numbers of controlled studies of the same phenomenon to yield a single statistically generated rational conclusion about that phenomenon

Method of adjustment: One of Fechner's psychophysical techniques, in which a research participant sets a variable stimulus so that it matches some characteristic of a standard stimulus

Method of average error: Another name for the *method of adjustment*

Method of constant stimuli: One of Fechner's psychophysical techniques, in which a research participant judges whether a characteristic of a variable stimulus is greater than, equal to, or less than some characteristic of a standard stimulus

Method of just noticeable differences: One of Fechner's psychophysical techniques, in which a research participant sets a variable stimulus to make its characteristic just noticeably greater or less than some characteristic of a standard stimulus

Method of limits: One of Fechner's psychophysical techniques, in which a variable stimulus is initially set to be clearly greater or less than some characteristic of a standard stimulus and then is gradually changed by the experimenter until the research participant indicates that, subjectively, it is no longer greater or less

Method of reproduction: Another name for the *method of adjustment*

Method of right and wrong cases: Another name for the *method of constant stimuli*

Methodological operationism: The *epistemological* practice of specifying theoretical concepts or dimensions in terms of the operations used to measure them

Middle Ages: The period of Western history from the decline of the Greek, Roman, and Byzantine empires to the beginning of the *Renaissance*

Mind–body problem: The question of the nature of the mind and of the body and their relationship

Minnesota Multiphasic Personality Inventory (MMPI): A prominent 20th-century paper-and-pencil test for measuring various dimensions of personality

Molar approach: Analysis and description of phenomena in terms of higher-order processes and events; compare *molecular*

Molar–molecular controversy: A primarily 20th-century debate about whether scientific explanation of events requires analysis in terms of other events at the same level or in terms of lower-level "elements"

Molecular approach: Analysis and description of phenomena in terms of their most basic elementary components; compare *molar*

Monad: In Leibniz's philosophy, an independent, noninteracting, ultimate element of reality; see *preestablished harmony*

Moral philosophy: The part of philosophy dealing with ethics; in the 18th and 19th centuries in the United States, usually dealing with topics that later became part of the discipline of psychology

Motor theory of thinking: The doctrine that thinking is actually a matter of the contraction of various muscles or is the result of such *physiological* activity

Nativism: The *epistemological* doctrine that some knowledge is innate and not dependent on experience; compare *empirism, tabula rasa*

Necessary connection: An essential relationship between a cause and its effect, which Hume argued does not exist; rather, he held that a cause and its effect are merely *contiguous* in time and place

Nomothetic approach: Allport's strategy aimed at identifying general laws that apply to all people or all organisms; compare *idiographic approach*

Nonsense syllables: Three-letter consonant–vowel–consonant combinations including no meaningful words, invented by Fechner for the experimental study of rote memorization

Normal curve of distribution: A bell-shaped, symmetrical distribution of data points around a central tendency, characterizing measurements of many human and animal variables; the Gaussian distribution of error

Noumena (singular: *noumenon*): The constituents of Kant's world of true reality, of which human experience is an error-riddled reflection, tempered by the *categories* of space, time, and cause and effect

Null hypothesis: The hypothesis in classical *inferential statistics*, which the researcher usually attempts to refute, that there is no *correlation* among or difference in relevant variables in the population from which the research sample is drawn

Objectivism: The philosophical doctrine that only what is objectively measurable in *cgs* terms—space (centimeters), mass (grams), or time (seconds)—is a permissible object of investigation by natural science

Objectivity: Removing everything subjective from descriptions, data, and explanations

Oedipus complex: The Freudian concept that there is a universal unconscious striving for union with the opposite-sex parent and destruction of the same-sex parent

Operational triangulation: The methodological prescription to use a variety of operational characterizations of a particular theoretical concept or dimension rather than just one

Operationism: The *epistemological* doctrine that concepts are identical to the operations used to specify or measure them; compare *descriptive operationism*

Opponent-process theory: Hering's doctrine that color vision is based on increase or decrease in excitation of three different kinds of retinal cone cells

Organization of perception: The doctrine that the result of sensory stimulation is not a random mosaic of unrelated *sensations* but is an organized *percept* of objects in context; the *Gestalt theorists* proposed a variety of principles for this organization

