The American Psychological Association's spokes-persons have a number of favorite phrases when they discuss psychology. They often refer to the "the basic science of psychology," or to the "scientific research" that helps to provide the foundations of the discipline. Somehow the term science has become linked to descriptions of what psychology's researchers and practitioners do. However, there are skeptics who wonder about the accuracy of these descriptions. Are they reasonable representations stemming from the time in 1879 when Wilhelm Wundt ushered psychology into the family of sciences in Leipzig? Or are they ways of paying lip service to the discipline's desire to appear scientific when in fact the field has a long way to go to achieve scientific status?

When Wundt, a physiologist by training, took the position that the centuries-long philosophical disputes about the nature of mind needed to be set aside and replaced by the approaches favored by the natural sciences, he asked: Why can't the study of mind be based on observation? Just as physics observes the events of the physical world, why shouldn't psychology observe the events of the mental world?

These were good questions and the emphasis on observation was a positive step, but Wundt and his followers were handicapped by the methodology they chose to use and by their lack of appreciation of the whole of science. They were right about the importance of observation and could have moved mental science forward if they had not been stymied by their reliance on the technique of introspection, a form of disciplined, self-observation aimed at looking at mental activity. Such self-reports, even under the most stringently controlled conditions, did not have the kind of repeatability and reliability on which science depends. Moreover, while it is true that the scientific method relies on observation, more is involved. Knowledge is not advanced by the mere collection of facts. The facts have to be systematized and ordered in a way that helps to generate hypotheses (or questions) that can lead to more research. Although Wundt and his student E. B. Titchener (at Cornell University) were interested in analyzing mental experiences into their elemental components as well as in finding out how these elements combine, they did not have a well-ordered, systematic position in which their observations tended to produce hypotheses or call up new questions. Even if introspection provided data, they needed something more to give their findings the kind of structure that had the potential to lead to more knowledge.

While a number of researchers were turning their attention to the new mental science emerging from Wundt's laboratory and were acknowledging the view that objective observation had much to offer, there were scholars who preferred to work from a theoretical base. For them, mind was not merely a concept or a shorthand term for mental processes; it was the controller, the process that managed to organize the input from the outside. Just as Immanuel Kant argued in 1781 that the human mind imposes order on the sensations it receives, so did the triumvirate of Gestalt psychology, Max Wertheimer, Kurt Koffka, and Wolfgang Köhler take the position that the brain organizes incoming stimuli into wholes, or "gestalts." With this preconception as their guide, they set out to find ways to demonstrate how the principle of organization affects perception. While they did perform something like experiments, the observations they sought to make were primarily designed to demonstrate the worth of their ideas. It was not science, but it did keep alive a viewpoint about what the mind does that would provide a basis for the development a few decades later of cognitive psychology.

During the first two decades of the 20th century, when the gestaltists were working around the edges of science and Wundtian laboratory work still had its adherents, William James was emerging as a major influence in American psychology. Here was another point of view about mental science, a position that underscored the mental aspect and downplayed the science features of this new discipline. Although his title at Harvard University was professor of psychology, James was a philosopher at heart and unwilling to give science a central or commanding role in the search for knowledge,
especially knowledge of the mind. Moreover, James was unwilling to confine psychology to the laboratory, referring with distaste to the "brass-instrument" psychology that grew out of Wundt's approach. He was skeptical that science—any science—could deal with something as complex and in "constant flux" as consciousness.

While James's influence was spreading in American academic circles, the quest to understand the mysteries of the mind continued in Europe and it extended beyond the research laboratories. It found its way into the clinical setting where, in 1895, Sigmund Freud set out to develop the elaborate theory of psychoanalysis. Although Freud was a clinician, he had been well trained in the principles of scientific research and knew the value of observation. However, he also felt that standard observation would not suffice; he could not limit his inquiries to the kind of evidence appropriate for physics or chemistry, or for that matter to laboratory psychology. And, unlike Wundt, he did not focus on objectivity. Instead, he sought to find ways to analyze subjective material. To accomplish this goal, Freud made the therapy setting his laboratory by seeing to it that the situation was unstructured as possible. He encouraged his patients to say any and all things that came to mind without attempting to restrain or censor their thoughts. The reliance on this "free-association" technique, combined with his idea that dreams could also be very revealing, gave Freud the special tools he felt he needed.

