

INTRODUCTION:

MATERIALISM, PAST AND PRESENT

MATERIALISM as a theory of the nature of the world has had a curious history. Arising almost at the beginning of Greek philosophy, it has persisted down to our own time, in spite of the fact that very few eminent philosophers have advocated it. It has been associated with many scientific advances, and has seemed, in certain epochs, almost synonymous with a scientific outlook. Accusations of materialism have always been brought by the orthodox against their opponents, with the result that the less discriminating opponents have adopted materialism because they believed it to be an essential part of their opposition. At the present moment, the official creed of one of the largest States in the world is materialism, although hardly any one in the learned world explicitly adheres to this theory. A system of thought which has such persistent vitality must be worth studying, in spite of the professional contempt which is poured on it by most professors of metaphysics.

Lange's *History of Materialism*, here re-issued in "The International Library of Psychology, Philosophy, and Scientific Method," is a monumental work, of the highest value to all who wish to know what has been said by advocates of materialism, and why philosophers have in the main remained unconvinced. The first edition appeared

in 1865, at the height of the period often described as "The materialistic '60's." The preface to the second edition is dated June, 1873. The author died in 1875, before the reaction against materialism had made itself felt. Lange, while very sympathetic to materialism in its struggles with older dogmatic systems, was himself by no means a materialist. He is described by Professor Cohen, in the Preface to the Ninth Edition (1921), as an "apostle of the Kantian view of the world," to which Professor Cohen himself adheres. The description is quite correct. Lange considers that materialism is unable to explain consciousness, and is refuted, on scientific grounds, by the psychology and physiology of sensation, which shows that the world studied by physics is a world dependent on our modes of perception, not a world existing independently on its own account.

It is a commonplace to object to materialism on ethical grounds, since it is supposed to have a deleterious effect on conduct. While energetically repelling many forms of this criticism, Lange nevertheless upholds it in the end, since he regards the economics of the Manchester school and the ruthlessness of modern competition as attributable to a materialistic outlook. This is perhaps the weakest part of his book, in spite of the fact that, unlike most German learned men, he had considerable experience of practical life. In 1861, at the age of 33, he resigned his position as a teacher, and became secretary of the Duisburg Chamber of Commerce. But his position became difficult owing to his radical opinions, which found vent in various directions. He edited a newspaper called *The Rhine and Ruhr Gazette*, and he wrote a book called *Die Arbeiterfrage in ihrer Bedeutung für Gegenwart und Zukunft*, which appeared in the same year as his *History of Materialism*. His industry was

little short of miraculous, for in this same year he published yet another book, *Die Grundlegung der mathematischen Psychologie*—and all this without neglecting the newspaper or the Chamber of Commerce.

In the following year (1866) he went to Switzerland, where he again took up academic work, becoming Professor at Zurich in 1870, and returning to Germany in 1872 as Professor at Marburg. But his experiences in the world of industry and commerce undoubtedly helped to widen his outlook, and to give him an understanding, not always possessed by the learned, of the operation of theories when they pass out into the market-place. He remarks that, in England, philosophers are often statesmen, and, what is still more extraordinary, statesmen are sometimes philosophers. He does not point out how often the mixture is damaging to both, making the statesman too theoretical and the philosopher too practical.

Lange's book is divided into two parts, one dealing with the times before Kant, the other with Kant and his successors. This division shows the very great importance which he attaches to the philosopher of Königsberg—an importance which, perhaps, may seem less as time goes on. Kant's system is intimately bound up with the state of the exact sciences in his day: Euclidean geometry gives the foundation of the transcendental æsthetic, and the Aristotelian syllogism gives the ground for the deduction of the categories. Now that geometry has become non-Euclidean and logic non-Aristotelian, Kant's arguments require re-statement; to what extent this is possible, is still a moot question. To the present writer, the first half of Lange's book appears considerably better than the second, because it is less affected by the author's views on matters which are still undecided. In the periods before Kant, his critical

judgment is extraordinarily sound. The account of Greek atomism, the analysis of Plato's influence for good and evil, are admirable. The combination of scientific materialism with theological orthodoxy in seventeenth-century England, and its contrast with the revolutionary materialism of eighteenth-century France, are set forth with a nice historical sense. But it is always a very difficult task to see one's own time in historical perspective. Apart from philosophical predilections, there is difficulty in disentangling what is important and permanent in the purely scientific work of one's own generation. The problems which occupied the men of science sixty years ago were very different from those of the present day, and it was impossible to know which of them would prove to be historically important.