Organology: Another name for *phrenology*

Ortgeist: "The spirit of a place"; a doctrine in *historiography* holding that major historical events result from the prevailing attitudes and conditions at the location where they occur; compare *great individual, Zeitgeist*

Ossicles: Three tiny bones in the inner ear, which transmit movement of the eardrum to the oval window in the cochlea

Overlearning: Practicing material to be memorized by rote several times more than required for *mastery;* compare *mastery*

Parapsychology: The study of psychic phenomena such as extrasensory perception, telepathy, and clairvoyance

Paired associates: A rote memorization task requiring the research participant to recall or recognize the second member of a memorized pair when the first one is presented

Path analysis: A late 20th-century statistical procedure that goes beyond the basic *inferential statistics* which concentrate on refuting the *null hypothesis*, to analyze cause-and-effect relations in a matrix of data

Percept: What is perceived

Permanent possibilities of sensation: John Stuart Mill's metaphysical characterization of *epistemological* reality: if it is possible to sense it, then it exists

Person cognition: Perception of other people, a field of study that became prominent in mid-20th-century *social psychology*

Personal equation: A mathematical formula used by astronomers to correct for individual differences in *reaction time*, so that times of various astronomical events recorded by one observer can be transformed to match those recorded by another

***Petites perceptions*:** Literally, "little perceptions" (French); subthreshold sensory events, unnoticed individually, which according to Leibniz can be combined with others to lead to a conscious *sensation*

Phenomenology: In psychological research, the unbiased description of subjective experience

Phrenology: The doctrine that the strength of psychic *faculties* in an individual can be determined by examining bumps in the skull that indicate the size of the corresponding underlying parts of the brain

Physiology: One of the five scientific trends that culminated in the founding of *experimental psychology* as a separate discipline; the study of the functions of anatomical parts

Practice of psychology: The application of principles of psychology to solving practical problems, including applied *experimental* *psychology, clinical psychology*, and many other specialties

Pragmatism: The doctrine that if there is no other convincing evidence of the truth or falsity of a proposition, the criterion for judging its *validity* should be how well assuming the truth of the proposition works in a practical sense

***Prägnanz*:** The *Gestalt* doctrine that the organization of any whole is as "good" (e.g., symmetrical, simple, harmonious) as the prevailing conditions allow

Preestablished harmony: Leibniz's doctrine that noninteracting *monads*, including those of mind and body, are predestined like set clocks to seem to interact although they do not actually do so

Presentism: A *historiographic* strategy that discusses historical events in terms of the perspectives of the here and now; compare *historicism*

Primary qualities: According to Locke, sense qualities that correspond to actual physical qualities such as number and size; compare *secondary qualities*

Productive thinking: Thought processes that result in creative problem solving and *insight* into the nature of the problem situation; a psychological process emphasized by *Gestalt theorists*

Professional psychology: The practice of psychology

Projective test: A test in which one's personality, motivation, etc. presumably affects one's perception or description of ambiguous material (e.g., *Rorschach* or *Thematic Apperception Test);* the personality is "projected" onto the material

Psi Chi: An honor society in psychology founded in 1929, having more members than any other psychological association in the world, with over a thousand chapters

Psychic causality: The cause–effect relationships in mental events, which, according to Wundt, cannot contradict the cause–effect relationships in the physical world and are equally regular

Psychoanalysis: One of the major 20th-century *schools of psychology*, characterized by emphasis on the role of unconscious processes in mental events; also, the Freudian approach to *psychotherapy*

Psycholinguistics: The study of the relationship between language and psychological events, including the role language can play in the way cognitive processes occur

Psychoneuroimmunology: The study of ways in which behavioral variables affect the immune system

Psychonomic Society: A late 20th-century organization of active behavioral scientists; criteria for membership include publication of several articles in peer-reviewed scientific journals

Psychopathology: Mental aberrations and mental illness; the study of these phenomena

Psychophysical parallelism: A position concerning the *mind–body problem* stating that, while mind and body do not interact or affect one another, events in one realm parallel events in the other

Psychophysics: The study of the relationship among physical characteristics of stimuli and characteristics of the resulting subjective *sensations*

Psychosexual stages: The Freudian developmental stages defined by changes in the source of erotic pleasure, from oral through anal, phallic, and latent to genital

