

## Whatever Happened to Psychology as the Science of Behavior? B.F. Skinner

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There can scarcely be anything more familiar than human behavior. We are always in the presence of at least one behaving person. Nor can there be anything more important, whether it is our own behavior or that of those whom we see every day or who are responsible for what is happening in the world at large. Nevertheless it is certainly not the thing we understand best. Granted that it is possibly the most difficult subject ever submitted to scientific analysis, it is still puzzling that so little has been done with the instruments and methods that have been so productive in the other sciences. Perhaps what is wrong is that behavior has seldom been thought of as a subject matter in its own right, but rather has been viewed as the mere expression or symptom of more important happenings inside the behaving person.

The Homeric Greeks thought they knew the very organs. The thumos, or heart, was one of them. It was a vital organ (when it stopped, the person died), but for the Greeks it was also the seat of such things as hunger, joy, fear, will, and thought. To be undecided about something, for example, was to have a divided thumos. We may smile at that, but we do much the same thing ourselves. Here are some of the definitions of the word heart in [Webster's Third New International Dictionary\(1981\)](#): the whole personality("deep in one's heart"), intelligence("knowing something by heart"), character("look into the heart of a person"), compassion("have a heart"), mood("a heavy heart"), opinion("a change of heart"), affection("a broken heart"), goodwill("with all my heart"), courage("a stout heart"), and taste("a man after one's own heart"). Of course, we do not mean the real heart, but the Greeks may not have meant that either. The point is that, like them, we appeal to something inside a person to explain what that person does.

When Galen described human anatomy in greater detail, especially the nerves connecting the brain with sense organs and muscles, it was clear that the Greeks had got the wrong organ. They should have said brain. It was Descartes who showed how the brain and nerves could explain the kind of behavior that was later called reflex. Although the notion of a stimulus suggested an external cause, the search for internal causes did not stop. During the 19th and early 20th centuries, reflexes were studied by physiologists. [Sherrington's \(1906\)](#) book was called *The Integrative Action of the Nervous System*. and [Pavlov's \(1927\)](#) book had the subtitle *The Physiological Activity of the Cerebral Cortex*.

It was hard to find plausible organs for many kinds of behavior, of course, and Plato and others gave up the attempt. Speculation could then be freer. Although we think we see the object we are looking at, for example, it was said that we must see only an internal copy of it, because we can still see it with our eyes closed and even recall it from memory later on. Before we act, moreover, we can merely think of acting; we can have intentions, expectations, or ideas and do nothing more about them. Somewhere inside the body, in short, there seemed to be another person made of a different kind of stuff. For 2, 500 years philosophers and psychologists have discussed the nature of that stuff, but for our present purposes we may accept the famous dismissal that appeared in *Punch* in 1855:

What is Matter?—Never mind.

What is Mind?—No matter (quoted in [Bartlett, 1968](#), p. 810A).

Mind or matter, it was something inside a person that determined what that person did.

### Early Behaviorism

The theory of evolution raised a different question about those internal causes. Nonhuman animals had reflexes and organs, but did they have minds? Darwin, committed to the continuity of species, said yes, and he and his contemporaries could cite examples that seemed to prove him right. It was Lloyd Morgan who objected that the examples could be explained in other ways and Watson who took the inevitable next step and contended that the same thing could be said of human animals. An early form of behaviorism was born.

The predilection for internal causes survived, however. Probably as a reaction to the heavily mentalistic psychology of the time, a central issue in early behaviorism was the existence of consciousness. Experiments were designed to show that animals either could or could not do everything traditionally attributed to feelings and states of mind. If they could not,

something like a mental life would have to be recognized. Perhaps because Watson first studied instincts, he replaced feelings and states of mind with habits. He may have meant nothing more than the behavior said to show the presence of instincts and habits, but he turned later to conditioned reflexes, and his associate, Lashley, went still further into the nervous system. Later, Tolman restored purpose to the organism and still later installed cognitive maps and hypotheses. Clark Hull built an elaborate system of internal processes that, as in “afferent neural interaction,” for example, became increasingly physiological. In short, 3,000 years after the Homeric Greeks, mentalistic and behavioristic psychologists alike were still looking inside the organism for explanations of its behavior. To say that the habit of doing so must have been deeply ingrained would be to give another example.

