

LECTURE TWO

Philosophic Problems in the Natural Sciences

In the first lecture, I tried to set forth the general structure and purpose of this course. I suspect you might want some further clarification to help clear up confusion. Now, since you've had time to gather some of your thoughts together, let me go on to explain what I was saying then. This will be for those who were here as well as those who were not.

We shall be dealing with problems of philosophy in this sequence of courses. In this, the first, we shall try to take our beginning in the problems of philosophy which come from the subject matter that is normally the subject matter of the natural sciences, discussing specifically the basic ideas of motion, space, time, and cause, on the supposition that *there are involved in all problems treated by the natural sciences certain philosophic problems distinct from the problems that are scientific or empirical in character but intimately interrelated.* I tried to explain last time what that was by pointing out that this involves a consideration of the nature of philosophy itself. Whether we engage in philosophy much of the time more consciously or whether we engage in it only part of the time unconsciously, we normally are committed to a philosophic approach which it's extremely difficult to shake. In fact, one of the chief purposes of the early meetings of this course—and, therefore, one of the reasons why I go on at length about the way in which any course begins—is to shake these ideas loose, to create a confusion which you will recognize may have *some relation to the confusion that you yourself could have.* This was an ancient function of philosophy. You'll recall that Socrates usually professed to have this preference; the torpedo fish simile pointed in this direction.¹ You take an idea which is commonly accepted and simple; you point out to the person who is doing this business, who has a reputation for doing it, that he does it well but he doesn't know what he's doing; and then you've started on the philosophic enterprise.

I tried to do that by using the set of terms that I shall use throughout the course. This is something different than what I usually do, but I thought this

time I'd try the device of telling you at the beginning what I'm doing. It may, however, be less clear what I'm doing as we go along, since I will say at each point that I'm merely doing the same thing. The terms are knowledge, the knowable—things or objects, if you wish—, the known, and the knower (see fig. 1). What I propose to do now is, first, review briefly what I did last time, indicating the way in which these terms would operate in talking about philosophy in general, and then go on to spend the better part of the lecture indicating the way in which they enter into such things as you might imagine were simple or something that we had learned about through the ages and that, therefore, with the progress of science and technology we could be sure about, namely, without their affecting our emotions.

Let me go to the question I suggested last time. The way in which you make your introduction to philosophy is from any ordinary situation. Suppose you were discussing in the serious part of a student's life, the part after class, what the relation is between the three general courses you take in college. What is the relation between the natural sciences, the social sciences, and the humanities? Or if this discussion or bull session were late enough, you probably would want to be more concrete: what is the relation between problems that you encounter when you talk about falling bodies and problems that you encounter when you talk about the operation of the law court and problems that you encounter when you talk about the structure of a poem, a poetic process (which I understand is a fashionable combination of words on the undergraduate level)? *How do you go about it? Obviously, you'd be in a discussion because you differed, and in all probability you would consider one or more—preferably not all of these approaches; in other words, two would be acceptable—set up by another approach.*

Let me begin with the man, your friend, who takes his beginning from the known. I will frequently use the device of giving you the first exposition in terms of what the Greeks said, not necessarily because the Greeks were clearer—although, in fact, this is frequently the case—but because I know them better than I know my contemporaries. This position, therefore, would be taken by Howard Aristotle. [L!] Howard would take the position that there are three sciences and they're all sciences. There are the theoretic sciences, the practical sciences, and the productive sciences. Their methods are different and their subject matters different, but to keep things clear let's call them all sciences. The reason I begin with Howard is that Howie always makes distinctions and his friends always collapse the distinctions; therefore, if you get his distinctions out first, you can see what his friends are talking about. It does not mean that he has any other peculiarity. Notice, he has a great advantage. Suppose you were to take even one of the things you were talking about, that is, the structure of a poem or the poetic process. It obviously belongs in the productive sciences—you can quote Howard's *Poetics* for that—but you can con-

sider the poem either theoretically or practically as well as under the productive sciences. For example, under the theoretic sciences, you can conduct elaborate experiments which would have to do with the nature of imaginative perception, sensitivity; you might even—and this would be much more modern—investigate processes of creativity, which is hot stuff. Or you might turn around and say, Well, let's leave the theoretic; let's consider it, instead, in the history of taste. That is, as cultures go along, there are different tastes every age; and this taste is formed by the environment, by the culture, by the people. Therefore, what you need to do is to consider the history of mankind and the formation of his various considerations. Or, finally, you might say, Let's take the artificial object, a poem, and analyze it; let's find out what its parts are, how it's constituted, its properties, and the rest.

