

Mechanistic-Materialism and the Genesis of Modern Skepticism^{*}

George Cronk

Skepticism is one of the major characteristics of modern thought, and the rise and spread of the skeptical attitude constitutes a central theme in the work of intellectual historians and historians of philosophy Special attention will be paid to the philosophy of Thomas Hobbes, for it was he who first attempted to extend the principles of early modern science into a systematic doctrine.

I. THE NEW SCIENCE

The so-called Scientific Revolution, which restructured man's view of and attitude toward nature, was followed by the development of a new and purportedly "scientific" metaphysics (as if there could be such a thing as a "scientific" metaphysics). This metaphysics, mechanistic-materialism, through a radical redefinition of the nature and scope of human knowledge, contributed significantly to the destruction of the medieval world-view and altered drastically the Western conception of reality. But before discussing the emergence of the new world-view in modern thought, let us examine the fundamental principles of the new science from which mechanistic-materialism claims descent. Such examination will demonstrate, I think, that the mechanical view of reality is, at least, a pretender to the throne of science and, at most, the king's bastard offspring.

In his attempt to organize his experience, man has formulated mythologies, religions, philosophies, and, finally, scientific theories, all of which aim at "discovering" principles of order in a changing universe and expressing those principles in coherent symbolic constructions. Science, therefore, is only the latest stage in man's search for comprehension. Experience had been highly organized and articulated in myth and religion long before the advent of scientific thought.¹ The difficulty with those earlier world-structures, however, was the complexity and ambiguity of their symbols. Thus, science emerges as a quest for simplicity and precision; and the language (or symbol-system) of science, by which this simplicity and precision is to be achieved, is mathematics.

The Greek philosophers and mathematicians had developed mathematics to a high degree of generalization and had perceived that number is the key to rendering the cosmos intelligible. But the decline of classical civilization produced a long hiatus in the history of Western science and mathematics; the Greeks, therefore, never followed through to the conclusion of their achievement. Continued development of mathematics and science had to wait until the passing of the Middle Ages. And

^{*} Originally published in *Kinesis* (Fall 1969), 15-25. Slightly revised here.

then, during the Renaissance, there was a revival of Platonic philosophy and, with it, a dissemination of neo-Pythagoreanism among educated Europeans. Western thought thus took up the ancient idea that the world, if it is to be comprehended by man, must be explained in mathematical terms. And from the Renaissance through the nineteenth century, and even into the twentieth century, many Westerners have entertained a mathematical conception of physical reality.²

Descartes was among the first to attempt a thoroughly mathematical interpretation of nature. He was unsuccessful, his picture of the world taking the form of a vast, confusing sea of swirling, geometric vortices. But through this enterprise he set one of the major directions of modern scientific inquiry. Physics, in particular, was to pay tribute to the Cartesian ideal. "Henceforth this aim was clearly understood and firmly established. In all its single branches physics tended to one and the same point; it attempted to bring the whole world of natural phenomena under the control of number."³

The commitment of science to mathematical description and explanation, of course, limits rather strictly the field of inquiry. In the first place, science cannot consider the realm of metaphysics, for that realm is not susceptible to observation and quantification. In the words of Isaac Newton, "What the real substance of anything is we know not. In bodies, we see only their figures and colors, we hear only the sounds, we touch only their outward surfaces, we smell only the smells, and taste the savours; but their inward substances are not to be known either by our senses, or by any reflex act of our minds; much less, then, have we any idea of the substance of God."⁴ Scientific investigation, therefore, is restricted to the realm of natural phenomena and has nothing to say concerning reality in the ontological or metaphysical sense. From the viewpoint of ontology, we must say that scientific analysis is solely concerned with appearances and the relations between appearances.

