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Can Psychology Be a Science of Mind?

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Many psychologists, like the philosophers before them, have looked inside themselves for explanations of their behavior. They have felt feelings and observed mental processes through introspection. Introspection has never been very satisfactory, however. Philosophers have acknowledged its inadequacies while insisting that it is nevertheless the only means of self-knowledge. Psychologists once tried to improve it by using trained observers and the brass instruments of which William James had such a low opinion. Introspection is no longer much used. Cognitive psychologists may see representations and may even argue that they are the only things that can be seen, but they do not claim to see themselves processing them. Instead, like psychoanalysts, who face the same problem with processes that cannot be seen because they are unconscious, they have turned to theory. Theories need confirmation, however, and for that many have turned to brain science, where processes may be said to be inspected rather than introspected. If the mind is "what the brain does," the brain can be studied as any other organ is studied. Eventually, then, brain science should tell us what it means to construct a representation of reality, store a representation in memory, convert an intention into action, feel joy or sorrow, draw a logical conclusion, and so on.

But does the brain initiate behavior as the mind or self is said to do? The brain is part of the body, and what it does is part of what the body does. What the brain does is part of what must be explained. Where has the body-cum-brain come from, and why does it change in subtle ways from moment to moment? We cannot find answers to questions of that sort in the body-cum-brain itself, observed either introspectively or with the instruments and methods of physiology.

The behavior of the organism as a whole is the product of three types of variation and selection. The first, natural selection, is responsible for the evolution of the species and hence for species behavior. All types of variation and selection have certain faults, and one of them is especially critical for natural selection: It prepares a species only for a

future that resembles the selecting past. Species behavior is effective only in a world that fairly closely resembles the world in which the species evolved.

That fault was corrected by the evolution of a second type of variation and selection, operant conditioning, through which variations in the behavior of the individual are selected by features of the environment that are not stable enough to play any part in evolution. In operant conditioning, behavior is reinforced, in the sense of strengthened or made more likely to occur, by certain kinds of consequences, which first acquired the power to reinforce through natural selection.

A second fault in variation and selection is critical for operant conditioning: Selection must wait upon variation. The process is therefore usually slow. That was not a problem for natural selection because evolution could take millions of years, but a repertoire of operant behavior must be constructed during a lifetime. Operant conditioning must solve the "problem of the first instance": How and why do responses occur before they have been reinforced?

The problem was solved in part by the evolution of processes through which individuals take advantage of behavior already acquired by others. Imitation is an example. It often brings the imitator into contact with the reinforcing consequences responsible for the behavior imitated. The behavior of the imitator is "primed" in the sense of made to occur for the first time and usually when it is likely to be reinforced.

At this point the human species appears to have taken a unique evolutionary step. Other species imitate, but if they model behavior to be imitated, it is only as the product of natural selection. The consequence of modeling, the behavior of the imitator, is too remote to serve as an operant reinforcer. Only in the human species does the behavior of the imitator reinforce modeling.

The species underwent another unique evolutionary change when its vocal musculature came under operant control and when vocal behavior began to be shaped and maintained by its reinforcing consequences. People could then prime the behavior of others by telling them what to do as well as by showing them. (In a presumably later step, temporary reinforcing consequences were added to make the behavior more likely to remain in strength until the consequence for which it was primed could come into play. Adding temporary reinforcements in this way is teaching.)

Advice can be useful on more than one occasion, and it is then often given or taught in such a way that it is passed on from person to person or from generation to generation. Maxims ("great sayings") and proverbs ("sayings put forth") are examples. They describe rather general contingencies of reinforcement–a penny (as well as many other things) saved is a penny (as well as many other things) earned. Rules are sayings transmitted by groups, usually with stronger reinforcing consequences. The laws of governments and religions describe the contingencies of (usually negative) reinforcement maintained by those institutions. They have the effect of warnings: By obeying the law a person avoids behaving in ways that would be punished. The laws of physics and chemistry ("rules for

effective action") describe the contingencies of reinforcement maintained by the physical environment.

Modeling, telling, and teaching are the functions of the social environments called cultures. Different cultures emerge from different contingencies of variation and selection and differ in the extent to which they help their members solve their problems. Members who solve them are more likely to survive, and with them survive the practices of the culture. In other words cultures evolve, in a third kind of variation and selection. (Cultures that shape and maintain *operant* behavior are exclusively human. Animal societies have many similar features, but only as the product of contingencies of survival.) Cultural evolution is not a biological process, but as a kind of variation and selection it has the same faults. The fact that a culture prepares a group only for a world that resembles the world in which the culture evolved is the source of our present concern for the future of a habitable earth.