On the question : what is true and what false in materialism ? it is possible to speak with more learning and more complication than in former days, but it may be doubted whether any substantially new arguments have been invented since Greek times. Nevertheless, it may be profitable to attempt a survey of the position as it appears in the light of modern science.

The theory of Democritus was intelligible and simple. The world consisted of hard round atoms of various sizes, all falling, but the heavier atoms falling faster, so that they would occasionally impinge upon the lighter atoms. If the impact was not exactly in the line of centres, there would be a resultant sideways motion, which accounts for the fact that bodies do not move only in one direction. This view, of course, had to be modified for purely physical reasons, but the modifications were not important until we come to Descartes with his plenum and his doctrine of vortices. This showed that atomism is not an essential part of materialistic physics. Newton's followers intro-

duced another modification, namely, action at a distance (which Newton himself still regarded as impossible). To this day the oscillation continues between atoms with action at a distance and a continuous medium (the æther) with continuous transmission of effects. Few physicists nowadays cling to either as a matter of principle; the only question is: which best explains observed phenomena? Both views have in common a belief in physical determinism, *i.e.* a belief that what happens in the world dealt with by physics happens according to laws such that, if we knew the whole state of the physical world during a finite time, however short, we could theoretically infer its state at any earlier or later time. This is the kernel of materialism from the standpoint of ethics, religion, sociology, etc., though not from the standpoint of metaphysics. If physical determinism is true—if, that is to say, everything that we commonly regard as the motion of matter is subject to laws of the above kind—then, although there may be a concurrent world of mind, all its manifestations in human and animal behaviour will be such as an ideally skilful physicist could calculate from purely physical data. Physics may still be unable to tell us anything about a man's thoughts, but it will be able to predict all that he will say and do. Under these circumstances, a man will be, for all practical purposes, an automaton, since his mental life can only be communicated to others or displayed in action by physical means. Even his thoughts can be inferred from physics, unless he is content never to give utterance to them.

This point of view resulted from Cartesianism, though most Cartesians attempted to escape from its consequences. *Lametrie*, author of *L'homme machine*, justly claimed that he had derived his philosophy from Descartes. Descartes, who knew about the conservation of *vis viva*, but not

about the conservation of momentum, endeavoured to safeguard human freedom by maintaining that the will could alter the direction of motion of the animal spirits, though not the amount of their motion. He did not, however, extend this freedom to animals, which he regarded as automata. Nowadays no one would dream of drawing such a distinction between men and animals. And even his immediate followers had to abandon his position on this point, owing to the discovery of the conservation of momentum, which showed that the quantity of motion in each direction must be constant. From that day to our own, many philosophers have advocated the theory of two parallel series, one mental and one physical, each subject to its own laws, and neither influencing the other. This theory has less plausibility in our time than it had formerly; but apart from the question of its truth, it is worth while to realise that it does not afford an escape from the more disagreeable consequences of materialism.

If there is parallelism between the physical and mental series, as this theory supposes, every physical law must have its psychological counterpart, and therefore psychology must be as rigidly deterministic as physics. There will be, so to speak, a dictionary, by which physical events can be translated into the concurrent mental events. Given this dictionary, the Laplacean calculator can, by physics alone, deduce the state of the material world at any given time, and discover from the dictionary what must be the corresponding state of the mental world. Clearly, the emancipation from physics which anti-materialists desire, is not to be achieved along these lines.

