

NEW BOOKS

Philosophy and the Physicists. By L. S. STEBBING. (London: Methuen & Co. 1937. Pp. xvi + 295. Price 7s. 6d.)

Professor Stebbing's book is intended to assess the philosophical value, if any, of the numerous works in which certain eminent scientists have expounded to the general public what they consider to be the implications of recent developments in mathematical physics. The writers whom she mainly discusses are Sir James Jeans and Sir Arthur Eddington. She complains, with some justice, that they both "approach their task through an emotional fog," and both "present their views with an amount of personification and metaphor that reduces them to the level of revivalist preachers." This is a severe judgment, but it appears to me to be amply borne out by my own experience in reading their works, and by the quotations which Miss Stebbing gives. I find myself in complete agreement with her remark on p. 18, that "the fundamental objection to the modes of expression so dear to Eddington and Jeans . . . is that such writing obfuscates the common reader whilst pretending to enlighten him."

The two writers under discussion are, as Miss Stebbing recognizes, of very different calibre when considered as contributors to philosophy. There is no evidence that Jeans has any serious contribution to make, and Miss Stebbing disposes of his puerilities in a couple of chapters. This massacre is too much like knocking down a sitting bird to be of much interest, and Miss Stebbing devotes the rest of her book to the more sportsmanlike exercise of peppering Eddington as he flits from one metaphor to another. No one who has read Eddington's works can doubt that he has a genuine interest in philosophical questions, and one suspects that he may have something of importance to say about them. But any philosophically trained reader is troubled by two defects. The first is stated by Miss Stebbing on p. 55. "He has nowhere expounded his philosophical ideas in non-popular language." It is therefore very difficult to know whether his ideas are as confused as his language often is. The second defect, which Miss Stebbing does not explicitly mention, is this. Most of the problems which Eddington discusses lead at the first or the second move into territory with which professional philosophers have long been familiar. This is full of linguistic and other pitfalls, many of which have been discovered, mapped out, and fenced round by philosophers in the course of ages. Anyone who enters these regions without having studied the most recent maps, and without knowing and using the technical apparatus which philosophers have devised in order to reduce the risks of exploration, is almost certain to fall into fallacies himself, or to lead his followers into them. Now there is no evidence in Eddington's writings that he has made the least attempt to prepare himself for philosophical investigation by studying the work of experts in the subject. (His naïve use of the mouldy old metaphor of the "telephone-exchange," e.g., is a case in point.) Of course no one can blame a man for not studying a foreign subject when he has been engaged in making the most profound and original contributions to his own science, which has been changing and advancing with unprecedented rapidity. And no one wants Eddington to stick entirely to his last and renounce his interest in philosophy. Still, the fact remains that his lack of technical philosophical training, however excusable it may be, is a most serious handicap to him in his excursions into philosophy.

The result of all this is that Eddington does lay himself open to very serious criticisms from a competent and clear-headed thinker with a thorough knowledge of contemporary analytical philosophy, such as Miss Stebbing. And it is very difficult to believe that all the *verbal* confusions which she

PHILOSOPHY

undoubtedly detects and points out are *merely* verbal. In order that the reader may judge of this for himself, I will now go rapidly through Miss Stebbing's book, mentioning briefly the more important of her criticisms.

The book is divided into four parts. In Part I Sir James Jeans is disposed of, and we need not linger to dance over his corpse. Part II is entitled *The Physicist and the World*. It describes, in four chapters, Eddington's views of the relation of physics to the external world, and to human sense-experience. In the first of these, *Furniture of Earth*, Miss Stebbing deals severely with Eddington's talk about his "two tables," the familiar and the scientific one; with the statement that the table is not "really" solid; and so on. She suggests that it is as meaningless to talk of a "*scientific* table" as to talk of a "*familiar* electron or quantum." And she contends that, unless tables and floors were "really solid," we should not understand what was being said when we were told that certain other things or collections, e.g. a swarm of flies or the duckweed on a pond, are *not* really solid.