Our friend has another friend who says, You know, the way in which you start in science is to begin with the nature of things. There are two processes that are involved: there are the cognitive processes and the emotive and persuasive processes, and you have science only when you deal with the cognitive. Therefore, there aren't three sciences; there is only natural science—I am giving you the standard word for theoretic—and you establish the natural science by showing the warrant for your statement, showing that it's objective. All other statements, all value statements, are not statements about the nature of things; they're statements about your feelings, your emotions, how you want other people to feel. Consequently, you will have only physical science, and physicalism is the position, for example, of Joseph Democritus. You know what is good because you like it. If you wanted to examine the reason why you like it, you can be scientific about that. But the good? It's merely your feelings, other people's feelings, what you can persuade them of, and the rest.

The third person we'll bring in is slightly ahead of Aristotle in time. Plato says, No, the way in which you get science is not by trying to reproduce the structure in things; you've got to climb up through the mathematical analyses until you reach a level at which you know what the basis of your mathematical procedure is. This is a dialectical process; and, therefore, at the top of all your more-or-less-arbitrary hypotheses on the mathematical level will be the idea of being, the idea of the good, or the idea of the one, and knowledge is always an approximation to this level. You will very seldom get to the very top, but without a knowledge of this structure, you get no science at all. Consequently, with respect to the question we're talking about, there isn't any difference between the falling body, the court of law, or a poem, except, of course, that some people don't treat them properly. What is justice or any other virtue? It's the same thing as knowledge. What is a poem? Well, unless you take the bad poems that the professional poets write—and they ought to be excluded from the state—it's the same as dialectic, too. Therefore, poetry, virtue, physics are all instances of dialectic. There's only one science, to be sure—Democritus

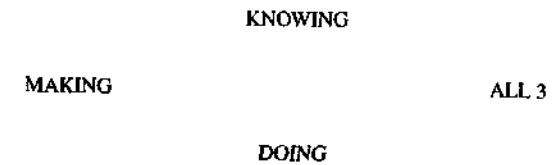


Fig. 3. *Four Kinds of Science.*

was right about this—but the science would apply equally to all three and not merely make physical science the only one.

Then, finally, there's another fellow, whose last name is Protagoras, who says, Well, look! You're all wrong, all of you! Plato is right, they are all one science; but there isn't any transcendental reality, there isn't any atomic base, and there aren't a lot of substances out there that we've got to fit our knowledge to. All knowledge is operational: it depends on what you do. Essentially, it's measurement, and in the measurement you can't leave the measurer out. As I said when I learned of quantum mechanics, man is the measure of all things. [L!] You can't make a separation of this sort; but, on the other hand, the sciences are all one.

Notice that we've gotten not only four different conceptions of philosophy but also four different conceptions of science. Bear in mind that I'm merely giving you the large, generic distinctions. Under each of these headings there will be more distinctions, and, therefore, the varieties of philosophy and the varieties of science will go on, potentially indefinite in differentiation. But these four headings will give you a notion of how the differentiation will occur.

Why should this be the case? Well, it's fairly simple. Howard makes the distinctions that will assist us in seeing them. According to Howard, there are three processes that are going on here: one is called the process of knowing, the next is the process of doing, and the final one is the process of making. And Howard argues that they are quite different (see fig. 3).² Even education in the three would be quite different. If you want a theoretic education, you learn it; if you want to get practical education, you habituate yourself; if you want to get poetic education in an art school, you produce things. And learning, practice, and production are quite different.

But suppose we take a look at what his friends would say. Let's go to Plato. According to Plato, since knowledge is the nature of things, the whole emphasis is on knowing; and knowing, therefore, is based on being. Doing and making have a function only if they are qualities of being. Consequently, we say to Howard, Forget your distinctions. Doing and doing well is knowledge. That's why Socrates, our master, said that virtue is knowledge. But making, likewise, is knowledge. That's why rhetoric is a mere art unless you go through the three stages that the *Phaedrus* points out, and then at the third stage you're in dialectic.

tic, which is good rhetoric because it's knowing. Consequently, everything is knowing.