There is, however, no good reason to accept the theory of psycho-physical parallelism. The dualism of mind and matter is probably not ultimate, and the supposed impos-

sibility of interaction rests upon nothing better than scholastic dogmas. To common-sense it appears that our minds are affected by what we see and hear, and that, conversely, our bodies are affected by our volitions whenever we will to make any movement. There is no reason whatever to suppose that common-sense is mistaken in this view, although, of course, there is great need of analysis as to what really takes place when we perceive or will.

Lange advances, quite justly, as an argument against materialism, the fact that we only know about matter through its appearances to us, which, according to materialism itself, are profoundly affected by our own physical organisation. What we see depends not only upon what is there to be seen, but also upon the eye, the optic nerve, and the brain. But the eye, the optic nerve, and the brain are only known through being seen by the physiologist. In this way materialism is driven back to sensationalism. If it is to escape sensationalism, it must abandon the empirical scientific method, substituting for it the dogmatism of an *a priori* metaphysic, which professes to know what is behind appearances. Historically, we may regard materialism as a system of dogma set up to combat orthodox dogma. As a rule, the materialistic dogma has not been set up by men who loved dogma, but by men who felt that nothing less definite would enable them to fight the dogmas they disliked. They were in the position of men who raise armies to enforce peace. Accordingly we find that, as ancient orthodoxies disintegrate, materialism more and more gives way to scepticism. At the present day, the chief protagonists of materialism are certain men of science in America and certain politicians in Russia, because it is in those two countries that traditional theology is still powerful.

The two dogmas that constitute the essence of materialism are : First, the sole reality of matter ; secondly, the reign of law. The belief that matter alone is real will not survive the sceptical arguments derived from the physiological mechanism of sensation. But it has received recently another blow, from the quarter whence it was least to be expected, namely, from physics. The theory of relativity, by merging time into space-time, has damaged the traditional notion of substance more than all the arguments of philosophers. Matter, for common-sense, is something which persists in time and moves in space. But for modern relativity-physics this view is no longer tenable. A piece of matter has become, not a persistent thing with varying states, but a system of inter-related events. The old solidity is gone, and with it the characteristics that, to the materialist, made matter seem more real than fleeting thoughts. Nothing is permanent, nothing endures ; the prejudice that the real is the persistent must be abandoned.

The notion of substance has not been regarded by philosophers as metaphysically valid since the time of Hume and Kant, but it persisted in the practice of physics. Its defeat, within physics, by the abandonment of a single cosmic time affords a purely scientific argument against the older type of materialism, which utilised the belief that substance is what persists through time.

The reign of law raises more difficult and also more important questions. The outlook with which the phrase "reign of law" seems to belong most naturally is that of Newton, especially as developed by his disciples. Belief in the reign of law is often combined with strict theological orthodoxy, but in that case human volitions are excepted, at any rate in certain cases. The reign of law only becomes part of the materialistic outlook when it is believed to

have no exceptions, not even human volitions. It is in this form that we have to consider it. It will be necessary first to define the phrase, and then to inquire what ground there is for believing it applicable to the world.

The definition of the reign of law is by no means so easy as seems often to be supposed. The idea is derived from such instances as the law of gravitation in the solar system, where a simple formula enables us to predict the motions of the planets and their satellites. But this instance is deceptive in several respects. In the first place, there is no reason to suppose that the laws in other cases are equally simple. In the second place, it turns out that the Newtonian form of the law of gravitation is only approximate, and that the exact law is enormously more complicated. In the third place, the geography (if one may use such a term) of the solar system is amazingly schematic. To a first approximation, it may be regarded as consisting of a small number of mass-points, whose individual motions are easily observable. This point of view is not adequate for dealing with such matters as tides, but it suffices for the deduction of Kepler's laws from the law of gravitation, which was Newton's most spectacular achievement. It is obviously a very different matter to obtain laws applicable to individual electrons and protons, because of the greater geographical complexity involved. For these reasons, among others, it is rash to regard the Newtonian astronomy as typical of what is to be expected in physics.