Psychotherapy: The use of talking or other psychological techniques to deal with psychological problems or *psychopathology*

Purposive psychology: Another term for *hormic psychology*

Quantification: One of the five scientific trends that culminated in the founding of *experimental psychology* as a separate discipline; systematic, objective techniques for numerical measurement of variables

Rationalism: The *epistemological* doctrine that reliable and valid knowledge can be obtained through careful logical reasoning; compare *empiricism*

Reaction time: The time period between a stimulus and the resulting response, a measurement that is a major tool of *experimental* *psychology*

Reality principle: In psychodynamic theory, the principle that the *ego* must deal with in recognizing that having a wish does not automatically result in that wish being fulfilled; the harsh realities of the external world

Redintegration: Hamilton's doctrine that activation of a prominent element in a complex *memory* can activate the entire memory

Reductionism: Explaining a higher-level phenomenon by recourse to lower-level factors, such as the effort to explain psychological events via *physiological* ones

Reflex: Automatic response to an activating stimulus

Reflex arc: The basic analytic unit of *reflexology*, consisting of a stimulus, a response, and the connection between them (*S–R*), in which activation of the stimulus automatically results in the associated response

Reflexology: The doctrine that all psychological events can be fully explained in terms of *reflexes*

Reinforcement: According to Skinner, change in the probability of a particular response in a particular stimulus situation due to an event after the response has occurred; any event that strengthens (or weakens) the tendency to make a preceding response

Reinforcer: A stimulus applied after a response is made that strengthens the *stimulus–response connection* it follows (Thorndike), satisfies a need (Hull), or increases the probability of the response it follows (Skinner)

Relational determination: A basic *Gestalt* doctrine that the qualities of related items affect the connection that exists between those items and that the qualities of a whole affect the nature of its constituent parts

Reliability: The stability of a measurement; the extent to which a measurement of a variable agrees with an earlier or alternate measurement of the same variable:

Reminiscence: Somewhat improved recall or recognition of memorized material at some time later than immediately after memorization; a phenomenon that tends to occur with *massed practice* of the memorized material

Remote *associations*: *Associations* beyond immediately adjacent items in a list to be memorized, such as between the first and third or fourth and seventh

Renaissance: A period in European history immediately following the *Middle Ages*, usually considered to occur about 1400–1600 and characterized by major intellectual and sociocultural "rebirth"

Repression: One of the Freudian *ego defense mechanisms*, in which unacceptable material is forced into the unconscious

Research attitude: An *epistemological* doctrine contrasted with faith, authority, and reasoning, asserting that the scientist must concentrate on determining whether an assertion is true and on how to determine whether it is true

Resonance theory: Helmholtz's doctrine of pitch perception, stating that different tones activate different transverse fibers on the basilar membrane of the cochlea in the inner ear by resonance

Response-produced stimuli: Internal, usually kinesthetic, stimulation produced by making a particular response; a theoretical concept used primarily by the *behaviorist* perspective

Retinal disparity: The slight difference in the images of three-dimensional scenes on the retinas of the two eyes, the combination of which by the visual centers in the brain generates a powerful cue to the perception of three-dimensionality

Retroactive inhibition: The interference of new material to be memorized with later recall of material memorized earlier

Rorschach test: A series of ambiguous, bilaterally symmetrical inkblots, described and interpreted by an individual; used to measure fundamental aspects of personality and *psychopathology* in a *projective test*

Savings: A measurement in the experimental study of memorization identifying how many fewer trials are required to relearn a list of items memorized earlier than to memorize it initially

Schools of psychology: Major foci of theoretical psychology, especially during the first half of the 20th century, among them *structuralism, functionalism, Gestalt theory, behaviorism*, and *psychoanalysis*

Scientific materialism: One of the three philosophical trends that culminated in the founding of *experimental psychology* as a separate discipline, calling for the explanation of scientific phenomena in materialistic or physical terms

Secondary qualities: According to Locke, sensory qualities such as color, taste, smell, and temperature that are generated in an observer by the *primary qualities* of physical objects but that do not themselves reside in those objects; compare *primary qualities*

Self-actualization: According to Maslow, the effort to realize one's potential fully; the highest in the hierarchy of human motivations

Semantic differential: Osgood's procedure for measuring the connotative meaning of any word or other item