Let's go down to Democritus. Well, being isn't knowing. Knowing is a process that atoms go through when they're very fine atoms, the atoms of the soul assembled in the human body which react in a particular way. What you need, therefore, is the distinction between the state of things which the atomic structure brings out and the state of things which is a reaction that man has. Notice—this is still Democritus—that what we begin with are sense impressions. Sense impressions don't give us knowledge, but out of our sense impressions we can work out the arguments which will tell us what the atoms are, though we never see the atoms, we never have those by sense experience. Therefore, if we want to know what science is, namely, knowledge, it's obviously doing; it's one way in which the atoms operate.

That leaves only our third friend, the operationalist. The operationalist is the man who says that knowledge is not an experience, an adventure in a world of preexisting things. This is what Protagoras's master, John Dewey, said is the "showcase theory of knowledge."—I am trying to emphasize as we go along, history means nothing in this course; all the men are contemporary. On the level of basic ideas, therefore, you cannot set a date when an idea came into existence and say that only after that was a philosophic discussion of it possible.—But to come back, if this is the case, then, obviously the external world, other minds, knowledge, all are constructions that the thinker goes through; therefore, knowledge is making.

You will notice, what we have done conforms to the process we've referred to, likewise, as the making of science. Howard gave us three terms which we've distinguished; then each of his three friends changed the meanings systematically so that the one term after the other became identical with knowing. This, I am suggesting to you, is the general process of philosophic discussion. And don't think it is silly: you go through it yourself constantly, and it is present in every serious, objective inquiry of human beings. This is not a piece of subjectivity; this is the way in which we think.

But let's turn around and ask, now, with respect to this, What about our particular subject, motion? And after all, anyone who has been three years to the College at Chicago will realize that Aristotle enslaved men's minds for two thousand years; then Galileo woke us up by establishing dynamics and told us the truth; and since that time we have made a cumulative advance which has been built on knowledge, remembering what was true and forgetting what was false. Let's look at what the problem of motion is. I suggest we follow the same procedure that we've gone through before and ask what Howard says.

Howard says motion is a kind of change, and—you'll recognize this as a reasonable position to take—there are two kinds of change. There are kinds of change that are instantaneous; they're not motions. They have a venerable title

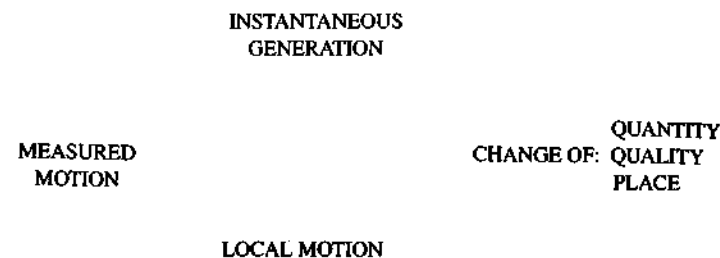


Fig. 4. *Four Kinds of Motion.*

which you'll run into again and again: generation and destruction or corruption—I like corruption better, it's more emotional. [L!] Generation and corruption is the process by which a substance comes into existence or ceases to be, and it's quite different from any motion: it's instantaneous. This is a position which the Supreme Court of the United States still holds to [L!]
—I'm being serious! [L!] It is a case which was brought to them—it's the St. Luke's Hospital case; it's in the law books—where a mother giving birth was injured. The case was brought for the mother and the child, but the child was thrown out, the reason being that it was prenatal. Even though the fetus was injured, the fetus was not a person, it had not yet been generated; therefore, no one could bring suit on its behalf. The mother could bring suit, she had been generated; but the child had not. There is, therefore, a very subtle legal problem concerning the point at which a person becomes a person. This is a problem of generation. And as Aristotle said, generation is instantaneous: the moment before, the person did not exist; the moment after, he did. This, then, is the characteristic of change of existence. There are, in addition, three kinds of motion—Howard, by the way, has some categories; that's how he gets these distinctions. There is motion which involves changes of quantity; that's called increase and decrease. Then there are changes of quality; that's called alteration. And then there are changes of place; that's called local motion (see fig. 4).³