The process of variation and selection has a third fault: Variations are random and contingencies of selection accidental. What evolved is not a single slowly developing species but millions of different species, competing with each other for a place in the world. The product of operant conditioning is not a single coherent repertoire but thousands of smaller repertoires, conflicts among which must somehow be resolved. The evolution of social environments has produced not a single culture but many often conflicting ones.

Although operant control of the vocal musculature is exclusive to the human species, it is seldom if ever cited as its distinguishing feature. The presence or absence of "consciousness" or "conscious intelligence" is more likely to be cited. The role played by the mind/brain has always been a problem in comparing species. Descartes excepted "man" from his mechanical model of an organism, and Wallace, unlike Darwin, did not believe that evolution could explain the human mind. Brain scientists have expressed similar reservations. Evolutionary theorists have suggested that "conscious intelligence" is an evolved trait, but they have never shown how a nonphysical variation could arise to be selected by physical contingencies of survival. (The suggestion simply moves the bothersome physical—metaphysical distinction a step further out of sight.) It has been said that we may never know how a conscious mind evolved because nothing would survive for palaeontologists to discover, but the operant control of the vocal musculature and the showing, telling, and teaching that follow have survived, and it is possible that they explain introspection and also what is "seen" with its help.

The root *spect* suggests vision. We say that we "look at" and "see" what is happening within ourselves, but no inner eye has ever been discovered. We can avoid specifying a kind of organ by saying *observe, notice,* or *note* rather than *see,* and it is significant that *observe, notice,* and *note,* and less commonly *remark,* mean both *say* and *see* . Much depends on what it means to sense any part of the world with any kind of organ. Input—output theories, as in stimulus—response or information-processing models, make a sharp distinction between sensing and doing. We are said to sense the world before acting upon it. The experimental analysis of behavior assigns a very different role to the

stimulus, however. An operant response is more likely to occur in the presence of a stimulus that was present when it was reinforced. Sensing is as much a product of variation and selection as doing. It is a part of doing. For similar reasons, natural selection explains the readiness with which animals respond instantly to features of the environment that have been crucial to the survival of their species, such as the sight, sound, or smell of food or sexual opportunity, or a threat of danger, including the danger of the unfamiliar. Animals presumably "receive" all the stimuli that impinge upon them, but it is possible that they only respond to those that have played a part in contingencies of selection. (We cannot know whether nonverbal animals see stimuli that have never played such a part, because we should have to arrange contingencies containing such stimuli in order to find out.) We ourselves may see things with respect to which we have taken no *practical* action (we see things that are out of reach, for example) but possibly only because we have talked about them. To see things without taking further action is to be *aware* of them. (The root in *aware* is also found in *wary;* we are wary of things that have been part of negative contingencies of selection.) The word *conscious,* used more often than *aware,* means co-knowledge (Latin: *con-science*) or "knowing with others"– an allusion to the verbal contingencies needed for being conscious.

All this is particularly important when what we see is within our body, the kind of seeing to which we usually reserve the word introspection. But what do we actually see? Psychologists who are uneasy about the metaphysical nature of mental life often say that what we see through introspection must be the brain, but that is unlikely. We have no sensory nerves going to important parts of the brain; a surgeon can operate without anesthesia. No contingencies of selection would have promoted the evolution of such nerves before the advent of verbal behavior, and that was very late in the evolution of the species. It is more likely that what we see through introspection are the early stages of our behavior, the stages that occur before the behavior begins to act upon the environment.

Sensing is such a stage; we see things before we respond to them in any other way, and we see that we are seeing them when we are doing nothing else. The necessary contingencies are supplied by people who ask us whether we see things. The very beginning of action is another early stage. It does not raise any question of the availability of sensory nerves because we should be able to see early stages with the nerves needed for the complete action. (It is also possible that we are sometimes not *intro* specting at all, but are responding to the external setting, as if "I am going to go ..." meant "In situations like this I have usually gone ....")

The Greeks are said to have discovered the mind, but it is more likely that they were the first to talk at great length about what they saw within themselves and thus construct the contingencies needed for introspection. The "Great Conversation" of Plato's Academy would have created contingencies under which more and more of the beginnings of behavior would be seen. It must have been a puzzling world. We see the public world about us, but we also feel, hear, taste, and smell it. We do nothing with an inner world but "see" it. It is not surprising that the Greeks called it *meta* physical.

Unfortunately, what they saw occurred at just the time and place to be mistaken for a cause of what they then did, and it was therefore easy to suppose that they had discovered an originating self or mind. If what they saw was simply an early part of what they then did, however, it was no more a cause of the rest of what they did than the backswing of a golfer is the cause of the stroke that strikes the ball. Early parts of behavior affect later parts, but it is the behavior as a whole that is the product of variation and selection.

