part of intellectual life and discourse. That is an interesting topic, one well worth pursuing, but I will not undertake this project here, apart from a few comments later on. If we were to pursue it, we would, I think, find ourselves in the domain of the second series of lectures that I have been giving here in Managua (see preface).

Let us return to Descartes's problem, the problem of how language is used in the normal creative fashion, as I described earlier. Notice that I am not concerned here with use of language that has true aesthetic value, with what we call true creativity, as in the work of a fine poet or novelist or an exceptional stylist. Rather, what I have in mind is something more mundane: the ordinary use of language in everyday life, with its distinctive properties of novelty, freedom from control by external stimuli and inner states, coherence and appropriateness to situations, and its capacity to evoke appropriate thoughts in the listener. The history of this problem is of some interest.

The issue arose in the context of the mind-body problem or, more specifically, what was later called "the problem of other minds." Descartes developed a mechanical theory of the universe, a major contribution to the physical sciences of his day. He convinced himself that virtually everything that takes place in the universe of our experience can be explained in terms of his mechanical conceptions, in terms of bodies that interact through direct contact—a "contact mechanics" we might call it. In these terms he sought to explain everything from the motion of the heavenly bodies to the behavior of animals and much of the behavior and perception of humans as well. He apparently felt that he had largely succeeded in this task and that all that remained was to fill in the details in his overarching conceptions. But not all our experience could be accommodated within this framework. The most striking exception, he suggested, was what I called earlier the creative aspect of language use. This falls entirely beyond the conceptions of mechanics, so Descartes argued.

Through introspection each person can perceive that he or she has a mind, which is quite distinct in its properties from the bodies that constitute the physical world. Suppose now that I want to determine whether another creature also has a mind. The Cartesians proposed that in this case, one should undertake a certain experimental program, designed to determine whether this organism exhibits distinctive features of human behavior, the creative aspect of language use being the most striking example and the one most readily investigated. If the organs of a parrot are placed in a certain configuration under given stimulus conditions, the Cartesians argued, what the parrot "says" is strictly determined (or it may be random). But this is not true of an organism with a mind like ours, and experiment should be able to reveal this fact. Many specific tests were proposed. If these tests convince us that the organism exhibits the creative aspect of language use, then it would be unreasonable to doubt that it has a mind like ours.

More generally, as I mentioned earlier, the problem is that a "machine" is compelled to act in a certain way under fixed environmental conditions and with its parts arranged in a certain way, while a human under these circumstances is only "incited and inclined" to behave in this fashion. The human may often, or even always, do what it is incited or inclined to do, but each of us knows from introspection that we have a choice in the matter over a large range. And we can determine by experiment that this is true of other humans as well. The difference between being compelled, and merely being incited and inclined, is a crucial one, the Cartesians concluded—and quite accurately. The distinction would remain crucial even if it were not manifested in actual behavior. If it
were not, one could give an accurate description of human behavior in mechanical terms, but it would not be a true characterization of essential features of the human being and of the sources of human behavior.

To account for the facts about the world that surpass the possibilities of mechanical explanation, it is necessary to find some extramechanical principle, what we might call a creative principle. This principle, the Cartesians argued, belongs to mind, a "second substance" entirely separate from body, which is subject to mechanical explanation. Descartes himself wrote a lengthy treatise in which he laid out the principles of the mechanical world. It was to include a final volume devoted to the mind, but allegedly Descartes destroyed this part of his comprehensive work when he learned of the fate of Galileo before the Inquisition, which compelled him to renounce his beliefs about the physical world. In his preserved writings Descartes suggests that we may not "have intelligence enough" to discover the nature of mind, although "we are so conscious of the liberty and indifference [absence of strict determination] which exists in us that there is nothing that we comprehend more clearly and perfectly," and "it would be absurd to doubt that of which we inwardly experience and perceive as existing within ourselves just because we do not comprehend a matter which from its nature we know to be incomprehensible."

For the Cartesians, mind is a single substance, distinct from body. Much of the speculation and debate of the period dealt with the question of how these two substances interact—how the decisions of the mind might lead to actions of the body, for example. There is no such thing as an "animal mind" because animals are merely machines, subject to mechanical explanation. There is no possibility in this conception of a human mind as distinct from other kinds of mind, or of differently constituted human minds. A creature is either human or it is not; there are no "degrees of humanness," no essential variation among humans apart from superficial physical aspects. As the philosopher Harry Bracken has pointed out, racism or sexism is a logical impossibility under this dualist conception.

The mind, Descartes held, is a "universal instrument which can serve for all contingencies." Notice that this claim is not consistent with his belief that we may not have intelligence enough to discover the nature of mind. The conclusion that the mind has intrinsic limits is surely the correct one; the idea that it is a "universal instrument" might be regarded as one of the ancestors of the widely held belief that the human language faculty, and other cognitive systems, all fall within the bounds of "general learning mechanisms" that are applicable to every intellectual task.