The second of these chapters, entitled *The Symbolic World of Physics*, contains an attempt to elucidate Eddington's statement that the aim of science is to "construct a world which shall be symbolic of the world of commonplace experience." Miss Stebbing begins by explaining Eddington's contention that there are three kinds of law—identical, statistical, and controlling. She then makes some criticisms on points of detail in Eddington's attempt to construct, from the minimum of data, a mathematical scheme in which the metrical, gravitational, and electro-magnetic fields are all included. She ends, however, by admitting that "*given the provision of adequate building material*, such an inclusive construction could be made." But she attacks Eddington's conclusion that such laws as the conservation of mass, energy, momentum, the law of gravitation, and Maxwell's equations, are mere truisms and not controlling laws. I think that her doctrine can be stated as follows. Beside the three kinds of law distinguished by Eddington, there are certain observable regularities in human sense-experience. She proposes to call these "natural laws," as contrasted with Eddington's "laws of Nature." Eddington pays lip-service to the importance of these, but Miss Stebbing thinks that he fails to take them seriously. Actually the concepts of mathematical physics were constructed and the laws of Nature were formulated in view of these natural laws. And, even if it had been possible in theory to start from the other end and construct an abstract system of mathematical physics in which the concepts and the laws are so interconnected that the laws are truisms, there is no guarantee whatever that anything would have been found in our sensible experience to answer to the concepts and to obey the laws.

An important point which Miss Stebbing makes in this chapter is that there seems to be some kind of mystification in Eddington's writings due to the metaphorical word "building." There seems to be a suggestion that, because physical scientists "build" the system of concepts which is theoretical physics, therefore in some sense everyone of us "builds" the external world to which these concepts apply.

In the next chapter, *The Descent to the Inscrutable*, Miss Stebbing tries to discover the senses in which Eddington uses the phrases "the familiar world," "the external world," "the scientific world," "the physical world," "Nature," "the world of physics," and "the spiritual world," and how he supposes that these worlds are related to each other. What she finally condenses from clouds of metaphor may be roughly summarized as follows. The *external world* is known only as that which is capable of "sending messages" along nerve-fibres to people. These fibres are themselves part of the external world, and one end

NEW BOOKS

of each fibre leads into the brain of some person, which is, presumably, also a part of the external world. Each person's mind is inside his head, and the inner end of each fibre is "in consciousness." Each mind thus "receives the messages" which are conveyed from the external world through nerve-fibres to its brain. It then and there, without being conscious of doing so, "transforms" and "dresses up" the messages in spatial, substantial, coloured, scented forms. And finally it becomes conscious of these products of its own unwitting action. The *familiar world* is the world of chairs, tables, trees, and the common things of daily life. But, in consequence of the theory about the external world, the messages, the transforming, and dressing-up, etc., Eddington concludes that the familiar world is a delusion, spun by the mind of each of us for himself under the mistaken impression that he is just translating messages from the external world. The two phrases, "the *scientific world*" and "the *world of physics*," are almost certainly synonymous. But it is extremely difficult to know what is meant by "the *physical world*," and how it is related to "Nature" and to "the world of physics." Miss Stebbing quotes a number of passages which show the difficulty in discovering what Eddington means by these terms. The most plausible view of his meaning seems to be that the physical world is a complex of metrical symbols, that these symbols "shadow" the familiar world, but that experience as a whole contains more than can be shadowed by metrical symbols.

Naturally Miss Stebbing has little difficulty in making hay of all this talk of "messages," "mind-spinning," "editors," "shadowing," and so on. Eddington seems never to have asked himself the question: "If the relation between the external world and the familiar world and myself were as I have stated, how could I possibly *know* or have *any rational ground for believing* it to be so?" He seems never to have considered seriously what is involved in the metaphor of "messages," "symbolizing," and "decoding." I think that it is in this part of his philosophy, more than in any other, that his lack of familiarity with the work of competent professional philosophers has let him down.

These criticisms are carried further in the next chapter, called *Consequences of Scrutinizing the Inscrutable*, which Miss Stebbing prefaces with a cryptogram concealing a quotation from Eddington's writings. She begins by pointing out, quite correctly, that "Eddington has not attempted, and has never felt the need to attempt, to deduce religion from modern physics, or to base religion on scientific discovery." His contention is that physics itself, as a science, requires a certain supplementation which the physicist as such cannot provide. Physics is concerned only with "pointer-readings" and their interconnections. These correspond in certain ways to sensible objects in the *familiar world*, but the latter are merely products of "mind-spinning." It seems obvious to Eddington that the pointer-readings and their interconnections must, as he puts it, be "attached to some unknown background" in the *external world*. E.g. colours, which he regards as mental products, symbolize electro-magnetic waves in the world of physics, and electro-magnetic waves in turn symbolize something in the external world whose intrinsic nature is unknown.

Miss Stebbing naturally asks: "How, on Eddington's own principles, can he know or even suspect that physical entities symbolize anything whatever?" She carefully analyses Eddington's examples of the antiquarians who discover a book of completed chess-games, after all knowledge of chess has been lost; of decoding cryptograms; and of assigning certain call-signals to certain wireless-stations. She points out that in every such case it is essential for the deciphering individual to have certain detailed knowledge to which

PHILOSOPHY

there could be no analogy in the case of an individual who treats a physical entity as a symbol of an unknown something.