## Radical Behaviorism

Behavior seems to have been first accepted as a subject matter in its own right when organisms were studied that were too small, and their behavior too simple, to suggest internal initiating processes. [H. S. Jennings's \(1906\)](#) *The Behavior of the Lower Organisms* was the great classic, of course, but more to the point were the work and theories of Jacques Loeb. Loeb's formulation of tropisms and his emphasis on “forced movement” dispensed with internal explanations. The thing to be studied was the behavior of the “organism as a whole” ([Loeb, 1916](#)). (For an excellent account of Loeb's contributions, see [Pauly \[1987\]](#).) And that could be said of larger organisms, as well.

Equally important were new developments in the philosophy of science. Concepts began to be more carefully defined in terms of the operations from which they were inferred. Ernst Mach, especially with his *Science of Mechanics* ([Mach, 1915](#)), was an important figure. Later, P. W. Bridgman (1927) took a similar line in his *Logic of Modern Physics*. In *Philosophy* ([Russell, 1927](#)), a book said to have been written as a potboiler, Bertrand Russell anticipated the logical positivists by several years and “behavioristically considered” a number of psychological processes. (For a full discussion of behaviorism and logical positivism, see [Smith \[1986\]](#).) My thesis, “The Concept of the Reflex in the Description of Behavior” ([Skinner, 1931](#)), was in that tradition. A reflex, I argued, was not something that happened inside the organism; it was a law of behavior. All we actually observed was that a response was a function of a stimulus. It could also be a function of variables in the fields of conditioning, motivation, and emotion, but they too were outside the organism. I called them “third variables,” but Tolman later put them back inside and called them “intervening.”

It was easy to make my case because reflexes, conditioned or unconditioned, were only a small part of the behavior of more complex organisms. The research I was doing at the time, however, had a broader scope: The environment not only triggered behavior, it selected it. Consequences seemed, indeed, to be more important than antecedents. Their role had, of course, long been recognized—for example, as reward or punishment. It was Thorndike who first studied their effects experimentally. Given several possible ways of solving a problem, a cat eventually took the successful one when incorrect ways, or “errors,” dropped out.

I studied the same process in a different way. Prompted by Pavlov's emphasis on the control of conditions, I made sure that all Thorndike's “errors” were eliminated before a successful response could be made. A single “reinforcing” consequence was then enough; the response was immediately and rapidly repeated. I called the process operant conditioning. Thorndike had attributed his effect to feelings of satisfaction and annoyance, which were inside the organism, of course, but I traced the strengthening effect of an operant reinforcer to its survival value in the natural selection of the species.

My first arrangement of setting, response, and consequence was quite simple, but I reported the effects of more complex “contingencies of reinforcement” in *The Behavior of Organisms* ([Skinner, 1938](#)). Still more elaborate ones have been studied for more than 50 years in laboratories throughout the world. Most of the work has been done with nonhuman animals in order to cover a wider range of conditions than would be feasible with human subjects and to avoid “verbal contamination.”

The contamination has also been studied, however. Verbal behavior differs from nonverbal in certain features of the contingencies of reinforcement. The verbal stimuli we call advice, rules, or laws describe or allude to contingencies of reinforcement. People who have been advised or who follow rules and obey laws behave for either of two very different reasons: Their behavior has been directly reinforced by its consequences, or they are responding to descriptions of contingencies. How and why they respond to descriptions must also be explained by analyzing verbal contingencies of reinforcement.

A better understanding of verbal contingencies has also brought two important fields of psychology within range of an operant analysis. One is self-observation. The analysis neither “ignores consciousness” nor brings it back into a behavioral science; it simply analyzes the way in which verbal contingencies of reinforcement bring private events into control of the behavior called introspecting. Only when we are asked about what we have done, are doing, or are about to do, and why, have we any reason to observe or recall our behavior or its controlling variables. All behavior, human and nonhuman, is unconscious; it becomes “conscious” when verbal environments provide the contingencies necessary for self-observation. (It is the person, of course, who is “conscious” or “unconscious,” not the behavior.) Other verbal contingencies generate the behavior called self-management or thinking, in which problems are solved by manipulating either contingencies (as in practical problem solving) or rules (as in “reasoning”).