Well, as this discussion goes on, the same thing happened as happened with the nature of philosophy itself. To all this Democritus said, Well, look, everybody knows there is only one kind of motion: that's change of place, local motion. Explain local motion and you can explain all these other funny changes; therefore, local motion is the basis of all change. His friend in the upper story, Plato, says, Well, you're right, there aren't all these funny kinds of motion. There is only one kind of motion—and this is a very good doctrine—namely, all motion is a series of instantaneous creations succeeding each other in time. Motion is not a continuum of change, but instantaneous creations. Incidentally, if you look in the philosophers of antiquity, this is the thought that's connected with Boethius's name. Finally, since our operationalists insist

that everything is the result of operations, it's perfectly clear that all that motion means is a rate of change in which you need to know only what is changing, that is, what you can see to be changing, and the time. Consequently, the only kind of motion is obviously measured motion. You don't even need bodies: you can measure other kinds of changes with their rate, with their specification, write your equation, and proceed with the motion.

Notice that as I've stated them, each one of these hypotheses is plausible. There's nothing wrong in principle with any of these approaches, and each of them can take care of everything. That is to say, the original beginning was a nice schematism of the kinds of motion. But if you say everything is local motion, then you can explain all the other changes that Aristotle is referring to in terms of changes of place. Conversely, the only thing that happens if you go up to the top of the matrix is that you don't proceed by constructing out of pieces; instead, you write general field equations in which the whole is prior and the part is posterior. You go into a topological examination rather than a molar dynamic explanation. Or, finally, your operationalist will insist on having the frame of reference in terms of which you are making your motion. It's a conviction that absolute simultaneity, absolute time, absolute space, these are all fictions; but you can translate from any frame of reference to any other frame of reference fairly easily.

We have differentiated motion, then, in a series of radically different ways. Let me, therefore, examine what these different conceptions of motion would be, because those of you who are going to read the books in the course and discuss them with me will, from this point on, be coming into these various approaches. The readings start with the ancients, but we'll come down to Galileo, Newton, and Clerk Maxwell. We'll go rapidly; we may even move into Einstein, though this has not happened recently; we've had a kind of diminution of speed.⁴ Anyway, we will get to Clerk Maxwell, who started all the difficulty by inventing, or helping invent, a science called thermodynamics, which has a Second Law that C. P. Snow says nobody understands except the nonhumanists—it preserves them from cultural pollution.⁵ [L!]

The readings will begin with some selections from the *Timaeus*. Plato is concerned with motion, as I suggested, in the broadest and most general sense. I will say nothing now that will really bear on the questions that I will ask in our first discussion, but I do want to give you a framework which might help some. To begin with, all the processes of change are interdependent in an organic universe, including the process by which the universe itself came into being. Therefore, the treatment of motion that Plato's *Timaeus* gives involves a cosmology, just as much discussion today of the basic considerations of motion gets you very quickly into cosmological questions, which are almost the exclusive property of Cambridge University, England. They are arranging

the cosmos either in a steady way or in an explosive way, which would affect the entire treatment of motion. How does Plato do it? Well, the *Timaeus*—and this is one of the reasons why I wanted to tell you this in advance—is divided into three sections, and the selections that you have represent each of the sections.

The first section deals with the cosmological question in general: the generation of the universe, the soul of the world, and questions of this sort. Plato's way of talking about it is that this is the part of science which depends on reason, and reason is applied all the way through. There's a basic rationality: the universe itself is, in a significant sense, rational in structure. It deals, therefore, with the relation of being to becoming, which is a relation that repeats the ratio of reason to opinion. Understanding depends upon the upper end of this proportion, that is, on being. The second section deals with the necessary interrelations of parts. It begins with a differentiation of the elements; and just as you began in the section on reason by taking the universe as a whole and then breaking it down into parts, so in the second section you begin with the parts and construct the universe out of the parts. But there's a further point that needs emphasis. You notice, reason and necessity are not related as contraries. That is, there is nothing wrong with a thing being at once necessary and rational: it all depends on what your analytic approach is which aspect you bring out, the necessity or the reason. There are a great many philosophers who take this position, that between chance and necessity, between probability and reason, there is a supplementary rather than a contradictory relation. The third section then turns to man. So you began with the universe; the second section began with the element; but man is an organic whole midway between the two, participating both in reason and in necessity and, consequently, dealing in his thought with both truth and probability.