But, in the second place, we must restrict the scope of science still further. Science, in pursuing its program of quantitative explanation, cannot take the entire phenomenal world as its object, but only those phases of nature which are subject to mathematical description. Thus, in early modern thought, experience was bifurcated according to the distinction between primary and secondary qualities. This distinction was made rather forcefully by, among others, Galileo:

I feel myself impelled by the necessity, as soon as I conceive a piece of matter or corporeal substance, of conceiving that in its own nature it is bounded and figured in such and such a figure, that in relation to others it is either large or small, that it is in this or that place, in this or that time, that it is in motion or remains at rest . . . that it is single, few or many; in short by no imagination can a body be separated from such conditions: but that it must be white or red, bitter or sweet, sounding or mute, of a pleasant or unpleasant odour, I do not perceive my mind forced to acknowledge it necessarily accompanied by such conditions; so if the senses are not the escorts, perhaps the reason or the imagination by itself would never have arrived at them. Hence I think that these tastes, odours, colours, etc., on the side of the object in

which they seem to exist, are nothing else but mere names, but hold their residence solely in the sensitive body; so that if the animal were removed, every such quality would be abolished and annihilated.⁵

The qualities of sense – the secondary qualities – therefore are purely subjective, whereas the primary qualities – number, position, extension, bulk, etc. – are objective. The latter alone constitute the object of the proper operation of science.

The methodological approach of early modern science, then, may be described as "mathematical phenomenalism." "At last it had dawned upon men," writes W.H. Werkmeister, "that the necessary control of all [scientific] thinking must come from observation, and that all scientifically significant observations were of quantity, and in units of measure. . . . Experience was indeed to be the basis of science; but measured data alone were to be regarded as [methodologically] 'real,' and whatsoever could not be measured was to be excluded from the subject matter of science."⁶

That mechanistic-materialism was extrapolated from the methodology of modern science testifies to man's inventiveness and his need for metaphysical constructions. For the new metaphysics cannot be logically derived from the principles of the new science. Science does not claim to describe reality, but phenomena alone, and then only in their mathematically measurable aspects. Science can neither affirm nor deny metaphysical propositions. The realms of science and metaphysics are, as the positivists and pragmatists have pointed out, distinct and independent of one another.

But, of course, the history of thought, *contra* Hegel, does not adhere to the rules of logic, dialectical or otherwise. To understand fully the development of ideas in time, we must take human psychology into account. Hence, modern men, conditioned in the habit of phenomenalistic thinking, began to conceive of the phenomenal world as the *only* world. In many minds, the measurable qualities of phenomena came to be viewed as the whole of reality, the metaphenomenal was thus denied, and the phenomenal was elevated to the status of ontology. Thus, although Newton and other scientists were concerned with distinguishing between physics and metaphysics, and while they did not seek to deny the reality of the metaphenomenal, in time their ideas and theories did lead large numbers of educated men to attribute a metaphysical character to the theories and findings of science. For Kepler, Galileo, and Newton, the metaphenomenal was merely irrelevant in the conduct of scientific investigation; in later times, the metaphenomenal was considered not only as irrelevant, but also as unreal.

II. HOBBS

Perhaps the earliest systematic exposition of the new metaphysics and its markedly skeptical implications is to be found in the epistemology of Thomas Hobbes. With characteristic brutality, Hobbes stated the case for mechanistic-materialism:

The world . . . is corporeal, that is to say body, and hath the dimensions of magnitude, namely length, breadth, and depth; also every part of body, is likewise body, and hath the like dimensions; and consequently every part of the universe, is body, and that which is not body, is no part of the universe: and because the universe is all, that which is no part of it, is *nothing*; and consequently *nowhere*.⁷

Materiality, for Hobbes, is the sole reality. Only that which can be described in terms of determinate quantity and motion (i.e., "body") is entitled to be called "real." Anything other than "body determinate" is unreal. Because of his basic materialism, Hobbes was forced to the conclusion that even ideas in the mind, if they are to be regarded as real, must possess the properties of matter (i.e., magnitude and motion). But let us delay the discussion of the epistemological consequences of Hobbes's materialism for a later stage in our analysis. What is important here is to gain some insight into the fundamental (i.e., metaphysical) assumptions with which he approached the world.