The Cartesian tests for the existence of other minds have been resurrected in a new guise in recent years, most notably by the British mathematician Alan Turing, who devised what is now called the Turing test, to determine whether a machine (for example, a programmed computer) exhibits intelligent behavior. We apply the Turing test to a device by submitting to it a series of questions and asking whether its responses can deceive a human observer who will conclude that the responses are being offered by another human being. In Cartesian terms this would be a test of whether the device has a mind like ours.

How should we respond today to these ideas? Descartes's argument is far from absurd and cannot easily be discounted. If indeed the principles of mechanics do not suffice to explain certain phenomena, then we must appeal to something beyond these principles to explain them. So far, that is familiar science. We need not accept the Cartesian metaphysics, which required postulation of a "second substance," a "thinking substance" (res cogi-
tans), undifferentiated, without components or interacting subparts, the seat of consciousness that accounts for the "unity of consciousness" and the immortality of the soul. All of this is entirely unsatisfying and provides no real answer to any of the problems raised. The problems themselves, however, are quite serious ones, and much as Descartes held, it would be absurd to deny the facts that are apparent to us merely because we can conceive of no way of solving them.

It is interesting to observe the fate of the Cartesian version of the mind-body problem and the problem of the existence of other minds. The mind-body problem can be posed sensibly only insofar as we have a definite conception of body. If we have no such definite and fixed conception, we cannot ask whether some phenomena fall beyond its range. The Cartesians offered a fairly definite conception of body in terms of their contact mechanics, which in many respects reflects commonsense understanding. Therefore they could sensibly formulate the mind-body problem and the problem of other minds. There was important work attempting to develop the concept of mind further, including studies by British Neoplatonists of the seventeenth century that explored the categories and principles of perception and cognition along lines that were later extended by Kant and that were rediscovered, independently, in twentieth-century gestalt psychology.

Another line of development was the "general and philosophical grammar" (in our terms, scientific grammar) of the seventeenth, eighteenth, and early nineteenth centuries, which was much influenced by Cartesian conceptions, particularly in the early period. These inquiries into universal grammar sought to lay bare the general principles of language. These were regarded as not essentially different from the general principles of thought, so that language is "a mirror of mind," in the conventional phrase. For various reasons—some good, some not—these inquiries were disparaged and abandoned for a century, to be resurrected, again independently, a generation ago, though in quite different terms and without recourse to any dualist assumptions.

It is also interesting to see how the Cartesian conception of body and mind entered social thought, most strikingly in the libertarian ideas of Jean-Jacques Rousseau, which were based on strictly Cartesian conceptions of body and mind. Because humans, possessing minds, are crucially distinct from machines (including animals), so Rousseau argued, and because the properties of mind crucially surpass mechanical determinacy, therefore any infringement on human freedom is illegitimate and must be confronted and overcome. Although the later development of such thinking abandoned the Cartesian framework, its origins lie in significant measure in these classical ideas.

The Cartesian conception of a second substance was generally abandoned in later years, but it is important to recognize that it was not the theory of mind that was refuted (one might argue that it was hardly clear enough to be confirmed or refuted). Rather, the Cartesian concept of body was refuted by seventeenth-century physics, particularly in the work of Isaac Newton, which laid the foundations for modern science. Newton demonstrated that the motions of the heavenly bodies could not be explained by the principles of Descartes's contact mechanics, so that the Cartesian concept of body must be abandoned. In the Newtonian framework there is a "force" that one body exerts on another, without contact between them, a kind of "action at a distance." Whatever this force may be, it does not fall within the Cartesian framework of contact mechanics. Newton himself found this conclusion unsatisfying. He sometimes referred to gravitational force as "occult" and suggested that his theory gave only a mathematical description of events in the physical world,
not a true "philosophical" (in more modern terminology, "scientific") explanation of these events. Until the late nineteenth century it was still widely held that a true explanation must be framed somehow in mechanical or quasi-mechanical terms. Others, notably the chemist and philosopher Joseph Priestley, argued that bodies themselves possess capacities that go beyond the limits of contact mechanics, specifically the property of attracting other bodies, but perhaps far more. Without pursuing subsequent developments further, the general conclusion is that the Cartesian concept of body was found to be untenable.