Such an analysis of introspection and of the "consciousness" introspected needs careful consideration, of course, but every effort should be made to preserve it because it dispenses with any need to appeal to a special kind of knowing or a special kind of stuff known. It stays within the world of physics and chemistry and the sciences of variation and selection. It avoids any suggestion of a break in the processes of variation and selection.

Two established sciences, each with a clearly defined subject matter, have a bearing on human behavior. One is the physiology of the body-cum-brain–a matter of organs, tissues, and cells, and the electrical and chemical changes that occur within them. The other is a group of three sciences concerned with the variation and selection that determine the condition of that body-cum-brain at any moment: the natural selection of the behavior of species (ethology), the operant conditioning of the behavior of the individual (behavior analysis), and the evolution of the social environments that prime operant behavior and greatly expand its range (a part of anthropology). The three could be said to be related in this way: Physiology studies the product of which the sciences of variation and selection study the production. The body works *as* it does because of the laws of physics and chemistry; it does *what* it does because of its exposure to contingencies of variation and selection. Physiology tells us *how* the body works; the sciences of variation and selection tell us *why* it is a body that works that way.

The two sciences observe very different causal principles. The body-cum-brain obeys the laws of physics and chemistry. It has no freedom and makes no choices. No other vision of "man a machine" (in this case a biochemical machine) has ever been so well supported. Some brain scientists have argued that the brain must have structural features that allow for freedom of choice, creativity, and the like, but in doing so they argue from what the brain does rather than from its structure. It has also been said that variation and selection may occur in the brain, but although the brain, like any other part of the body, undergoes variations, the selecting contingencies are in the environment.

The more we know about the body-cum-brain as a biochemical machine, the less interesting it becomes in its bearing on behavior. If there is freedom, it is to be found in the randomness of variations. If new forms of behavior are created they are created by selection. The faults in variation and selection are a source of fascinating problems. We must adapt to new situations, resolve conflicts, find quick solutions. A lawful biochemical structure does nothing of the sort.

Computer simulations of human behavior are electronic machines designed to behave as the biochemical machine of the body behaves. We know how they were designed and

built, and hence we ask no questions about origin. For the same reason, however, simulations are of no particular interest to behavior analysts. The interesting things in life come from the vagaries of variation and selection, in the construction of the machine.

Behavior analysis is the only one of the three sciences of variation and selection to be studied at length in the laboratory. Ethologists observe behavior in the field and reconstruct evolution from evidence that survives from earlier times. Ethology is supported by a laboratory science, genetics, but no one has yet produced a new species with a repertoire of innate behavior under laboratory conditions. The evolution of a culture is also primarily a matter of inferences from history. It is speed that makes the difference; only operant conditioning occurs quickly enough to be observed from beginning to end. For the same reason it is the only one of the three sciences to be much used for practical purposes in daily life.

It is therefore hard to understand why operant conditioning has not attracted more attention. The role of variation and selection in the behavior of the individual is often simply ignored. Sociobiology, for example, leaps from socio- to bio-, passing over the linking individual. Many of the psychologists who have studied behavior have also neglected variation and selection. Thorndike's Law of Effect came close, but his experiment suggested that variations were trials and consequences errors. Watson, Lashley, and Hull appealed to habit formation and stimulus and response. Tolman's purpose, like goal orientation or subjective expected utility, projected copies of past consequences into the future as attractions that seemed to pull behavior.

Behavior analysis is the youngest of the three sciences (theories of natural selection and the evolution of cultures dating from the middle of the 19th century and behavior analysis only from the end of the first third of the 20th), but immaturity will not explain why it has so often been neglected. A better explanation may be that its field had been occupied for so long by that extraordinarily intriguing theory of an internal originating mind or self.

We do not speak the languages of brain science and behavior analysis in our daily lives. We cannot see the brain and we know very little about the history of variation and selection responsible for a given instance of behavior. Instead, we use a language that came into existence long before there were philosophers or scientists of any kind. It is properly called a vernacular. The word means, as its root meant for the Romans, the language of the household, of daily life. We all speak it. It is the language of newspapers, magazines, books, radio, and television. When speaking of the behavior of the individual, it is the language of behavioral scientists–psychologists, sociologists, anthropologists, political scientists, and economists. William James wrote *Principles of Psychology* in the vernacular. Behaviorists speak it in their daily lives (and young behaviorists must learn to do so without embarrassment).

The vernacular refers to many feelings and states of mind. In English, for example, we say that we do what we *feel* like doing or what we *need* to do to *satisfy* our desires. We say that we are *hungry* and are *thinking* of getting something to eat. It is easy to suppose that the references are to an initiating mind, but, as we have seen, the useful allusions are

to prior contingencies of selection or to the beginnings of action. From "I'm hungry" we infer that a person has not eaten for some time and will probably eat when food is available. From "I am thinking of getting something to eat" we infer a probability of doing something that will make food available.