Much of this is at the moment only an interpretation, but that is common scientific practice. Astronomers interpret the waves and particles reaching Earth from outer space by using what has been learned under controllable conditions in the laboratory—for example, in high energy physics. In a similar way we use what has been learned from an experimental analysis to explain behavior that cannot, at the moment at least, be brought under experimental control, such as covert behavior or behavior observed casually in daily life.

The traditional preoccupation with internal explanatory agents broke behavior into fragments. Psychophysicists, for example, study the effects of stimuli, but only up to the point at which they are supposedly received by an inner agent. Psycholinguists record changes in the number of words or the length of sentences a child speaks over a period of time, but usually with no record of what happened when the child heard similar words or sentences or of what consequences followed when they spoke them. Psychologists study verbal learning by asking their subjects to memorize and recall nonsense syllables, but the word nonsense makes it clear that they are not interested in all of the variables controlling the behavior. Somehow the internal entity or process acts as a starting or stopping place. A bit of sensing is studied by one psychologist, a bit of behaving by another, and a bit of changing by still another. The experimental analysis of behavior puts Humpty Dumpty together again by studying relatively complete episodes, each with a history of reinforcement, a current setting, a response, and a reinforcing consequence.

Many of the facts, and even some of the principles, that psychologists have discovered when they may have thought they were discovering something else are useful. We can accept, for example, what psychophysicists tell us about responses to stimuli without agreeing that they show a mathematical relation between mental and physical worlds. We can accept many of the facts reported by cognitive psychologists without believing that their subjects were processing information or storing representations or rules. We can accept what happens when subjects respond to descriptions of contingencies of reinforcement without believing that they are “subjectively evaluating expected utilities.”

The relation between an analysis of behavior as such and physiology is no problem. Each of these sciences has instruments and methods appropriate to part of a behavioral episode. There are inevitable gaps in a behavioral account. Stimulus and response are separated in time and space, for example, and so are a reinforcement on one day and stronger behavior on the next. The gaps can be filled only with the instruments and methods of physiology. They cannot be filled by introspection, because there are no sensory nerves going to the right parts of the brain.

For more than half a century the experimental analysis of behavior as a function of environmental variables and the use of that analysis in the interpretation and modification of behavior in the world at large have reached into every field of traditional psychology. Yet they have not become psychology, and the question is, Why not? Perhaps answers can be found in looking at three formidable obstacles that have stood in the path of an experimental analysis of behavior.

### Obstacle 1: Humanistic Psychology

Many people find the implications of a behavioral analysis disturbing. The traditional direction of action of organism and environment seems to be reversed. Instead of saying that the organism sees, attends to, perceives, “processes,” or otherwise acts upon stimuli, an operant analysis holds that stimuli acquire control of behavior through the part they play in contingencies of reinforcement. Instead of saying that an organism stores copies of the contingencies the process operant conditioning. Thorndike had attributed his effect to feelings of satisfaction and annoyance, which were inside the organism, of course, but I traced the strengthening effect of an operant reinforcer to its survival value in the natural selection of the species.

Some long-admired features of human behavior are then threatened. Following the lead of evolutionary theory, an operant analysis replaces creation with variation and selection. There is no longer any need for a creative mind or plan, or for

purpose or goal direction. Just as we say that species-specific behavior did not evolve in order that a species could adapt to the environment but rather evolved when it adapted, so we say that operant behavior is not strengthened by reinforcement in order that the individual can adjust to the environment but is strengthened when the individual adjusts (where “adapt” and “adjust” mean “behave effectively with respect to”).

The disenfranchisement of a creator seems to threaten personal freedom (Can we be free if the environment is in control?) and personal worth (Can we take credit for our achievements if they are nothing more than the effects of circumstances?). It also seems to threaten ethical, religious, and governmental systems that hold people responsible for their conduct. Who or what is responsible if unethical, immoral, or illegal behavior is due to heredity or personal history? Humanistic psychologists have attacked behavioral science along these lines. Like creationists in their attack on secular humanists (with the humanists on the other side), they often challenge the content or selection of textbooks, the appointment of teachers and administrators, the design of curricula, and the allocation of funds.

