THE END OF THE MIND-BODY PROBLEM

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In the history of Western thought there have been many problems that when first formulated caught the attention of the best minds and continued to receive attention for decades, even centuries. Strictly speaking, these problems have never been solved, but for one reason or another, the lack of a solution is no longer troublesome. The historical or intellectual context in which the problems were first defined and in which they later flourished gradually changed. The problems no longer appear as obstacles which must be overcome before any further progress can be made. The problems remain intelligible as problems but they are no longer relevant.

For example, such problems as action at a distance, or whether essence precedes existence, the exact nature of substance, or whether an omnipotent being can create an immovable object, although never solved, are problems which are clearly remote from our current concerns. My contention in this paper will be that it is high time to add the mind-body problem to the list of unsolved philosophical questions which are of only, or primarily of historical interest.

The argument here must walk a narrow line. There are questions once the province of philosophy which have been "solved" by empirical or rational means. For the Greek atomists, perception was a matter of philosophical speculation. Many of the problems that arose from their philosophical speculations have since been "answered" by more recent developments in the "empirical" sciences. In the rational sciences, problems such as the justification of arithmetic reasoning have been "solved" by the work of Russell and Whitehead, among others.

At the other extreme are questions which, depending on how one chooses to regard them, are either perennial questions, or questions which are in principle unanswerable and which a good positivist would have dismissed at once as meaningless. For example, such questions as, "What ought to be done?" or "What is justice?" admit of no final answers, but they are raised anew by each generation in one form or another, and answered more or less satisfactorily for the time.

The question we are concerned with here is of a kind that lies between those problems which have been put aside and those which are perennial. Once of great interest because it presented a roadblock to inquiry, it remains unsolved in anything like its original form, but is no longer taken seriously as an obstacle to inquiry. The mind-body problem is no longer an important philosophical issue.

To some, such a claim may seem simply false. After all, Ryle's *Concept of Mind* appeared less than forty years ago--not very long as far as philosophical problems are concerned. Those who think that the mind-body problem is still a living issue might argue that the terminology has changed since Ryle's day, but the literature related to the problem continues to grow significantly. No one talks of substance anymore, but "behaviorism," "identity theory," "functionalism," and "intentionality," are current and familiar terms. Behind them, though, is the mind-body problem, still very much alive.

The evidence for the continuing vitality of the mind-body problem includes such obvious items as an article in the January 1981 *Scientific American* by Jerry A. Fodor called "The Mind-Body Problem" (pp. 114-123), and an article by Richard Rorty in *Synthese 53* (1982) on the "Contemporary Philosophy of Mind" which opens with a discussion of the same problem. Longer works focusing on the problem with various perspectives would include constributions such as *Beyond Reductionism*, edited by Arthur Koestler and J. R. Smythies in 1969, and the 1966 volume edited by Sir John Eccles, *Brain and Conscious Experience*, and Stanley L. Jaki's 1969 book, *Brain, Mind, and Computers*.

In the face of the volume of literature being produced, why would anyone claim that the mind-body problem is passé? There are several reasons. First, relatively few of the people who write about the problem of today conceive of the subject in the terms of the traditional mind-body problem. That problem has been dropped in favor of another one which can be called the mind-machine problem, but which is often confused with the mind-body problem. Finally, some recent work in control theory suggests that the solution to the second, the mind-machine problem, may be at hand.

Virtually no one presently writing on the subject conceives of the mind-body problem in anything like the terms in which it was initially formulated. The view that mind and body are two entirely different substances has fallen out of favor. This may be due in part to the difficulties that were apparent from the very beginning, and which we recite to our freshmen classes: the problems about causal interaction and the concept of substance itself, and the problem about the conservation of energy. But it is also partly the result of the gradual extension of empirical methods. As Fodor notes in the *Scientific American* article, "most philosophers now agree that no argument has successfully demonstrated why mind-body causation should not be regarded as a species of physical causation." (p. 114) Rorty goes further, dismissing the notion of mind as a "blur which we would be better of without. . . " (p. 325) According to Rorty, on close examination the notion of "the mind" is an empty one. "The reason there is nothing there," he claims, "is that the distinction between mind and body is entirely parasitical upon two other distinctions: the distinction between knowers and non-knowers and the distinctions between the morally relevant and the morally irrelevant." Progress in the philosophy of mind began, "only when people recognized that they were being misled by the very term 'mind.'"