Another metaphysical assumption, in addition to his materialism, which Hobbes extrapolated from the new science was the principle of inertia – the view that all motion is caused by external stimuli (or forces). "Whatsoever is at rest, will always be at rest, unless there be some other body besides it, which, endeavoring to get into its place by motion, suffers it no longer to remain at rest. . . . In like manner, whatsoever is moved, will always be moved, except there be some other body besides it, which causeth it to rest [rest being a special case of motion]."⁸

Hobbes's materialistic assumptions and his adoption of the principle of inertia led him to posit a strict causal determinism which denied the possibility of (real) contingency. The principle of inertia constitutes a radical denial of the older doctrine of impetus – the late medieval view that natural entities (especially the mind) can be self-moved. All change, for Hobbes, is the effect of *determinate* and *external* mechanical forces. All change, in other words, is the result of one body pushing another around. The political implications of this view are fairly obvious and have found classic expression in the *Leviathan*.

In line with his metaphysical outlook, Hobbes attempted a mechanical interpretation of human thought. Thoughts (or ideas), he argued, are motions in the nervous system which are causally determined by external (material) stimuli. The mind, therefore, is not an independent reality as it had been for most ancient and medieval philosophers; on the contrary, all mental activity is firmly rooted in and utterly dependent upon the material world. The emergence of ideas, thoughts, etc., is comprehensible only in terms of material cause-and-effect relations (based upon the principle of inertia). Hobbes thus overcame the dualism between mind and matter – which has perplexed countless thinkers, such as Descartes – by reducing the former to the latter; i.e., Hobbes conceived of the mind in material terms and as thoroughly subject to mechanical law.⁹

Hobbes's mechanical approach to the problem of mind is at the basis of his sensationalist analysis of knowledge. Ideas arise as the result of the nervous system's reacting to external stimuli, or, to put it the other way round, the nervous system is activated when the external world impinges upon the sense organs. All knowledge of the world, therefore, is derived from sensations; or, more precisely, the existence of the external world is *inferred* from sensations.¹⁰ Thus, according to Hobbes, physiology and psychology form the basis of all knowledge.

It is important to note, in relation to the overall implications of Hobbes's epistemology, that the sensationalist analysis of knowledge provides no basis for *proving*, or demonstrating, the existence of the external world. If all our knowledge is derived from sensation, then the most we can claim, on empirical grounds, is that we are experiencing certain kinds of sensations; we have no *immediately verifiable* evidence of the reality of the external world. The existence of the world is an inference drawn from sensations which may or may not be representative of reality. We shall see that Hobbes's sensationalism, along with the other elements in his theory of knowledge, led him to a position of nearly total skepticism.

In line with the implicit atomism of the new world-view, Hobbes is also a nominalist. If ideas, or thoughts, arise in response to motions in the physical world, then each particular idea, or thought, must be related to some particular motion. Hence, all so-called general ideas (universal terms) are meaningless since they contain no reference to particular spatio-temporal events; universal terms (such as "man") do not connote anything existent, but are merely *names* for ranges of similar sense impressions. Language, therefore, which is built mainly on general, and therefore communicable, terms, is essentially a system of conventional definitions which are at best indirectly related to reality.¹¹ In this analysis of the nature of language, Hobbes anticipated the position of many twentieth century analytic philosophers.

Despite his view of language as a conventional-definitional system, Hobbes recognized clearly the utilitarian value of linguistic forms. Language makes possible the development of a cultural heritage; it acts as a register of experience which enables historical consciousness to rise and develop; and, finally, language renders certain forms of direct experience unnecessary (e.g., it is sufficient to be *told* that the taking of poison leads to death – one need not experience death by poison in order to appreciate the situation in question). Thus, despite its serious epistemological limitations, language is of immense value from the standpoint of utility.

To summarize to this point, Hobbes's theory of knowledge is based upon three foundations: (1) his mechanical conception of the mind; (2) his sensationalist analysis of knowledge; and (3) his nominalism. We are now in a position to draw some conclusions from his epistemology. Let us look first at the status of science according to the Hobbesian doctrine of knowledge. On the basis of his nominalism, Hobbes held that all certain (or absolute) knowledge is

mathematical, definitional, and tautological. Scientific knowledge is the knowledge of the *consequences* of definitions: Thus, if X is a circle, then any straight line drawn through the center of X will divide it into two equal parts; this conclusion is derived from the *definition* of the term "circle," and not from an experiment with an empirical circle. But is X *in fact* a circle? Such a question is irrelevant to the situation since science, or, in this case, mathematics, is not concerned with X in particular but with the nature of circles *in general* (*i.e.*, with *definitions*). But according to Hobbes's nominalist thesis, only particular materialities are real; hence, science does not demonstrate reality.¹²