Lastly, even if one did somehow acquire the idea of an "unknown background," and did somehow come to believe that physical entities symbolize items in it, how could one hope to learn anything further about the items which they symbolize? Eddington's answer seems to be as follows. There is one sensible object, viz. one's own brain, such that the pointer-readings which correspond to it in the world of physics symbolize something that is known to oneself *directly* as a thinking and willing subject. The suggestion is that this can be generalized and extended to the objects symbolized by other sets of pointer-readings. Miss Stebbing's criticism is as follows. No one is aware of *his own* brain either as a sensible object or as a set of pointer-readings, though a person may be aware of *another's* brain as a set of pointer-readings. Each person is directly aware *only of himself*, and never of another, as a thinking and willing subject. Hence no one is in a position to make the identification which Eddington postulates.

Part III is concerned with Causality and Human Freedom. In the first chapter Miss Stebbing explains how the problem presented itself to Huxley and to Mill. (There is a delightful misprint in the Bibliography on p. 288, where a synthetic "eminent Victorian" is exhibited under the name of "Thomas *Hill* Huxley." Miss Stebbing confesses that she cannot abide Huxley, and I should like to believe that this is what has caused her to conflate him with Green.)

In the second chapter Miss Stebbing explains what is meant by a "deterministic scheme of law," with reference to the Laplacean ideal calculator. She explains that it has room for statistical laws, but that it regards them as derivative from deterministic laws. She then gives an account, first of Bohr's model of the atom, and then of Heisenberg's Uncertainty Principle; and shows how they are incompatible with a completely deterministic scheme of law. In quantum phenomena the Laplacean calculator could not begin his calculations, because he could not know the initial conditions precisely; and this lack of knowledge would not be due to any defect in his mind or his instruments, it would be inherent in the very nature of physical measurement. We have now to accept statistical laws which are not derivable from deterministic laws. She ends the chapter by saying that "the discovery of the uncertainty relations does involve a considerable change in our attitude to determinism," and by expressing a doubt whether it has precisely those philosophical consequences which Jeans and Eddington believe it to have.

In the next chapter Miss Stebbing considers the consequences and tries to justify her doubt. She reduces the inquiry to the following three questions: (1) Is there any sense in which it is true to say that science *has been* based on determinism? (2) What is the connection between determinism, prediction, and rationality? (3) Why should there be such glee, in some quarters, and such gloom, in others, at the rejection of determinism?

The discussion of the first question is lengthy, and not, I think, very well arranged. In the course of it Miss Stebbing says that she herself feels difficulties in the notion that statistical laws are fundamental; that she is not sure that these difficulties may not be due to prejudice; that she is open to conviction; and that this notion will not become clear until it has been associated with a satisfactory theory of probability in general and of *a priori* probability in particular. This seems to me to be a good point. Next she observes that we did not need to wait for the Uncertainty Principle in order to know that all prediction by means of physical laws is uncertain. Even if we could have kept to the deterministic scheme, our belief in any alleged law would have

NEW BOOKS

been at best highly probable opinion and never certain knowledge. She thinks that Eddington has made statements which are likely to mislead his readers on this matter. Then she enumerates and discusses four different alternatives in connexion with the interpretation of Heisenberg's Uncertainty Principle. She thinks that Eddington accepts the third of these, and Heisenberg the second, which, in her opinion, excludes the third. The fourth is her own suggestion, and I must confess that I do not understand it. In two successive paragraphs on p. 202, referring to this fourth alternative, she says (a) that it would be generally admitted that space and time, "in any ordinary sense," *have no significance in the microphysical domain*, and (b) that "we encounter only bodies that are *very large compared with an electron*." It is not easy to reconcile the clauses which I have italicized in these two statements. Lastly, Miss Stebbing makes a severe, and in my opinion wholly justified, criticism on the extremely confused and confusing use which Eddington makes of the word "inference," with special reference to his statement that "the world of physics is populated with *inferences*," and to his muddled remarks about "the shadow of the moon on Cornwall in 1999" being "already in the world of *inference*." All these discussions are interesting and important; but I am not left at the end of them with any very clear idea of Miss Stebbing's answer to her original question, viz. "Was science ever based on determinism?"

After this long discussion of her first question, Miss Stebbing considers that she is justified in answering her second question in a few lines. I gather that she agrees with Eddington that intelligibility is not bound up with a scheme of deterministic laws, and that it is quite compatible with the Uncertainty Principle and with the ultimate laws of physics being statistical.