Since I've already told you what motion is, this time I'm going to try to identify the differences by telling you what space is. Space, for Plato, is the word "space": it's the Greek word *khóra*. *Khóra* is the word that you would use if you wanted to talk about a room. It is the space within which something takes place. He says—and here I am telling you something about your readings, but it's rather far on in the selection—that space is related to change in the way in which gold would be related to all the shapes that gold could have. If you had a hunk of gold which is square, then circular, then triangular or pyramidal, and so on, and if someone pointed to it in its successive motions and asked, "What is it?," the right answer would be gold, not a triangle, not a circle, or the rest. This is a figure of speech which has a long history. When you get to reading Descartes, if you get to reading Descartes, you will discover he says that space is something like this—only there was an inflation in between: he calls it wax instead of gold. Wax has a great advantage because it not only can take all the

ROOM (*Khóra*)

DISTANCE

PLACE (*Topos*)

VOID

Fig. 5. *Four Kinds of Space.*

shapes gold can take, it can also melt easily and become a liquid, or it can be vaporized. Therefore, the changes are even greater. This is what space is in the idea of people like Plato and Descartes (see fig. 5).

Let me indicate one further point regarding the way in which the philosophic problem of space comes out. When Aristotle comes along, he states that the trouble with Plato's conception of space is that he got space mixed up with matter: when he's describing matter, he calls it space. Now, if you are approaching this purely in the terms of ordinary language, you might easily say, Well, this is unimportant, even implausible. How could anyone confuse space and matter? Everybody knows what space and matter are. Therefore, in his own whimsical way, Aristotle is obviously pulling your leg; nobody could possibly make this mistake. But in the nineteenth century, without collusion, Clerk Maxwell—who I am sure did not read Aristotle, in spite of the enslavement of men's minds by Aristotle—wrote a book you'll be reading in which he talks about Descartes. He says, It's a funny thing about Descartes: he confuses matter and space. Again, you are in the same situation. There'd be no plausibility about it except that in the structure represented in figure 2, it's perfectly clear that what a man down at the knowable or over at the known would mean by space would be such that space in the sense that it's used up at knowledge is not matter, it's potentiality. In space, according to Plato, you have potentially present everything that can later become present. And if you think that this is a strange, ancient idea, there was a man in Germany when I was young who was well known—you may not have heard of him—named Meinong.⁶ He was rather "gone" on objectivity, and he wrote four large volumes about objects. His position about objectivity was a very odd one, namely, everything that is possible *is*. It would be possible for the universe to be like a twelve-story library building in a circle; it might be a volcano there, too. It is, it is objective. Possibility or potentiality would be the basic characteristic of any space, and from this you would go on. As I say, once you begin thinking this way and get over the prejudices which prevent you from appreciating the fineness of insight which is involved, it's perfectly all right.

Let me sum up some of the characteristics of this space. This space is empty space. There are going to be some spaces that are full of physical characteristics, some that are empty. This space, moreover—and I want to give you some

Table 1. Characteristics of Space.

PLATO	DEMOCRITUS	ARISTOTLE	GORGIAS
EMPTY (Potentiality)	EMPTY (Void - Nonbeing)	FULL (Physical Characteristics)	FULL (Place of Argument)
INFINITE (Indeterminate)	INFINITE (Extension)	FINITE (Unbounded)	FINITE (Measured)

characteristics that sound as if they were empirical—is indeterminate, it is infinite—it has to be infinite (see table 1).⁷

Let's go on to a second conception of space, again arising from motion, namely, Aristotle's space. Notice that for Plato, his kind of space is needed for all kinds of motion; therefore, as Plato sees it, space is a principle of motion. For Aristotle, the function of space is to separate one kind of change from the other three kinds; that is, local motion occurs in a space different than other kinds of space. Therefore, he doesn't call space "space": he calls it "place." *Topos* is his word, as *khóra* is the word that Plato uses. —I take no responsibility, incidentally, if you come to me with the English translations of Plato and Aristotle and say that they both say "place," they both say "space." What I am talking about is the difference between *topos* and *khóra*. — What is a "place"? Well, only bodies are in place, in a literal sense. The place of this lectern is the boundary of particles that surround it—the air particles, if you like. Therefore, it has the same shape as the lectern, but it has no physical properties. But it has another characteristic: there are proper places. The proper place of a heavy body is down; that's why heavy bodies fall down. Consequently, the place of Aristotle, unlike the place of Plato, is not empty; it has physical characteristics, it's one of the reasons why things move.