Sensations: Subjective impressions produced by stimuli in the *environment* that activate the sense organs

Sensory neuroscience: The study of the physiological correlates of *sensations*

Set: Another term for *determining tendency* or *Einstellung*

Short-term memory: *Memory* of an immediately preceding event or stimulus, before that event or stimulus has been processed for encoding in *long-term memory;* also, the mechanism by which *iconic memories* are transformed into *long-term memories*

Similarity: One of Aristotle's principles of *association,* the doctrine that if one idea is present in the mind it increases the likelihood that one will think of a similar idea

Simple ideas: Elemental ideas that correspond to simple *sensations;* according to James Mill, the building blocks of everything that is in the mind

Social learning: A learning procedure in which, according to Bandura, one learns by watching what happens when another organism behaves in a certain way in a particular situation

Social psychology: The branch of empirical psychology that deals with relationships between groups as well as between the group and the individual

Society of Experimental Psychologists: An exclusive organization founded by Titchener, initially called the *Fechner Club* and then "Titchener's experimentalists"

Sociocultural psychology: The branch of empirical psychology dealing with the effects of social and cultural groups on one another and on the individual, including linguistic issues

Solipsism: The *epistemological* doctrine held by Hume, Berkeley, and others that there is nothing of which one can be certain other than one's own existence

Specific fiber energies: According to Helmholtz, the specific subjective qualities, such as colors or tones, that result from activation of specific sensory fibers, for instance, in retinal cones or on the basilar membrane of the cochlea in the inner ear

Specific nerve energies: According to Johannes Müller, the *sensation* in specific domains that results from activation of specific nerves; for instance, seeing as a result of activating the visual nerve and hearing as a result of activating the auditory nerve

Stereoscope: A device for presenting two slightly different images to the two eyes at the same time, so that the resulting *retinal disparity* results in the perception of a three-dimensional scene with objects having depth in visual space

Stimulus error: In Titchenerian *introspection,* description of mental contents in terms of knowledge about the stimulus rather than in terms of basic *mental elements*

Stimulus–response connection: The connection between a stimulus and a response; the unit assumed by the *behaviorist school of psychology* to suffice for explaining all behavior

Stoicism: An early Greek philosophy recommending a conservative orientation and reasoned restraint; compare *Epicureanism, hedonism*

Stream of consciousness: The succession of subjective mental events in an individual, described in detail by James

Stroboscope: A device for presenting a series of slightly changing stationary images in rapid succession, in such a way as to generate perceived motion in the image; sometimes a drum with vertical viewing slits, whose interior surface contains the stationary images

Structuralism: One of the major 20th-century *schools of psychology*, characterized by Titchener's doctrine that psychology must concentrate on the study of the structure and contents of consciousness

Style of life: Adler's characterization of the pattern of attitudes, beliefs, and actions that the adult has developed to overcome the inevitable feelings of inferiority that were generated by being young, small, and weak

Sublimation: One of the Freudian *ego defense mechanisms*, which converts unacceptable unconscious urges into acceptable conscious strivings

Subtractive method: The procedure of subtracting the *reaction time* to a simple task from the longer period measured for a more complex task to determine the time required for intervening decision or cognitive processes

Subvocal speech: Inaudible motions of the speech apparatus that, according to Watsonian *behaviorism*, are actually the behavioral aspect of thinking

Superego: One of Freud's three components of the mind; the mostly unconscious part of the human psyche that serves to civilize the individual by acting as a conscience that prevents the *ego* from permitting the expression of the pleasure principle's devastating, unconscious *id* desires

Survival of the fit: A major doctrine in the Darwinian theory of *evolution*, stating that species whose characteristics make them more able to cope with their *environment* than are other species are more likely to survive

Symbolic processes: Presumed cognitive processes undertaken by humans and animals when confronting problems; phenomena studied by Hunter using *delayed reaction* techniques and the *temporal maze*

Systematic experiment: According to Brentano, an experiment that determines how an *independent variable* affects one or more *dependent variables*, by measuring changes in the *dependent variables* produced by changes in the independent variable; compare *crucial experiment*

Systematic introspection: The careful analysis of mental contents produced in psychological experiments into their basic elemental component parts, performed by Titchenerian trained observers