Her third question may be taken along with the next chapter, entitled *Human Freedom and Responsibility*, for "the glee of some" at the recent setback to physical determinism is due to the fact that they think that physics now leaves room for freedom and responsibility, whilst formerly it did not.

The point with which Eddington is specially concerned here is the following. Certain bodily movements, such as intelligent speaking and writing, express the conclusions of processes of reasoning. Others are actions or abstinences which accord with a resolution which has been made after a considerable mental struggle. Now Eddington is concerned with the possibility that such bodily movements are not *completely* determined by physical causes. He assumes that, if they were so determined, they could not be *also* determined in any degree by the mental processes, such as reasoning and resolving, which led up to the experience which these movements express. If, on the other hand, they are not completely determined by physical causes, these mental processes may have been essential factors in their causal ancestry. This is, of course, the view of common sense, and it seems to be part of what we mean when we hold ourselves responsible for our speaking, writing, and keeping or breaking of resolutions.

Now Eddington admits that the Principle of Indeterminacy does not leave nearly a wide enough loophole to make any practical difference here. He has to postulate a measure of *macroscopic* indeterminacy in the case of human brains and nervous systems, which the principle will not guarantee. Miss Stebbing insists on this fact, and considers that Eddington is altogether on the wrong line. She holds, so far as I can understand, that the only hopeful line of attack is to show, *not* that physics can be reconciled with the fact of responsibility, but that no reconciliation is needed because there is really no conflict. She is inclined to think that Eddington tacitly accepts the uncritical dualism of the plain man; that this leads to pseudo-problems; and that what is needed is a radical discussion of the notion of a psycho-physiological *person*

PHILOSOPHY

and of the distinction which a person draws between himself and his environment.

In the earlier part of Chapter X Miss Stebbing discusses the notion of responsibility on her own account, and mentions and criticizes recent attempts by Mr. Wisdom, Prof. L. J. Russell, and the present reviewer to analyse it and to trace its implications. Mr. Wisdom's treatment is described as "curiously old-fashioned"; and a criticism on it by Miss Helen Smith, which may be annihilating in its full context, but is certainly not very convincing as quoted by Miss Stebbing, receives extremely high marks. I think we may summarize this part of the book by saying that Miss Stebbing here confines herself to "warming the teapot," but that she does this with such virtuosity that we are encouraged to hope for another book in which she will make delicious tea.

Lastly, she is inclined to think that the Uncertainty Principle and the correlated changes in physics have one and only one legitimate bearing on the question of freedom and responsibility. They reinforce, in a particularly obvious way, a fact which is well known to all competent philosophers, but is constantly ignored in popular discussions on free-will and determinism, viz. the fact that "compulsion" is no part of the meaning of causal determination. And they give the quietus to the notion of the physical world as a kind of machine, an image which has often been carried over to human beings, and has played an important and detrimental part in the free-will controversy. "Nothing could be a more inadequate image for a human being," says Miss Stebbing, "than a pot or a machine, unless it be a hazy collection of qualities accidentally collocated and labelled with a name."

The fourth Part, which concludes the book, is entitled *The Changed Outlook*, and consists of two chapters. The first of these is concerned with the Second Law of Thermodynamics, and with Eddington's suggestion of an "entropy-clock" in the human brain, which gives us our notion of the direction of temporal process. Miss Stebbing considers that this suggestion is a silly solution of a meaningless problem. She asks the pertinent question: "If increase of entropy is the criterion of the distinction of earlier from later, how was it discovered that entropy increases *as time goes on*?"

The last chapter deals in a deservedly destructive way with the attempts of some foolish people to extract a tonic for their religious or ethical ideals from the latest speculations and discoveries of physics.

In conclusion, I would express the opinion that we owe a debt of gratitude to Miss Stebbing for absenting herself for a while from the felicity of her own proper studies in order to do a much-needed work of intellectual scavenging. The labour itself cannot have been particularly pleasant for her, and she must often have felt that she might be better occupied than in clearing up the messes made by amateur philosophers. But at the end of it she must have enjoyed something of the exhilaration of a good housewife who has at last completed her spring-cleaning; and, were it not for the ill-omened associations of the phrase, we might congratulate her and her readers on the house being now "swept and garnished."

C. D. BROAD.

Time and its Importance in Modern Thought. By M. F. CLEUGH. (London: Methuen & Co. 1937. Pp. x + 308. Price 12s. 6d.)

This work was written as a thesis for the degree of Ph.D. in the University of London. Happy is the university that can extract such learning from its candidates for research degrees!