The least that can be meant by the reign of law is this : given any phenomenon, there exists some formula of finite complexity such that, from a sufficient (finite) number of data at other times the phenomenon in question can be calculated. In practice, the "other times" will usually be earlier times, but this is not always the case—for example,

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in speculations as to the geological history of the earth or the origin of the solar system. Theoretically, it should be irrelevant whether the "other times" are earlier or later than that of the phenomenon concerned.

In elucidation of the above definition, there are one or two observations to be made. The reason for saying that the formula must be of finite complexity is that otherwise nothing is asserted beyond a logical truism. By admitting formulæ of infinite complexity, any series of events whatever could be brought within the compass of a single law, and therefore we should assert nothing in asserting the reign of law. The reason for insisting that the number of data required must be finite is similar, but is reinforced by another, namely, that we cannot manipulate an infinite number of data, and could therefore never discover evidence either for or against a law which required them.

There is a further point which should be borne in mind. None of our observations are completely accurate; there is always a margin of error. Consequently we can never prove that events obey *exactly* any law which is found to work within the margin of error, nor, conversely, need we trouble ourselves about inaccuracies which must remain below this margin. For example: it is always assumed in physics that continuous functions can be differentiated, although, as a matter of pure mathematics, this is known to be only sometimes the case. There is no harm in this from the physicist's standpoint, because, given any continuous function which cannot be differentiated, there will always be another which can be differentiated, and which differs from the first by less than the probable error in our observations. Approximations are all that we can achieve, and therefore all that we need attempt.

The question now arises: Is there any reason to believe

in the reign of law in the above sense? In the world of pure physics there are a number of fundamental occurrences which cannot at present be reduced to law. No one knows why some atoms of a radio-active element disintegrate while others do not; we know statistical averages, but what goes on in the individual atom is completely obscure. Again, the spectrum of an element is caused by electrons jumping from one possible orbit to another. We know a great deal about the possible orbits, and about what happens when a jump takes place, and about the proportion that choose one possible jump as compared to those that choose another. But we do not know what (if anything) decides the particular moment at which an electron jumps, or the particular jump that it sees fit to make when several are possible. Here, again, it is statistical averages that we know. It is therefore open to anybody to say that, while averages are subject to law, the actions of individual electrons have a certain range of caprice, within which there is no evidence for the reign of law. A man who maintained such a view dogmatically would be very rash, since to-morrow he might be refuted by some new discovery. But a man who merely maintains that, in the present state of physics, it is a possibility to be borne in mind, is displaying a proper scientific caution. Thus even within the pure physics of inorganic matter the reign of law cannot be asserted to be indubitably universal.

This doubt cannot but be increased when we pass on to biology and psychology. I do not mean that there is any positive evidence against the reign of law in this region; I mean only that the evidence in its favour is less strong, because fewer laws are known, and prediction is as yet only possible within very narrow limits. The discovery of quanta in physics shows how rash it is to dogmatise

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as to the further surprises which even an advanced science may have in store for us ; and psychology is by no means an advanced science.

In the present condition of human knowledge, therefore, either to assert or to deny the universal reign of law is a mark of prejudice ; the rational man will regard the question as open. All perennial controversies, such as that between determinists and believers in free will, spring from a conflict between opposing passions, both widespread, but one stronger in one man and the other in another. In this case, the conflict is between the passion for power and the passion for safety, because if the external world behaves according to law we can adapt ourselves to it. We desire the reign of law for the sake of safety, and freedom for the sake of power. Common-sense assumes that law governs inanimate nature and one's neighbours, while freedom is reserved for oneself. In this way both passions are gratified to the full. But philosophy demands some more subtle reconciliation, and is therefore never weary of inventing new ways of combining freedom with determination. The sceptic can merely observe this struggle with detachment, and he is fortunate if his detachment does not degenerate into cynicism.