John R. Searle, whose 1980 essay, "Minds, Brains, and Programs," is strongly critical of some of the claims of strong A.I., and whose extended defense of the reality of intentional states might be supposed to put him among the defenders of a more traditional mind-body distinction, has gone to considerable lengths to separate himself from such a view. In the epilogue to his recent book, *Intentionality*, (1983) Searle says the following:

> On my account, mental states are as real as any other biological phenomena, as real as lactation, photosnythesis, mitosis, or digestion. Like these other phenomena, mental states are caused by biological phenomena and in turn cause other biological phenomena. If one wanted a label one might call such a view "biological naturalism". . . Mental states are *both caused by the operations of the brain and realized in the structure of the brain* (and the rest of the central nervous system). (p. 264, 265)

Clearly, if mind is not a separate substance, but is regarded as continuous with the rest of the physical universe, then the mind-body problem in the traditional Cartesian sense is no longer an issue. In retrospect, it is difficult to see how the traditional mind-body problem ever attained the degree of philosophical respectability it so long enjoyed. The expression "immaterial substance" appears self-contradictory, and it does not take a Hume or a Ryle to wonder whether something that is neither here nor there is anywhere at all. But this is too easy. If mind as a separate substance is no longer an issue, why the continuing fuss over the nature of mind?

The answer, in reality quite complex, can be simply stated: what used to be the mind-body problem has now become something quite different--the mind--machine problem. As Fodor says in the article mentioned above, "Dualism is incompatible with the practice of working psychologists," who frequently apply the experimental methods of the physical sciences to the study of the mind. Those methods require, among other things, a model or paradigm to provide an explanatory framework and to suggest lines of inquiry. It is especially desirable that the model lend itself to formal interpretation. The fact that computers have been developed to perform many of the tasks once believed to require a mind has made the computer an irresistably tempting model for the cognitive sciences.

The mind-machine dispute draws its energy from at least two important sources. One source is quasi-philosophical, drawing as it does on the tendency of many non-specialists to confuse the mind-machine debate with the earlier mind-matter controvery. The second source is entirely respectable. It arises quite naturally when we ask ourselves whether the computer is an accurate and adequate model for use in framing an explanation of intelligence. People who draw primarily on the first source often complain that any attempt to explain human traits in formal (e.g. "mechanical") terms is "reductionistic." Those who draw upon the second are likely to point to such things as intentionality or "raw feels," that is, pure qualitative states, as being in principle beyond the adequacy of the computer model to explain. Unfortunately, they also sometimes use the term "reductionist" to characterize their opponents who doubt the ultimate nature of intentionality or raw feels, or who think that with sufficient ingenuity the machine model will prove adequate.

Although I cannot prove it, I suspect that Descartes was himself the first reductionist in the latter sense of insisting on a certain model in spite of its obvious inadequacies. In so doing he also associated "reductionism" with the reactions of pure horrror that often still attend its use. I am referring of course to Decartes' experiments on animals. He was convinced that only humans possess minds. Since pains are mental, only humans can suffer pain. Animals he believed to be automata, devoid of thoughts or feelings. On occassion he dissected them alive. Their struggles and cries he interpreted as mere mechanical responses to the probings of his knife. It is perhaps a vision of something like this happening to humans that leads some people to deny the possibility of any adequate formal explanation of intelligence. But of course the moral of the story works the other way as well. I think it is Dennett who cautions us to think twice before we kick a robot.

In "Minds, Brains, and Programs" Searle distinguishes between two possible views of artificial intelligence (AI). Weak AI regards the computer as a powerful tool for investigating human cognitive capacities. Strong AI holds that "the appropriately programmed computer really is a mind in the sense that computers given the right programs can be literally said to *understand* and have other cognitive states. . . The programs are not mere tools that enable us to test psychological explanations; rather the programs are themselves the explanations" (in Haugeland, 1981 pp. 282-3). Searle has no difficulty with the weak claim, but he adamently rejects the strong claim.