Since all scientific knowledge is based upon definitions, that knowledge can be changed by changing the definitions. Definitions are relative to specific contexts and situations – there is nothing absolute about a definition. Hobbes saw that definitions are simply matters of convenience and expediency, that they have a purely pragmatic function, and that a definition has no necessary truth-value. According to Hobbes, definitions are fundamentally meaningless since they do not point to particular materialities. Science is thus relegated to a status very similar to that of language – a system of conventions and definitions which are useful but which do not constitute a basis for factual knowledge.

In the realm of values, Hobbes's epistemology produces a thoroughgoing subjectivism. Terms such as "good" and "bad" are simply names for specific motions: If we are motivated to move toward something (e.g., pleasure), then we call that something "good"; if, on the other hand, we are repulsed by something (e.g., pain) and move away from it, then we call that something "bad." This is perhaps the germ of the more elaborate nineteenth century philosophy of utilitarianism in which the major axiological categories were pleasure and pain. Values, then, for Hobbes, are reduced to particular sensations; and since sensations are relative to specific individuals, values must also be relative and subjective.¹³

Hobbes's nominalism tells us that language is a system of general terms which are not directly related to specific realities. Language is a poor substitute for concrete experience. Thus, when we talk to one another, we cannot communicate what we really perceive and feel, but can only suggest, through the use of generalized symbols, what we are trying to get at. J.W.N. Watkins has pointed out that Hobbes's nominalism thus renders true communication impossible:

Imagine a number of adjoining prison-cells, each occupied by a prisoner who has never met the others and who can communicate with them only by tapping signals on the wall. The prisoners can exchange information and they may even be able to work out a concerted plan of action, but they cannot establish *any rapport* or empathetic understanding between themselves. They are shut off from each other by the medium through which they send their signals. Each remains fundamentally solitary.

Hobbes' theory of communication places us all in the prisoners' situation. According to it, there are no common thoughts or purposes which we can share. I have a private thought, I transmit a public signal, and then you have a private thought – that is the closest we can get. Thus Hobbes' nominalism implies, not only that society is an aggregate of separate individuals, but also that each individual is inescapably lonely and self-reliant even when he acts in concert.¹⁴

Thus, we see that Hobbes's epistemology makes objective and factual knowledge impossible in the spheres of science and value and renders authentic human communication untenable. The Hobbesian doctrine of knowledge ends in relativism and subjectivism. And despite his emphasis upon the utilitarian value of so-called scientific knowledge, Hobbes was a skeptic vis-a-vis an empirical and objective apprehension of the real world. What's more, it is precisely because of his relativism, subjectivism, and skepticism that he insisted upon the necessity of a sovereign with unlimited powers who would compel agreement on definitions and values. Without such a sovereign, thought Hobbes, society would disintegrate into the anarchy and misery of the state of nature. Strangely enough, and yet quite fittingly, Hobbes's epistemological skepticism led him to advocate a system of political absolutism.

III. THE BIFURCATION OF EXPERIENCE

Mechanistic-materialism involves yet another level of uncertainty not treated directly by Hobbes, namely, the uncertainty which arises through an analysis of the dualism of primary and secondary qualities. The role of sense experience in modern scientific thought is interesting. On the one hand, observation is one of the two main foundations of scientific inquiry, the other being mathematics. But observation is a very special form of sense experience involving the use of precision instruments and apparatus. In general, science views ordinary sensation or common sense (from which we derive our ideas and feelings of the secondary qualities) as misleading in the search for knowledge. Ordinary sensation does not give us a true picture of the physical world. The entire drift of modern science, especially physics, has been to undermine the epistemological status of common-sense experience. There is no need for a lengthy documentation of the fact that the common-sense world has very little in common with the world described in scientific theory (atomic theory, Copernican theory, quantum theory, etc.). Ordinary sensation, in a word, is illusion.