The fact that the information provided by free-association and dream interpretation was not constrained by the standards of observation used in natural science did not bother Freud. As he saw it, he was delving into the mysteries of the unconscious and he felt free to interpret this material rather than taking it at face value. If others would not accept this approach, that was their problem, not his.

Despite the voluminous outpouring of work from Freud, many scholars became convinced that psychoanalytic theory was not defensible science. Some simply called it bad science and others insisted it had no place within scientific inquiry, likening it to a kind of counterfeit science. These negative judgments also included psychoanalytic therapy, the form of treatment derived from the theory. The therapy still continues to be the focus of disputes and has failed to garner much objective support, but a recent report does offer some findings that seem to defend the "efficacy of psychodynamic therapy." However, studies designed to test or evaluate therapy are difficult to judge because of the problems inherent in measuring—or even estimating—the many possible outcomes of a treatment procedure. In the absence of hard data, statements that tell us, "For many people, psychodynamic therapy may foster inner resources and capabilities that allow richer, freer, and more fulfilling lives" do little to add to the body of knowledge relating to questions about psychology-based treatment techniques. Phrases such as "inner resources," and "richer, freeing, and more fulfilling lives," indicate little about how such poetically-endowed events are to be assessed and possibly measured.

During the period from the late 1880s to the early 1920s, when the study of mind dominated psychology, questions continued to lurk about the role of science. Wundt's position about the need for observational methods had some influence, but the use of the scientific method and the investigation of mental processes still did not quite fit together. There were too many gaps between what to observe and how to do it. Moreover, concepts, especially those heavily laden with preconceptions about mind and mental processes, tended to put forward conclusions without factual support. However, around 1910 something new began to surface in the United States when questions started to be raised about whether psychology should focus exclusively on mental processes as such. Ironically, the possibility of some change in outlook arose from the writings of William
James who, despite his interest in consciousness and mental activities, called attention to the fact that these processes ultimately affect how we behave. In other words, they have functional consequences, many of which are observable.

In 1913, emboldened by the awakening interest in behavior and helped by the research in conditioning by Ivan Pavlov and the studies of learning conducted by E. L. Thorndike, John B. Watson set out to overthrow mind-centered psychology. Watson insisted that the goal of the discipline should be the "prediction and control of behavior." He wanted psychology to be a behavioral science, not the so-called science of mind. After all, both Pavlov and Thorndike had shown that the manipulation of stimuli and responses—even if the research had been done with animals—can be carried out in ways that show how behavior can be controlled and predicted.

Watson's bold pronouncements were not a function of his devotion to science. He was a promoter not a scientist, and although he set a movement in motion, he was more interested in shaking up the establishment than in conducting systematic inquiry himself. It remained for others to give life to this revolutionary approach to psychology. Such scientists as B. F. Skinner, Clark Hull, and E. C. Tolman entered the picture but it was Skinner's work which brought behaviorism to center stage in 1938 with the publication of The Behavior of Organisms. This book, as well as the bulk of the research that followed, showed Skinner to be a no-frills, hands-on researcher who believed that the gathering and organizing of data is fundamental to a science of psychology. Moreover, he emphasized Watson's central tenet that the science of psychology should focus on the prediction and control of behavior.

By the 1950s, however, mind-centered inquiry was still the defining feature of psychology and was gaining strength helped by the developments in information-processing technology. Behaviorism was still finding adherents. As might be expected, a rift developed between the scholars who sought to study mental processes and those who preferred to devote their attention to behavior. The differences in outlook also led to questions about the role science played for each group. Unsurprisingly, the behaviorists felt they had science on their side. Their research, much of which involved the study of learning, was objective and their findings verifiable. Furthermore, the data they gathered were quantifiable, amenable to display in graphic form, and could often stand on their own. However, those who focused on mental processes were not willing to concede the emphasis on science to the behaviorists. They were sure that they could make effective use of the scientific method, insisting that theorizing was an integral part of science.