Through the use of the vernacular with its allusions to personal history and probability of action, psychology has emerged as an effective, essential, and highly respected profession. The attempt to use the apparent references to an initiating mind and to convert the vernacular into the language of a science was, however, a mistake. Watson and other early behaviorists thought the mistake lay in using introspection. How well could feelings be felt or mental processes seen? Anticipating logical positivism, they argued that an event seen by only one person had no place in a science. The problem was not introspection, however. It was the initiating self or mind to which introspection seemed to gain access.

In face-to-face contact with another person, references to an initiating self are unavoidable. There is a 'you,' and there is an 'I.' I see what 'you' do and hear what 'you' say and you see what 'I' do and hear what 'I' say. We do not see the histories of selection responsible for what is done and therefore infer an internal origination, but the successful use of the vernacular in the practice of psychology offers no support for its use in a science. In a scientific analysis, histories of variation and selection play the role of the initiator. There is no place in a scientific analysis of behavior for a mind or self.

What, then, are we to make of the fact that for 100 years psychologists have tried to build just such a science of mind? What about the brilliant analyses that have been made of intelligence or the claims for the value of the concept of subjective expected utility or the equations that have been written to describe psychological space? Have these been parts of a search for something that does not exist? It appears that we must say so, but all is not lost. Intelligence, never introspectible, is clearly an inference from the behavior sampled in intelligence tests, and an analysis of different kinds of intelligence tests, and an analysis of different kinds of behavior. Expectation, another kind of "spection," cannot possibly mean seeing the future and must be the product of past contingencies of reinforcement. Utility means usefulness or use, the act or means of doing something in such a way that consequences follow. Psychological space is real space as it enters into the control of contingencies of reinforcement; at issue is the extent to which a stimulus present when a response is reinforced generalizes in such a way that similar stimuli that were not present exert control. In short, psychologists have unwittingly been analyzing contingencies of reinforcement, the very contingencies responsible for the behavior mistakenly attributed to an internal originator.

But what about the illustrious philosophers who throughout the centuries have tried to follow the injunction of the Delphic Oracle and to know themselves through introspection? Is there a similar justification or have they been uselessly pursuing a will-o'-the-wisp? To say so would seem little short of arrogance if there were not an illuminating parallel. Equally illustrious men and women have searched much longer and with greater dedication for another Creator, spelled this time with a capital 'C,' whose

reported achievements are also being questioned by science. It was Darwin, of course, who made the difference. It holds for the origin of behavior as well as for the origin of species. After almost a century and a half, evolution is still not widely understood. It is vigorously opposed by defenders of a creator. As a result, it is still impossible to teach biology properly in many American schools. A creation science has been proposed to be taught in its place. The role of variation and selection in the behavior of the individual suffers from the same opposition. Cognitive science is the creation science of psychology, as it struggles to maintain the position of a mind or self.

The history of psychology is informative. It began, 100 years ago, with an introspective search for mind. Watson attacked introspection in his behavioristic manifesto of 1913, and for that or other reasons introspection was essentially abandoned. Behaviorists turned to the study of behavior for its own sake, and nonbehavioristic psychologists turned to the behavior of teachers, students, therapists, clients, children growing older year by year, people in groups, and so on.

Cognitive psychologists tried to restore the status quo. Behaviorism, they declared, was dead. They could not have meant that psychologists were no longer studying behavior, of animals in laboratories and of teachers, students, therapists, clients, and so on. What they hoped was dead was the appeal to selection by consequences in the explanation of behavior. The mind or, failing that, the brain must be restored to its rightful position.

Because of its similarity to the vernacular, cognitive psychology was easy to understand and the so-called cognitive revolution was for a time successful. That may have accelerated the speed with which behavior analysts drew away from the psychological establishment, founding their own associations, holding their own meetings, publishing their own journals. They were accused of building their own ghetto, but they were simply accepting the fact that they had little to gain from the study of a creative mind.

Cognitive psychology was left as the scientific companion of a profession and as the scientific underpinning of educational, clinical, developmental, social, and many other fields of psychology. The help it has given them has not been conspicuous. A version of the vernacular refined for the study of mental life is scarcely more helpful than the lay version, especially when theory began to replace introspection. Much more useful would have been behavior analysis. It would have helped in two ways, by clarifying the contingencies of reinforcement to which the vernacular alludes, and by making it possible to design better environments–personal environments that would solve existing problems and larger environments or cultures in which there would be fewer problems. A better understanding of variation and selection will mean a more successful profession, but whether behavior analysis will be called psychology is a matter for the future to decide.