It has always been customary, and since the time of Kant it has been thought even respectable, to invoke moral considerations in support of freedom. While, however, the sceptic has a good case as against the dogmatic believer in the universal reign of law, he is not likely to admit the opposite claim that a dogmatic disbelief in this principle is helpful to morals. If he is a sceptic worthy of the name, he will begin by saying that no one knows what beliefs are helpful to morals, or even whether beliefs have any noticeable influence on conduct. But if he is a student of

history, he will observe that, as a practical postulate, belief in natural law has borne good fruit by producing such knowledge as we possess, whereas its rejection has been associated with intolerance and obscurantism. He will say that, though possibly there may be phenomena not reducible to law, this is a mere speculative possibility, of which it is unnecessary to take account in the actual practice of science, since science can only advance by the discovery of laws, and where (if anywhere) there are no laws, there is also no possible science.

In our own time, the old battle of materialism persists chiefly in biology and physiology. Some men of science maintain that the phenomena of living organisms cannot be explained solely in terms of chemistry and physics; others maintain that such explanation is always theoretically possible. Professor J. S. Haldane may be regarded, in this country, as the leading exponent of the former view; in Germany it is associated with Driesch. One of the most effective champions of the mechanistic view was Jacques Loeb, who showed (*inter alia*) that a sea-urchin could have a pin for its father, and afterwards extended this result to animals much higher in the scale. The controversy may be expected to last for a long time, since, even if the mechanists are in the right, they are not likely soon to find explanations of all vital phenomena of the sort that their theory postulates. It will be a severe blow to the vitalists when protoplasm is manufactured in the laboratory, but they will probably take refuge in saying that their theories only apply to multi-cellular organisms. Later, they will confine vitalism to vertebrates, then to mammals, then to men, and last of all to white men—or perhaps it will be yellow men by that time. Ordinary scientific probability suggests, however, that the sphere of mechanistic explana-

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tion in regard to vital phenomena is likely to be indefinitely extended by the progress of biological knowledge.

Psychology, which might have been expected to be more opposed to materialism than any other science, has, on the contrary, shown decided leanings in that direction. The behaviourist school maintains that psychology should only concern itself with what can be seen by external observation, and denies totally that introspection is an independent source of scientific knowledge. This view would make all the phenomena with which psychology is concerned physical phenomena, thereby conceding to materialism the utmost of its claims. Apart, however, from other difficulties, there is the difficulty already noted, that the data of physics are sensations, which are infected with the subjectivity of the observer. Physics seeks to discover material occurrences not dependent upon the physiological and psychical peculiarities of the observer. But its facts are only discovered by means of observers, and therefore only afford data for physics in so far as means exist of eliminating the observer's contribution to the phenomenon. This elimination is not an easy matter. It might be argued, on philosophical grounds, that it is impossible, and this is no doubt true if *complete* elimination is meant. But to a certain extent the problem can be treated scientifically, without raising metaphysical issues. It is then found that subjectivity is of three kinds, physical, physiological, and psychical. The first of these is satisfactorily dealt with by the theory of relativity: the method of tensors is its complete theoretical solution. The second and third are perhaps not really distinct; they can be dealt with in so far as one man's perceptions differ from another's, but it is difficult to see any method of eliminating subjective elements in which all men are alike.

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There is one other respect in which psychology has been tending towards the point of view advocated by materialists. We used to hear much of such supposed faculties as "consciousness," "thought," and "reason." Many modern psychologists, following William James, are inclined to dismiss "consciousness" as a term destitute of any clear meaning. "Thought" and "reason," meanwhile, are found to be analogous to processes of learning among animals, which are ultimately reducible to the law of habit. All this, of course, is still controversial; but if it should prove correct, the psychological difficulties of materialism will be greatly diminished.

The conclusion of the above discussion would seem to be that, as a practical maxim of scientific method, materialism may be accepted if it means that the goal of every science is to be merged in physics. But it must be added that physics itself is not materialistic in the old sense, since it no longer assumes matter as permanent substance. And it must also be remembered that there is no good reason to suppose materialism metaphysically true: it is a point of view which has hitherto proved useful in research, and is likely to continue useful wherever new scientific laws are being discovered, but which may well not cover the whole field, and cannot be regarded as definitely true without a wholly unwarranted dogmatism.

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