This is not the place to rehearse his arguments in detail. But the thesis I have presented seems to require some defense of the strong AI position. I have argued that the mind-body problem is no longer a problem for philosophy because (1) mind is no longer regarded as a discrete substance, and (2) that one important reason for no longer regarding mind as a discrete substance is the ability of computer models to simulate and perhaps, to duplicate phenomena previously attributed to mind-substance, and (3) that recent work in control theory shows that (2) is entirely possible. If, in fact, control theory does what I claim, why not put Searle aside and let control theory show that (2) is the case?

Well, for at least two reasons: (1) control theory is an engineering approach and does not deal directly with issues such as intentionality, and (2) there are elements in Searle's account which support my thesis.

Beginning with the second reason, Searle replies to the question, "Could a machine think?" by saying:

> My own view is that only a machine could think, and indeed only very special kinds of machines, namely brains and machines that had the *same causal powers* as brains. . . .whatever else intentionality is, it is a biological phenomenon and it is as likely to as causally dependent on the specific biochemistry of its origins as lactation, photosynthesis or any other biological phenomena. No one would suppose that we could produce milk and sugar by running a computer simulation of the formal sequences of lactation and photosynthesis; but where the mind is concerned, many people are willing to believe in such a miracle, because of a deep and abiding dualism; the mind they suppose is a matter of formal processes and is independent of specific material causes in the way that milk and sugar are not.

It appears from the foregoing quotation that Searle agrees with the nineteenth century materialists who maintained that "the brain secretes thought the way the liver secretes bile." At any rate, as a thorough-going biological process, thought is very much a part of the causal order of things.

But this passage among others in the text present a difficulty that is worth noting. Searle grants that the brain is a machine, albeit a special kind of machine. It is part of the received wisdom that a machine may be represented as a formal system, and, conversely, that any formal system may represented as a machine. The actual character of the representations may vary widely as long as the formal or mechanical relations are preserved. I take this to be an important premise of what Fodor (198lb) calls "Turing machine functionalism," a view which Searle rejects as inadequate.

Searle answers affirmatively the question "Could a man-made machine think?" If it were possible to produce artificially a machine with a nervous system sufficiently like our own, it would be possible to make a machine that thinks. "If you can exactly

duplicate the causes, you could duplicate the effects." Searle goes on to concede that it might be done "using chemical principles different from those human beings use." Whether it can be done, he regards as an empirical question.

As we have seen, Searle objects strongly to the idea that thinking could be instantiated in a variety of ways in the same manner as a formal program. "Stones, toilet paper, wind and water pipes," he tells us, "are the wrong kind of stuff to have intentionality in the first palce (only something that has the same causal power as brains can have intentionality). . . ." (in Haugeland, p. 301).

The difficulty I wish to note arises when one tries to reconcile the preceding claims. Searle wants to maintain all of the following: mental states are biological phenomena produced by the brain in a manner analogous to the way milk is produced by lactation or sugar by photosynthesis. Mental states are causally dependent on the brain, or on some mechanism which is the causal equivalent of the brain. Mental states cannot be formalized. Lastly, it is possible that mental states could be replicated in an unfamiliar chemistry.

The most succinct way to characterize the difficutly in reconciling all of these statements is to recast them in classical terms: First, Searle claims that the brain is the material cause of thought, and as such is essential to the existence of thought. Second, there is no necessary formal cause of thought, and third, the brain may not be entirely essential either.

If mental states can be replicatd in an unfamiliar chemistry, it would apper that there is no necessary connection between brains and mental states. It follows that the criterion for saying of a machine that it has the same causal powers as a brain would be that it produces the same effects, and that would beg the question.

Moreover, the rule "same causes, same effects," must be a formal relation since the material cause would be the same only in the case of the simplest machine. For example, one in which the same lever moved the same cog wheel repeatedly. But in more complex cases where "raw material" is converted into a finished "product" as, for example, in lactation or photosynthesis, the material cause could not be the same in two successive cases. "Same" here must indicate a formal relation, but that is precisely what Searle wishes to deny. It seems then that his position is not a coherent one.

I realize that this is a caricature of arguments that have been well rehearsed elsewhere. But the third and final step in the logical progression of this paper requires that intentionality be regarded as a formal characteristic that can be replicated in systems other than brains, and Searle-like objections are often raised to such a view.

