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ON UNDERSTANDING PHYSICS

by

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*And therefore most times, is the poverty of human
understanding copious in words, because enquiring
hath more to say than discovering....*
Augustine, 'Confessions'

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P R E F A C E

THIS BOOK is based on a course of lectures on the logic of physics given during the last few years to graduate students of physics at McGill University and is offered in the hope that the interest of physicists in particular and scientists in general may be drawn to developments in modern philosophy which promise to be of great importance to learning. These developments are largely due to Dr Ludwig Wittgenstein. Though his writings and teaching have commanded the attention of those interested in mathematical philosophy (to use Russell's term), they are certainly little known by experimental scientists. Wittgenstein's *Tractatus Logico-Philosophicus* is hardly the book one would expect to attract the interest of working scientists, for in order to understand it one really requires the aid of philosophical discussion to explain the thoughts that are expressed in it, and besides, it has not been understood even by some professional logicians. In his Cambridge lectures since 1929, Wittgenstein's method of exposition has necessarily differed from that of the *Tractatus*, quite apart from any changes of view from what is expressed there; much of his teaching is by means of discussions. This seems to be the right way to teach philosophy; a book is of use only as a source of topics for discussion.

During the years 1929–31, I attended Wittgenstein's lectures in Cambridge and recently have had the pleasure of reading in manuscript, sent to me by Dr Wittgenstein, his lectures given during the session 1933–4. The present book is not intended in any way as a report of these lectures, but naturally it bears evidence of their influence, and also of the influence of private conversation with the man whose friendship I am happy to possess. Hoping that the general philosophical reader will in the near future have the opportunity to consult Wittgenstein's own writings, I have hardly dealt at all with questions that naturally belong to the philosophy

class room which is the proper place to wage ‘the fight against the fascination which forms of expression have over us’. My main interest is physics, and what is written here presents the results of my reflections in clearing up my own understanding of physics. Some of my readers are likely to be irritated by the form of presenting the subject-matter of this book, and will probably feel that a book on the philosophy of physics should resemble a book on mechanics, beginning with ‘the simplest conceptions’ and working up to ‘more complicated ideas’. If in the course of reading this book they are disabused of this prejudice, they will be freed from a very cramping form of thinking philosophically about science. The form chosen should make it clear that there is no question of a textbook or a treatise, and equally that this book is intended primarily for readers who are familiar with physics.

It is widely recognised by leading physicists that the training of young physicists in our universities should not be limited to modern knowledge but that senior students should be brought to interest themselves in the history of their subject—of the men and of the development of ideas. On the other hand, although it must be admitted that those in favour are enthusiastic, there is no such unanimity about the need for developing interest in the philosophy of physics nor indeed agreement as to the meaning of the term. It is unfortunate, therefore, that history and philosophy should be grouped together in connection with science courses at some universities. The only justification for the association of philosophy with science in the training of scientists is that it is of some definite use—that there is some technical value in the intellectual discipline of philosophising. Indeed, one can advance the weightiest of reasons for discouraging the training of a scientist in traditional philosophy, namely, that it will unfit him for the work of scientific investigation either by encouraging wild speculation, and developing literary facility in its expression, or by making him an expert in ‘logic chopping’. It is because scientists can be provided with a method in approaching the criticism of their subject, that philosophy in the sense of Wittgenstein (or as Wittgenstein

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puts it, “that activity which is one of the heirs of what was once called philosophy”) has a proper technical value for scientists. From the point of view of training scientists, the most important task is to show the limits of achievement to be expected of philosophy. Not only what is beyond the scope of philosophy must be indicated, but that some definite goal can be attained by philosophical activities. In this way we should gradually eliminate from the outlook of scientists two points of view that do little credit to the profession: first, the view that philosophy can accomplish nothing of value, and second, toleration of the type of professedly philosophical writing which accompanies popular expositions of modern science, under the guise of synthesising knowledge, for some religious end.

I am well aware that in maintaining that it is necessary in the first place to show the limits of achievement to be expected in philosophy, one is certain to incur reproof at the hands of not a few professional philosophers. It may seem an impertinence on my part to write boldly on matters which some of my philosophical friends wish to preserve intact in their traditional muddle. Perhaps it is forgotten, however, that the great philosophers of the past always had in mind the solution of the problems they raised, and would be appalled at the thought that they had produced an indestructible cud for academic rumination. Surely we can settle philosophical problems now, if questions that cannot be settled now do not belong to philosophy; and when we ask what we mean by the words we use, we have the right to expect a clear explanation—although not necessarily a simple one. This is the sense in which I approached these lectures on philosophy for physicists, and I offer no apology for having ignored nearly completely the history of philosophy and the modern writings of scientists on the philosophy of science. The great value to physicists in coming to understand Wittgenstein’s method, even if they are unversed in the technique of symbolic logic, is that they will become clear about symbolism in general and consequently more clear about physics itself. Probably no subject is more badly taught than mechanics in its intro-

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ductory stages, that is, whenever it is a question of explaining the method of representation to be employed. To remove the confusion of thought to which this is due is one of the important objects of training some physicists in philosophy. It is a necessary prelude to any attempt to eliminate obvious intellectual discomfort that has been associated with the recent development of the subject to describe atomic processes.

Thus, on the one hand, I have aimed at interesting physicists in philosophy in Wittgenstein's sense, on the other I have attempted to show its value for clarifying physics—especially mechanics which is the logical backbone of the subject. In this book are discussed among others some of the logical problems that have been thrown into prominence during the development of atomic mechanics, and the reader will find that the treatment here differs from that to be found in the writings of mathematical physicists and others who have dealt with them. The important step is that these matters should be regarded as logical problems; one might say that whether the analysis is complete or not will show itself in the same way as correctness or error in a mathematical theory, but of course the use of language is a more complicated affair than mathematics.

W. H. WATSON

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