## Obstacle 2: Psychotherapy

Certain exigencies of the helping professions are another obstacle in the path of a scientific analysis of behavior. Psychotherapists must talk with their clients and, with rare exceptions, do so in everyday English, which is heavy laden with references to internal causes—“I ate because I was hungry,” “I could do it because I knew how to do it,” and so on. All fields of science tend to have two languages, of course. Scientists speak one with casual acquaintances, and the other with colleagues. In a relatively young science, such as psychology, the use of the vernacular may be challenged. How often have behaviorists heard, “You just said ‘It crossed my mind!’ I thought there wasn’t supposed to be any mind.” It has been a long time since anyone challenged a physicist who said, “That desk is made of solid oak,” by protesting, “But I thought you said that matter was mostly empty space.”

The two languages of psychology raise a special problem. What we feel when we are hungry or when we know how to do something are states of our bodies. We do not have very good ways of observing them, and those who teach us to observe them usually have no way at all. We were taught to say “I’m hungry,” for example, by persons who knew perhaps only that we had not eaten for some time (“You missed your lunch; you must be hungry”) or had observed something about our behavior (“You are eating ravenously. You must be hungry”). Similarly, we were taught to say “I know” by persons who had perhaps only seen us doing something (“Oh, you know how to do that!”) or had told us how to do something and then said “Now you know.” The trouble is that private states are almost always poorly correlated with the public evidence.

References to private events are, nevertheless, often accurate enough to be useful. If we are preparing a meal for a friend, we are not likely to ask, “How long has it been since you last ate?” or “Will you probably eat a great deal?” We simply ask, “How hungry are you?” If a friend is driving us to an appointment, we are not likely to ask, “Have you driven there before?” or “Has anyone told you where it is?” Instead we ask, “Do you know where it is?” Being hungry and knowing where something is are states of the body resulting from personal histories, and what is said about them may be the only available evidence of those histories. Nevertheless, how much a person eats does depend upon a history of deprivation, not upon how a deprived body feels, and whether a person reaches a given destination does depend upon whether he or she has driven there before or has been told how to get there, not upon introspective evidence of the effects.

Psychotherapists must ask people what has happened to them and how they feel because the confidential relationship of therapist and client prevents direct inquiry. (It is sometimes argued that what a person remembers may be more important than what actually happened, but that is true only if something else has happened, of which it would also be better to have independent evidence.) But although the use of reports of feelings and states of mind can be justified on practical grounds, there is no justification for their use in theory making. The temptation, however, is great. Psychoanalysts, for example, specialize in feelings. Instead of investigating the early lives of their patients or watching them with their families, friends, or business associates, they ask them what has happened and how they feel about it. It is not surprising that they should then construct theories in terms of memories, feelings, and states of mind or that they should say that an analysis of behavior in terms of environmental events lacks “depth.”

## Obstacle 3: Cognitive Psychology

A curve showing the appearance of the word cognitive in the psychological literature would be interesting. A first rise could probably be seen around 1960; the subsequent acceleration would be exponential. Is there any field of psychology

today in which something does not seem to be gained by adding that charming adjective to the occasional noun? The popularity may not be hard to explain. When we became psychologists, we learned new ways of talking about human behavior. If they were “behavioristic,” they were not very much like the old ways. The old terms were taboo, and eyebrows were raised when we used them. But when certain developments seemed to show that the old ways might be right after all, everyone could relax. Mind was back.

Information theory was one of those developments, computer technology another. Troublesome problems seemed to vanish like magic. A detailed study of sensation and perception was no longer needed; one could simply speak of processing information. It was no longer necessary to construct settings in which to observe behavior; one could simply describe them. Rather than observe what people actually did, one could simply ask them what they would probably do.

That mentalistic psychologists are uneasy about these uses of introspection is clear from the desperation with which they are turning to brain science, asking it to tell them what perceptions, feelings, ideas, and intentions “really are.” And brain scientists are happy to accept the assignment. To complete the account of an episode of behavior (for example, to explain what happens when a reinforcement brings an organism under the control of a given stimulus) is not only beyond the present range of brain science, it would lack the glamour of a revelation about the nature of mind. But psychology may find it dangerous to turn to neurology for help. Once you tell the world that another science will explain what your key terms really mean, you must forgive the world if it decides that the other science is doing the important work.