But, secondly, with respect to the characteristics in table 1, Aristotle has a demonstration that the universe is necessarily finite, whereas Plato's is infinite. And in this demonstration he uses a pair of terms which, if you look at them, you might imagine were thought of only later: place, for Aristotle, is both finite and unbounded. This was a pair of terms, in case you're too young to remember, that Einstein also used at the time when he spoke of the universe as being a macroscopic egg [L!]⁸—these are sacred words! [L!] It's an egg which has no boundary, but it is finite, it is limited. The reason for it is related to the fact that this is not an empty space; that is to say, motion is conditioned by space. Aristotle argues that the motion of the outer sphere, being circular, bends around and, therefore, is unbounded; but it's finite since it surrounds a finite expanse within it. There's a famous argument he had with one of his opponents which the commentators make a great deal about. The opponent said, What would happen if a hoplite⁸ went to the edge of space and threw a spear over it? And

the answer for Aristotle is, He couldn't. It would have to follow a world line; that is to say, the thrown spear would begin going around in the proper geodesic.—Aristotle didn't use this language; since we are being contemporaries, I'm merely giving him a more up-to-date vocabulary.

Let's go to the third conception of motion that we distinguished and see if we can relate it to the idea of space that we are setting up for it. For Democritus, only bodies move. Whereas we said that for Aristotle, though only bodies have local motion, other things move in some of the other senses, for the physicalist approach there is a reductivism, namely, any change can be reduced to the physical equivalent of the change. Consequently, the nature of bodies which can be seized by reason or which can be perceived in interaction by sensations is such that they move through space. But what is the relation of bodies in space? Well, Democritus has a word for it, too. It isn't space and it isn't place: it's "the void." The characteristic of the void is that it's nonbeing, and the characteristic of body is that it is being. In one of the proofs of Democritus that have come down to us in a fragment—a lot of the things we attribute to Democritus we do by all kinds of art, but in this case the fragment still exists—he says that, "The thing does not exist any more than the nothing." The body and empty space exist in exactly the same sense. Notice, again space is empty—we have empty, full, and empty—but it is empty in a different sense than the emptiness of Plato. What is the empty space here? Well, as I've indicated, it's nothing, it's three-dimensional extension, empty of anything except the dimensions that enter into it. The motions of the parts, the motions of the whole, will be placeable within this extension.

There remains only one kind of motion for which we need to give the equivalent space—and it's a shame to take this too rapidly, although the lecture time is pushing on. It is an extremely subtle one: it's the Sophists' conception. The Sophists took the position that there aren't any entities such as these other philosophers are talking about. Nothing is changeless, nothing is possessed of unique characteristics independent of someone's experience. Consequently, everything that *is* is within the structure of an experience; that is, all knowledge is opinion or probability. There isn't any certainty—notice, there are necessary truths in all of the other positions. Science deals with probability; it deals with change or becoming. There isn't any such thing as being.

Gorgias wrote a famous treatise, and we have enough of it to reconstruct his physics. It's called, *On Not-Being, or On Nature*, and it has three parts. Before I recount the three parts, let me tell you what the character of scientific research is. He speaks of it—I translate him a little freely, although it's really based on what he says—as "a tragedy of thought and being." Now let me quote directly: "The treatises of the natural scientists who, by substituting one opinion for another"—that is, the revolutionary scientist comes and sets up a new hypothesis which destroys a hypothesis that had been accepted for a hundred years

before—"by means of the elimination of the one and the formulation of the other, cause existence not within reach of immediate perception and sight to be displayed to the sight of a comprehending imagination."⁹ The physicist discovers a proton or an electron or the characteristics of antimatter: this is what Gorgias is referring to as making things that are imperceptible apparent to the imagination. "But this," he says, "is the victory of one opinion over another, and it is possible only when persuasion is allied with speech." You neutralize antinomies, and the history of science is merely the history of one position being knocked down and another being set up to be knocked down again. This is no criticism; this is merely objective description.