More serious is Berkeley's argument which shows the "primary qualities" to be as dependent upon the observer as are the "secondary qualities." We derive our ideas and our knowledge of the external world from our sensations. Extension, motion, and solidity are "known" through perception and are never perceived as pure abstractions (i.e., these primary qualities are always perceived in conjunction with secondary qualities); and number and position are matters of subjective judgment. Both primary and secondary qualities, therefore, are derived from perception and both are subjectively conditioned: They are *all* perceptual qualities. One cannot demonstrate the *objective existence* of the so-called

primary qualities any more than one can the so-called secondary qualities. What, then, can we know about objective existence? Since all we can "know" are our sensations, and since these sensations are ultimately illusory, we can "know" nothing of objective existence! This was the conclusion reached by Berkeley, Hume, and other advocates of the tradition that developed from Hobbes to the positivists. The affirmation of the existence of an objective world is, therefore, essentially an act of faith. Thus, the predominant skepticism of modern thought, based in part upon scientific considerations, was directed at science itself, thereby producing a dilemma which was to occupy philosophers throughout the nineteenth and twentieth centuries.

IV. CONCLUSION

This article has traced, via Hobbes's epistemology, the development of a metaphysics, mechanistic-materialism, which was extrapolated from the assumptions of early modern science. The purely methodological principles of the Scientific Revolution – mathematical measurement, phenomenalism, the primary-secondary quality distinction – were reified and thereby transformed into an ontology by Hobbes and his followers in the empiricist tradition. The principles of modern science, I have argued, were conceived by Galileo, Newton, Kepler, and others as useful methodological abstractions in the conduct of scientific inquiry, *not* as ontological insights into the structure of being. Hobbes's identification of measurable phenomenal qualities (matter-in-motion) and ultimate reality, therefore, constitutes an illicit transposition from *methodology* to *ontology* – what Whitehead calls a "fallacy of misplaced concreteness."¹⁵ And it is upon the basis of this fallacious metaphysics that Hobbes builds his skeptical epistemology, an epistemology which has persisted throughout the history of modern philosophy. It would appear, then, that a philosophical solution to the epistemological problems raised by Hobbes and his descendants is impossible within the context of mechanistic-materialism since it is that context which has generated the type of skepticism discussed in this paper. As early as the nineteenth century, philosophers such as Kierkegaard, Hegel, and Nietzsche were recognizing the need for a reconstructed metaphysics which avoids the illegitimate "bifurcation of experience" represented by mechanistic-materialism; and the work of Whitehead and the phenomenologists has been largely an attempt to effect such a reconstruction in our ontological vision.

But metaphysical reconstruction has not been the aim of this paper. My goal has been much more modest: to describe the emergence of the mechanistic-materialistic world-view in modern thought, a world-view which has resulted in radically skeptical conclusions and which forms a significant chapter in Western intellectual history.

NOTES

¹ Ernst Cassirer, *An Essay on Man* (New Haven, CN, 1944), p. 208.

² Cf. E.A. Burtt, *The Metaphysical Foundations of Modern Physical Science* (New York, 1932), *passim*.

³ Cassirer, p. 214.

⁴ Isaac Newton, *Mathematical Principles of Natural Philosophy*, trans. Andrew Motte, revised by Florian Cajori, in *Great Books of the Western World*, 34 (Chicago, 1952), p. 371.

⁵ Galileo Galilei, quoted by Burtt, p. 85.

⁶ *A Philosophy of Science* (Lincoln, NB, 1940), p. 20.

⁷ Thomas Hobbes, *Leviathan*, ed. Michael Oakeshott (Oxford, n.d.), p. 440.

⁸ Hobbes, *Elements of Philosophy*, in *The English Works of Thomas Hobbes of Malmesbury*, I, ed. Sir. William Molesworth (London, 1839), p. 115.

⁹ *Leviathan*, pp. 232-41.

¹⁰ *Ibid.*, pp. 7-8.

¹¹ *Elements of Philosophy*, pp. 13-28.

¹² *Leviathan*, pp. 40-42.

¹³ *Ibid.*, pp. 31-39.

¹⁴ J.W.N. Watkins, "Philosophy and Politics in Hobbes," *Philosophical Quarterly*, V (1955), p. 140.

¹⁵ Alfred North Whitehead, *Science and the Modern World* (New York, 1925), *passim*.