What is the concept of body that finally emerged? The answer is that there is no clear and definite concept of body. If the best theory of the material world that we can construct includes a variety of forces, particles that have no mass, and other entities that would have been offensive to the "scientific common sense" of the Cartesianians, then so be it: We conclude that these are properties of the physical world, the world of body. The conclusions are tentative, as befits empirical hypotheses, but are not subject to criticism because they transcend some a priori conception of body. There is no longer any definite conception of body. Rather, the material world is whatever we discover it to be, with whatever properties it must be assumed to have for the purposes of explanatory theory. Any intelligible theory that offers genuine explanations and that can be assimilated to the core notions of physics becomes part of the theory of the material world, part of our account of body. If we have such a theory in some domain, we seek to assimilate it to the core notions of physics, perhaps modifying these notions as we carry out this enterprise. In the study of human psychology, if we develop a theory of some cognitive faculty (the language faculty, for example) and find that this faculty has certain properties, we seek to discover the mechanisms of the brain that exhibit these properties and to account for them in the terms of the physical sciences—keeping open the possibility that the concepts of the physical sciences might have to be modified, just as the concepts of Cartesian contact mechanics had to be modified to account for the motion of the heavenly bodies, and as has happened repeatedly in the evolution of the natural sciences since Newton's day.

In short, there is no definite concept of body. Rather, there is a material world, the properties of which are to be discovered, with no a priori demarcation of what will count as "body." The mind-body problem can therefore not even be formulated. The problem cannot be solved, because there is no clear way to state it. Unless someone proposes a definite concept of body, we cannot ask whether some phenomena exceed its bounds. Similarly, we cannot pose the problem of other minds. We can, and I think should, continue to use mentalistic terminology, as I have done throughout in discussing mental representations and operations that form and modify them in mental computation. But we do not see ourselves as investigating the properties of some "second substance," something crucially distinct from body that interacts with body in some mysterious way, perhaps through divine intervention. Rather, we are studying the properties of the material world at a level of abstraction at which we believe, rightly or wrongly, that a genuine explanatory theory can be constructed, a theory that provides genuine insight into the nature of the phenomena that concern us. These phenomena, in fact, are of real intellectual interest not so much in themselves but in the avenue that they provide for us to penetrate into the deeper workings of the mind. Ultimately, we hope to assimilate this study to the mainstream of the natural sciences, much as the study of genes or of valence and the properties of the chemical elements was assimilated to more fundamental sciences.
We recognize, however, that, as in the past, it may turn out that these fundamental sciences must be modified or extended to provide foundations for the abstract theories of complex systems, such as the human mind.

Our task, then, is to discover genuine explanatory theories and to use these discoveries to facilitate inquiry into physical mechanisms with the properties outlined in these theories. Wherever this inquiry leads, it will be within the domain of “body.” Or more accurately, we simply abandon the whole conception of body as possibly distinct from something else and use the methods of rational inquiry to learn as much as we can about the world—what we call the material world, whatever exotic properties it turns out to have.

The mind-body problem remains the subject of much controversy, debate, and speculation, and in this regard the problem is still very much alive. But the discussion seems to me incoherent in fundamental respects. Unlike the Cartesians, we have no definite concept of body. It is therefore quite unclear how we can even ask whether some phenomena lie beyond the range of the study of body, falling within the separate study of mind.

Recall the logic of Descartes’s argument for the existence of a second substance, res cogitans. Having defined “body” in terms of contact mechanics, he argued that certain phenomena lie beyond its domain, so that some new principle was required; given his metaphysics, a second substance must be postulated. The logic is essentially sound; it is, in fact, much like Newton’s, when he demonstrated the inadequacy of Cartesian contact mechanics for the explanation of the motion of the heavenly bodies so that a new principle, the principle of gravitational attraction, had to be postulated. The crucial difference between the Cartesian and the Newtonian enterprises was that the latter offered a genuine explanatory theory of the behavior of bodies, whereas the Cartesian theory offered no satis-

factory account of properties such the creative aspect of language use that lie beyond mechanical explanation in Descartes’s view. Therefore Newton’s conceptions came to be the “scientific common sense” of later generations of scientists, while Descartes’s fell by the wayside.

Returning now to Descartes’s problem, notice that it still stands, unresolved by these developments in the natural sciences. We still have no way to come to terms with what appears to be a fact, even an obvious fact: Our actions are free and undetermined, in that we need not do what we are “incited and inclined” to do; and if we do what we are incited and inclined to do, an element of free choice nevertheless enters. Despite much thought and often penetrating analysis, it seems to me that this problem still remains unsolved, much in the way Descartes formulated it. Why should this be so?

One possibility, of course, is that no one has yet thought of the right idea that will yield a solution to the problem. That is possible, but it is not the only possibility. Another possibility is the one suggested by Descartes: The problem escapes our intellectual grasp.

When we investigate other organisms, we discover that their capacities have a certain scope and certain limits. Thus a rat can do certain things very well. Suppose that we construct a radial maze, an experimental design consisting of a center with straight paths leading from it much like the spokes of a wheel. Suppose that at the end of each path there is a container with a single pellet of food. A rat placed in the center can quickly learn to obtain the food with maximal efficiency, running through each path only once. This remains true even if the device is rotated, leaving the food containers fixed, so that the rate has to traverse the same physical path more than once. This is no mean accomplishment; it requires rather sophisticated spatial concepts. On the other hand, rats apparently cannot learn to run mazes that involve sequential