Cognitive psychologists like to say that “the mind is what the brain does,” but surely the rest of the body plays a part. The mind is what the body does. It is what the person does. In other words, it is behavior, and that is what behaviorists have been saying for more than half a century. To focus on an organ is to rejoin the Homeric Greeks.

Cognitive psychologists and brain scientists have formed a new discipline called cognitive science. It is enormously appealing. From a single page in a book review in the New York Times titled “Inside the Thinking Animal” ([Restak, 1985](#)), we learn that the separation of mind and brain, as represented by the separation of psychiatry and neurology, is now blurring, that biochemistry will tell us about depression, that in dreams information is processed very differently from in the waking state, that cognitive neuroscientists would not explain forgetting a friend's name as repression but as a breakdown of memory retrieval, that psychoanalysis was a precursor to current developments in the neurosciences, and that quantum physics offers the most satisfying answer to understanding the mind and brain relationship and the nature of reality itself. Very rich fare, indeed, until one counts the calories. The bodily state felt as depression will no doubt eventually be understood by biochemists (it is now being changed with the biochemicals we call drugs). Dreaming is no doubt different from the waking state, but whether “information” is “processed” in either state is still a question. Is there any difference between “forgetting” and “failing to retrieve a memory” except the gratuitous metaphor in the latter expression? Is it likely that neurology will eventually find the elaborate “mental apparatus” of psychoanalysis? And must we wait for quantum physics before saying anything useful about the mind-brain relationship, let alone reality itself?

A preference for rule-governed rather than contingency-shaped behavior explains the warmth with which cognitive psychologists have also welcomed artificial intelligence. The artificial organisms that show artificial intelligence are much more complex than the automata that inspired the reflex theory of Descartes, but both do only what they are told to do. Fairly simple models have been built that are changed by the consequences of their behavior, and they are much more like real organisms, but cognitive psychologists naturally prefer those that follow rules, including rules for deriving new rules from old. Logicians and mathematicians have been discovering, composing, and testing rules of the latter sort for centuries. Machines can do some of the work and, like a hand calculator, do it much faster. Mathematicians and logicians have never given very consistent accounts of how they work, in part because they have tried to discover their “thought processes.” If an artificial organism can be designed to do what logicians and mathematicians do, or even more than they have ever done, it will be the best evidence we have that intuitive mathematical and logical thinking is only following rules, no matter how obscure. And following a rule is behaving.

## Damage and Repair

By their very nature, the antiscience stance of humanistic psychology, the practical exigencies of the helping professions, and the cognitive restoration of the royal House of Mind have worked against the definition of psychology as the science of behavior. Perhaps that could be justified if something more valuable had been achieved, but has that happened? Is there a better conception of psychology? To judge from the psychological literature, there are either many conceptions, largely incompatible, or no clear conception at all. Introductory textbooks do not help because, with an eye on their books' being

adopted, the authors call their subject the “science of behavior and mental life” and make sure that every field of interest is covered. What the public learns from the media is equally confusing.

Is there a rapidly expanding body of facts and principles? Of our three obstacles, only cognitive psychology offers itself as an experimental science. It usually does so with a certain *éclat*, but have its promises been kept? When the journal *Psychology Today* celebrated its 15th anniversary, it asked 10 psychologists to name the most important discoveries made during that period of time. As [Nicolas Wade \(1982\)](#) has pointed out, no 2 of the 10 agreed on a single achievement that could properly be called psychology. For more than two years *Science* has not published a single article on psychology, except one on memory citing work on brain-operated and braindamaged people and one on the neurological basis of memory retrieval. Apparently the editors of *Science* no longer regard psychology itself as a member of the scientific community.