Control theory (for some reason everyone avoids "cybernetics") has been with us a bit longer than AI. Its connections with engineering applications are more obvious than are its connections with mathematics, psychology, philosophy, or even computer science. Perhaps because of its closer association with problems of application, control theory has tended to develop on its own without much attention in the literature of the other disciplines. In these last paragraphs, I would like to point to two works, both of which claim to have developed a mathematically rigorous mechanical model of intelligent behavior.

The first is a book by W. Ross Ashby called *Design for A Brain.* First published in 1952 and revised in 1960, Ashby's book addresses the problem of adaptive behavior. His work is especially interesting because he takes a "nuts-and-bolts" approach at a time when the nuts and bolts of control mechanisms were coils, commutators and bar magnets. His mathematical model of adaptive behavior is grounded on an extraordinarily homely table-top device that instantiates what Ashby calls an "ultra-stable" system. He named the device a 'homeostat' without, I think, intending any irony.

His elementary device can exhibit goal-directed behavior. It provides a causal explanation for the kind of intentional behavior we might attribute to a cat that locates and moves to areas of sun or shade "because it wants to be warmer or cooler". Ashby shows how this kind of selective behavior is amplified as the system becomes more complex. He takes us from a rigorous explanation of the homeostat to a specualitive explanation of biological evolution. The transition appears seamless, at least to a non-mathematician. (The book was first brought to my attention by Prof. Stuart Kaufman who recommended it as an introduction to his own on-going research in genetic algorithms.)

The second work I would like to point out is by James S. Albus. Dr. Albus's background is in engineering. He worked for NASA, designing satellite optical and electronic systems and, according to the dust jacket of his book, he is director of the National Bureau of Standard's robotics research laboratory. His book, *Brains, Behavior*, and *Robotics*, published by BYTE in 1981, assumes that:

> The precursor of intelligence is behavior control; that abstract thought arises out of the sophisticated computing mechanisms designed to generate and control complex behavior; and that first comes the manipulation of objects, then the manipulation of tokens that represent the objects, and finally, the manipulation of symbols represent the tokens. (p. 5)

The first part of Albus's work is an analysis of the physiology of perception and the central nervous system. Like Ashby, he insists on a rigorous mathematical interpretation of the functions he analyzes. However, Albus has the advantage of a more sophicated notation, and well-worked out techniques for representing control procedures as vectors or trajectories in "hyperspace."

This is not the place to attempt a detailed description of Albus's work. But another quotation may suggest its tone and scope:

> Every robot needs some sort of highest level evaluator and goal selector function in order to exhibit any sort of autonomous behavior. At what point in the spectrum of multidimension sophisitication we choose to dignify an evalutor function with the term emotion or goal-selection function with will, is not clear. What is clear is that simple approximations to the functions computed by the emotions and the will can be modeled by CMAC (Cerebellar Model Arithmetic Computer) G and H function operating on input vectors and computing output vectors. The degree of sophistication and complexity of the modelling is limited only by the ingenuity and resources of the modeler (214-215).

Albus goes on to discuss the modeling of belief and faith, imagination and creativity in the chapters that follow this passage. Readers familiar with the very cautious way these problems are approached in the philosohical literature may react at first by saying that Albus just does not understand the nature of these problems. This may indeed be a case of an engineer rushing in where philosophers fear to tread. After all, a model may simulate behavior without explaining it. But there is a hint of exasperation from the other side as well.

In the March 1986 issue of *Behavioral and Brain Sciences* (vol 9, No. 1) Kenneth Sayre has a target article on "Intentionality Information Processing." In the open peer commentary, William T. Powers, a control theorist, objects that Sayre overlooks an obvious engineering solution to the problem of intentionality. He describes the solution and goes on to observe:

> The result is a standard arrangement for a physicallly realizable control system that varies its actions to make the "object" approach the "needed" state and remain there despite disturbances. The signal representing the "needed" state is identically one intention regarding that object. The problem is solved. We could build such a system (and have done so hundreds of thousands of times over the past 40 years). This is no metaphor.

Sayre's response to this criticism is, predictably, that Power's doesn't understand the problem, mistaking "intentional" for purposive rather than taking it in the sense intended, i.e. "being about." Still the engineers and philosophers are at least talking to each other, and that is always a hopeful sign. It would be interesting if the question "Can Machines Think?" proves to be a historical parallel to the question "Can Machines Fly?"