The three parts of the treatise, therefore, are devoted, first, to demonstrating that nothing is. Basically, neither not-being nor being can be attributed to experience, and experience is all we have. This is radical empiricism. Consequently, neither being nor not-being is. Further, neither rest nor motion can be predicated of being; since being is not, rest and motion are not. And, consequently, all proofs are deceptions—the Greek word is *apaté*: there's no doubt about it's being "deception." It's not that he has annihilated being, but he's pointed out there is nothing that we can know. And space, as nonbeing, is: since everything is nonbeing, it's the same as being. Then, the second part is devoted to demonstrating that if anything is, it is unknowable. Thought is creative, it creates things as well as knowledge, and, consequently, you can synthesize anything. You can synthesize Scylla and Charybdis, Gorgias's example, and the same process goes on in science, philosophy, and poetry. Science, philosophy, and poetry are all equally knowable: they do the same thing, they practice the characteristic deception of all knowledge. Notice, the first part shows that nothing is, and the second shows that even if there were anything, it couldn't be known. The third part, then, is the demonstration that even if something were known, it couldn't be stated; and he goes on merely to show that all statements of dogmatic positions are false. Nevertheless, you still have the region of probability: this is the region of science, this is enough, this is all that is necessary for poetry, practice, or science. There isn't any underlying reality that we are setting up.

What is space, then? He uses the same word as Aristotle; in fact, it is Aristotle who uses his word. It's a place; but it isn't the place of a body: it's the place of an argument. Since bodies depend on arguments, you need to get the place of the argument which will set up the peculiarity of the argument.¹⁰

Let me, since lecture time has run out, merely point out that we've been dealing with not only four conceptions of science (see fig. 3) but four conceptions of nature. This may have seemed a good, solid term for you. For Plato, nature is reason, nature is basically rational; consequently, reason will tell us what nature is. For Aristotle, nature is a principle of motion; it is the internal principle of motion, as opposed to an external principle of motion which deals



Fig. 6. *Four Kinds of Nature.*

not with natural motions but with violent motions. For Democritus, nature is bodies in motion. For the Sophists, nature is *nothing*—a creative nothing, a nothing which is very much like the nothing which Jean-Paul Sartre in *L'être et le néant*¹¹ proves to be a legitimate descendant from these theories. Therefore, Sartre's approach to nature would be the same (see fig. 6).¹²

In the next lecture I will complete this broad approach to the differences in philosophic problems. Then, we will go on to an examination of the methods that are involved in the four treatments of motion and the characteristics that emerge when we separate and distinguish the four methods.

LECTURE 2. Philosophic Problems in the Natural Sciences

1. See Plato, *Meno*, 80a.
2. Figure 3 is not in Mitchell's class notebook.
3. Figure 4 is not in Mitchell's class notebook.
4. Although in 1963 McKeon did not cover Einstein in discussions, he did leave notes from discussions in earlier versions of the course which suggest something of the way he treated Einstein. See appendix F.
5. See C. P. Snow, *The Two Cultures and the Scientific Revolution* (New York: Cambridge University, 1959).
6. Alexius Meinong (1853–1920) was a professor of philosophy and psychology at the University of Graz from 1882 until his death.
7. Table 1 is not in Mitchell's class notebook.
8. A hoplite was a heavily armed Greek infantry soldier.
9. McKeon's quotation regarding Gorgias's conception of the character of scientific research is from the latter's "Encomium to Helen," par. 13. See *The Older Sophists*, ed. Rosamond Kent Sprague (Columbia, S.C.: University of South Carolina Press, 1972), p. 53. For a translation of Gorgias's "On the Nonexistent or On Nature," see *The Older Sophists*, pp. 43–46.
10. At this point in the lecture, McKeon discovers that he has run out of time, so he cuts short his lecture notes. Those notes show he has a few additional comments to make about the Sophists' conception of space as well as a more extensive analysis of the effect of the four modes of thought on necessity and chance or probability. In addition, the notes contain four ideas of nature, which he condenses into the one paragraph that immediately follows. For those lecture notes, see appendix B.
11. *L'être et le néant; essai d'ontologie phénoménologique* (Paris: Gallimard, 1943). Translated by Hazel E. Barnes as *Being and Nothingness; An Essay on Phenomenological Ontology* (New York: Philosophical Library, 1956).
12. Figure 6 is not in Mitchell's class notebook.