Nor has psychology developed a strong technology. Internal determiners get in the way of effective action. An article on “Energy Conservation Behavior” in the *American Psychologist* ([Costanzo, Archer, Aronson, & Pettigrew, 1986](#)), carries the significant subtitle, “The Difficult Path From Information to Action.” If you take the “rational-economic” path and tell people about the consequences of what they are doing or of what they might do instead, they are not likely to change. (And for good reason: Information is not enough; people seldom take advice unless taking other advice has been reinforced.) If, on the other hand, you adopt the “attitude-change” approach, people are also not likely to change. Attitudes are inferences from the behavior that is said to show their presence and are not directly accessible. If I turn off unnecessary lights and appliances in my home, it is not because I have a “positive attitude” toward conservation, but because doing so has had some kind of reinforcing consequence. To induce people to conserve energy, one must change contingencies of reinforcement, not attitudes. No one should try to beat a “path from information to action,” because action is the problem and contingencies the solution.

Unable to offer a useful conception of its subject matter, psychology has not formed good relations with other sciences. As we have seen, it has given neurologists an impossible assignment, and the search for internal determiners has obscured any help it could give genetics. Once you have formed the noun “ability” from the adjective “able,” you are in trouble. *Aqua regia* has the ability to dissolve gold; but chemists will not look for an ability, they will look for atomic and molecular processes. Much of the controversy about the heritability of intelligence, schizophrenia, delinquency, and so on is due to the conceptualization of abilities and traits of character as explanatory entities. Longevity is a “heritable trait,” but rather than try to assign it to a gene, geneticists will look at the processes that contribute to a long life. The genetics of behavior can be much more directly studied by interbreeding members of a species that behave in different ways under the controlled conditions of the laboratory.

Psychology gives very little help to the “behavioral sciences”—sociology, anthropology, linguistics, political science, and economics. They have their own technical vocabularies, but beyond them—except for brief flirtations with utilitarianism, Marxism, psychoanalysis, and the like—they use the vernacular, with all its references to internal causes. Their data are usually more objective than those of psychology, but hypothetical explanations still flourish.

Beyond the current reach of all of the sciences lies an issue that cannot be safely neglected by any of them—the future of the world. For a variety of reasons all three of our “obstacles” have had special reasons for neglecting it. Humanistic psychologists are unwilling to sacrifice feelings of freedom and worth for the sake of a future, and when cognitive psychologists turn to feelings and states of mind for theoretical purposes and psychotherapists for practical ones, they emphasize the here and now. Behavior modification, in contrast, is more often preventive than remedial. In both instruction and therapy, current reinforcers (often contrived) are arranged to strengthen behavior that student and client will find useful in the future.

When Gandhi was asked, “What are we to do?” he is said to have replied, “Think of the poorest man you have ever met and then ask if what you are doing is of any benefit to him.” But he must have meant “of any benefit to the many people who, without your help, will be like him.” To feed the hungry and clothe the naked are remedial acts. We can easily see what is wrong and what needs to be done. It is much harder to see and do something about the fact that world agriculture must feed and clothe billions of people, most of them yet unborn. It is not enough to advise people how to behave in ways that will make a future possible; they must be given effective reasons for behaving in those ways, and that means effective contingencies of reinforcement now.

Unfortunately, references to feelings and states of mind have an emotional appeal that behavioral alternatives usually lack. Here is an example: “If the world is to be saved, people must learn to be noble without being cruel, to be filled with faith, yet open to truth, to be inspired by great purposes without hating those who thwart them.” That is an “inspiring” sentence.

We like nobility, faith, truth, and great purposes and dislike cruelty and hatred. But what does it inspire us to do? What must be changed if people are to behave in noble rather than cruel ways, to accept the word of others but never without questioning it, to do things that have consequences too remote to serve as reinforcers, and to refrain from attacking those who oppose them? The fault, dear Brutus, is not in our stars nor in ourselves that we are underlings. The fault is in the world. It is a world that we have made and one that we must change if the species is to survive.

For at least 2500 years philosophers and psychologists have proceeded on the assumption that because they were themselves behaving organisms, they had privileged access to the causes of their behavior. But has any introspectively observed feeling or state of mind yet been unambiguously identified in either mental or physical terms? Has any ability or trait of character been statistically established to the satisfaction of everyone? Do we know how anxiety changes intention, how memories alter decisions, how intelligence changes emotion, and so on? And, of course, has anyone ever explained how the mind works on the body or the body on the mind?

Questions of that sort should never have been asked. Psychology should confine itself to its accessible subject matter and leave the rest of the story of human behavior to physiology.

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