Both factions were, in some sense, correct. Neither group had a better grasp of science than the other but they used science in different ways. As behaviorism developed and morphed into what Skinner referred to as "the experimental analysis of behavior," it emphasized observation and with it the accumulation of data. With this approach the facts were made to speak for themselves. Most behaviorally-oriented researchers were more concerned with finding out what is happening than in figuring out what could happen. By contrast, the psychologists who focused on mental activity had to make use of some form of speculation as they went about their searches. At the same time, they needed to be on guard about endowing the concepts that arose from their speculation with extra explanatory powers that were not amenable to objective verification.

Despite differences in outlook, the majority of scholars in each group were aware (without always openly expressing this awareness) that the process of observation defined their connection to science. What Albert Einstein and others referred to as "external validation" had to be the crucial ingredient, whether the emphasis was on gathering data or creating theories. A body of data that leads to a set of generalizations or theoretical formulations must be challenged by subjecting it to tests in which the generalizations or the formulations can be disconfirmed. It is this testing and possible falsification that defines science, and both behaviorism and mental science could—under some conditions—meet this criterion.

The growth of information-processing technology and a renewed interest in the study of memory combined to provide frameworks for systematizing the study of mental processes. Questions about mental function could now be approached from the vantage point of positing central processing systems that deal with the flow of information from outside the person to inside and to outside again. Models were available (or could be constructed) that might help to analyze how information gets in, how it is stored, and then how it is retrieved. In 1985, Howard Gardner, a prominent psychologist, went as far as to assert that "the computer also serves as the most viable model of how the human mind functions." It is easy at this point
to say he was wrong, but during the 1970s and 1980s computer modeling of mental function was useful, even if the models were only elaborate metaphors aimed at creating hypotheses and not really intended to represent actual events. And to some extent they served a purpose as was shown by the research they helped to stimulate when they raised questions about how mental operations might process, store and retrieve information. Although none of this research had the air of finality, some of it pointed the way toward issues that could later prove productive.

As stimulating as the information-processing models seemed to be, the research they helped to encourage was limited. The models were, in effect, too simple. The processing of information by the central nervous system is enormously more complex than any serial or even parallel-processing models is able to represent. Perhaps that was the reason that research dealing with mental processes (now beginning to be referred to as “cognitive science”) began to make more extensive use of theoretical concepts. Ideas about the organizing properties of the brain and how language operates according to rules built into our mental systems made their way into the theories being developed within cognitive science. It also became obvious—at least to some—that it was time to regard these ideas in terms of the data being brought to light by neuroscience. What were guesses or suppositions about mental functions might now be looked at in terms of the known features of the central nervous system. A good example of this approach, whereby cognitive science and neuroscience join forces, may be seen in Michael Gazzaniga’s work in which he found that the left hemisphere of the brain seems to be involved in making sense of unclear or incomplete information and may be the locus of the kinds of organizing involved in categorizing and explaining (in other words, interpreting) the inputs we receive.

Research such as Gazzaniga’s and the many studies now emerging from the laboratories and clinics of neuroscientists are having a profound effect on cognitive science. The brain-imaging methods and the technology of electrode implanting have become increasingly precise to the point that questions about central processes—their locations, extent, interactions, and changes—are becoming answerable. For the first time it is also becoming feasible to turn speculations about neural events into direct observation of such events. As this happens, ideas about the nature of cognitions can be translated into actual targets of study that lend themselves to examination. However, it is still necessary to avoid endowing these conceptual depictions of cognitive activity with surplus meaning that can lead research astray. It should be obvious by now that one of the most vexing problems that intrudes so often into psychology is the discipline’s continuing attempts to deal with the idea of mind and the many meanings and misconceptions that concept brings along with it.

Even as the dangers of mind’s many meanings are still present and the temptations to invent ad hoc explanatory concepts lie in waiting, we can acknowledge that Wundt’s original goal is becoming more reachable. It now appears that the increasing cooperation between neuroscience and psychology is leading toward the moment when psychologists and neuroscientists (as partners) should be able to observe mental events. As this begins to happen, there will be no further need to worry about the role of science in psychology.

REFERENCES