Systems approach: Analysis of a situation in terms of its internal structure and its relevant context, as opposed to analysis into predetermined basic elements presumed to be inert

***Tabula rasa*:** Literally, "shaved (wax) tablet"; a metaphor for the doctrine that all knowledge comes from experience; the mind at birth is a blank "tablet" on which experience "writes"; compare *empirism, nativism*

Temporal maze: A maze in which the research participant returns to the choice point with the only clue to a correct choice being the immediately preceding choices; one of Hunter's devices for experimental study of *symbolic processes*

Thanatos: Freud's term for the aggressive impulse, one of the two major drives of the *id* (see also *eros*); the aggressive or destructive component of the *libido*, sometimes also called the "death *instinct*"

Thematic *Apperception* Test (TAT): A mid-20th-century projective procedure devised by Murray and Morgan, in which the individual is asked to tell stories suggested by pictures and the stories are interpreted to reveal personality and motivations

Three-dimensional theory: Wundt's doctrine of emotions, stating that all emotions can be specified by their location along the dimensions of pleasantness–unpleasantness, excitement–calm, and tension–release

Transference: In *psychoanalysis*, the analysand's emotional response to the therapist as if the therapist were an important person (such as a parent) in the analysand's early life

Trial and error: Learning that typically begins with random behavior, followed by gradual, automatic reduction of errors and increase in the correct response

Tropism: An automatic response, such as a flower turning toward light; compare *reflex*

Truncated law of effect: Thorndike's later version of his *law of effect*, in which he dropped the provision that punishment weakens previous *S–R connections*, retaining only the principle that satisfying consequences strengthen the preceding S–R connection

Two-point threshold: The minimum separation between two stimulated points that can be discerned as two rather than just one

Unconscious inference: Helmholtz's doctrine that perceptions involve unconscious, automatic conclusions about the nature of stimulus objects and dimensions, based on the sensory reception of the stimuli from those objects and dimensions and prior experience with those stimuli

Unconscious motivation: The doctrine in *psychoanalysis* that much of human thought and behavior, including *psychopathology*, is the result of powerful unconscious motives such as sex and aggression

Unextended substance: According to Descartes's *dualism*, the mental world; compare *extended substance*

User friendliness: A characteristic of computers, computer programs, and their manuals and help systems that makes them easy for unfamiliar users to learn to use

Validity: The extent to which a procedure succeeds in measuring what it purports to measure; an important characteristic of any *mental test*

***Verstehende Psychologie*:** Dilthey's psychology of "understanding" as opposed to an empirical natural science of *experimental psychology*

Vibratiuncles: Small residual activations that, according to Hartley, continue in the nervous system after a stimulus is removed and are the *physiological* counterpart of the *memory* of the initial *sensation*

Vitalism: The doctrine that living organisms contain a special quality over and above their physical characteristics, which differentiate them from inanimate objects; compare *animism*

***Völkerpsychologie*:** Wundt's multivolume work dealing with *higher mental processes*, culture, language, art, religion, and other complex cognitive processes and phenomena

Voluntarism: Wundt's term for his own system of psychology, with its emphasis on the will

WAIS: The Wechsler Adult Intelligence Scale, an individual test for measuring intelligence

Weber's law: $\Delta I/I = k$: the *just noticeable difference* for any *sensation* is a constant fraction of the intensity of the initial stimulus; a formulation that Fechner used in developing his own psychophysical law

WISC: The Wechsler Intelligence Scale for Children, a version of Wechsler's individual test for measuring intelligence intended for use with children

Würzburg school: Külpe's group of researchers and students examining the psychology of thinking, which came up with the finding that thought can be "imageless"

Zeitgeist: "The spirit of a time"; a doctrine in *historiography* holding that major historical events result from the prevailing attitudes and conditions at the time when they occur; compare *great individual, Ortgeist*

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Author Index

Note on indexing: To assist the reader in sorting through much-discussed topics, this index follows the model in *A History of Experimental Psychology* by Edwin G. Boring (1950), by listing passing mentions of such large topics separately, under “mentioned.”

Subject Index and Names Index: In a history such as this one, there is considerable overlap between figures whose historical role is considered and authors whose works are cited. To avoid making an artificial distinction between these two roles, people’s names appear in the Names Index, rather than the Subject Index, even when they are present in the book as topics in history.

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