CHAPTER I

DISCIPLINE IN PHILOSOPHY

No physicist who has made personal contact with the Cavendish Laboratory will have difficulty in recognising the phrase 'Get on with it' which has served to stimulate many research workers there. Sometimes the words have acted as a goad to irritate still further a man who has seen many unfruitful hours pass in his struggle with recalcitrant matter. But, apart from its private implications, this simple English sentence sums up a point of view which does not readily translate itself into the entertaining literature of popular science and speculative philosophy. 'Getting on with it' implies not only a definite job to be accomplished and a method for doing it, it insists that all activities which do not contribute to the speedy accomplishment of the task are to be firmly set aside. It emphasises the professional point of view as opposed to the dilettante's. It does not aim at discouraging thought and reflection, but it does have in mind the suppression of speculation which is not directed towards immediate experimental investigation. The work of the physicist is to find what happens in the world, and he is not doing that work when he engages in metaphysical speculation or indulges in omnibus discussions, however pleasant these may be. Not unreasonably a builder does not wish to see his bricklayers engaged in talking politics when they ought to be laying bricks, and with the same point, a director of research is interested to have the physicists under his charge lay the bricks of the structure of their science. The physicist, however, is not in the happy position of the bricklayer in that no one takes the trouble to assert the importance of bricklaying for philosophy or of philosophy for bricklaying, whereas at the present time the interest of philosophers in physics and of physicists in philosophy is greater than at any time in the last two hundred years. Indeed, at the end of last century,

with very few exceptions, the attitude of physicists was one of indifference, if not contempt, for metaphysical inquiry. This temper of mind was strongly condemned by Hertz who wrote, in the Introduction to his *Principles of Mechanics* (p. 23):

> A doubt which makes an impression on our mind cannot be removed by calling it metaphysical; every thoughtful mind has needs which scientific men are accustomed to denote as metaphysical.

To-day, physicists and mathematicians have produced much philosophical literature which, however, is in striking contrast to the attitude we have just noticed of the professional workers in their laboratories.

Of course, when one examines the philosophical prejudices of physicists and mathematicians one finds a great variety of belief and soon discovers that not all of them attach much importance to their own particular point of view. For every young man who is seriously interested in philosophical questions, there are perhaps ten, representative of all ages, who have an attitude of benevolent indifference and toleration. Most of the older scientists who are interested in philosophy, however, zealously uphold one of the views, either, that physics helps the philosopher to present a picture of the world which is important in the religious sense, or that philosophy is somehow the basis of mathematics and physics. The existence of this diversity of opinion makes one doubt whether the subject-matter which engages the attention of professional philosophers has anything at all to do with physics and mathematics. How can it be said that philosophy, as traditionally understood, is of technical value to scientists in their everyday work when it seems to be the case that the majority of them rarely give philosophy a moment's thought? If philosophy were of technical value to physicists, it is reasonable to suppose that physicists would not be able to function until philosophy, in so far as it affects physics, had been summarily dealt with, for philosophical problems that are technically important for physicists must be solved in the

course of the development of physics. In the history of physics there have actually been instances of this process, but in each case the philosophical atmosphere which at first pervaded the controversy has dispersed in time, and the final achievement is now seen as a modification or clarification of physical theory. The history of the changes which have brought about the clear statement of theory may be forgotten without loss to the student subsequently learning the subject for the first time. In this respect the natural history of physical theories is mirrored in the history of all branches of knowledge, and in the experience of individuals. If I am puzzled in learning the differential calculus, because I have not yet clearly formed the ideas to be learned, it is not necessary for me to recall that confusion at a later time when I have become clear about the matter and wish to use my knowledge. When one is puzzled one is aware of problems which one does not know how to solve although it seems essential to do so. These problems set by the sense of unclearness are not solved but removed when the source of confusion of thought has been discovered, and one really understands.

When new theories arise in physics they do not always appear with the clarity which is later imposed on them by refinement of the ideas and removal of misleading or contradictory expressions in the exposition of them. The questions which show the need for clarifying the theory are essentially philosophical questions, although they will only be recognised as such and engage the interest of philosophers if they are simple enough and of sufficiently general importance. For example, one would not usually call philosophical the problem that arises in the statement of Faraday's law of electromagnetic induction,* but one does refer to the philosophical problem of relative motion.

Philosophical problems, generally speaking, concern

* Faraday's law is often stated in terms of the rate of change of the number of lines of magnetic induction linked with the circuit in which the e.m.f. is induced. It is puzzling to recognise just where this statement differs in effect from that in terms of number of lines cut per second by the circuit, and what exactly is meant by linkage.

matters with which everyone is acquainted. For this reason, perhaps, there is an appearance of triviality about them. Nevertheless, it is also true to say that one is impressed by a philosophical problem; I do not refer to impressiveness resulting from literary skill in stating it, by which effects are produced that belong to the art of the orator and are out of place in arduous inquiry. In order to show what a philosophical problem is and how simply it may be stated, one cannot do better than turn to the words of Augustine who expressed with magnificent directness how he was puzzled about 'time'. The following is Pusey's translation, which hardly does justice to the essential modernness of the original.

> For what is time? Who can readily and briefly explain this? Who can even in thought comprehend it, so as to utter a word about it? But what in discourse do we mention more familiarly and knowingly than time? And, we understand, when we speak of it; we understand also when we hear it spoken of by another. What then is time? If no one asks me I know; if I wish to explain it to one that asketh, I know not; yet I say boldly, that I know, that if nothing passed away, time past were not; and if nothing were coming, a time to come were not; and if nothing were, time present were not. Those two times then, past and to come, how are they, seeing the past now is not, and that to come is not yet? But the present, should it always be present and never pass into time past, verily it should not be time, but eternity.
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> *Confessions of St Augustine*, XIV, 17.

Philosophical problems differ from ordinary physical problems in this respect: we have a method by which to solve the physical problem, and when the problem is stated we know what kind of answer to expect; but the philosophical problem solves itself when we are shown that we were mistaken in the answer we expected, and are forced to clear up the grammar of our language. Hertz clearly analysed such a situation in connection with the philosophical question as to the nature of electricity.

> Weighty evidence seems to be furnished by the statement which one hears with wearisome frequency, that the nature of force is a mystery, that one of the chief problems of physics is the

investigation of the nature of force and so on. In the same way electricians are continually attacked as to the nature of electricity. Now, why is it that people never in this way ask what is the nature of gold, or what is the nature of velocity? Is the nature of gold better known to us than that of electricity, or the nature of velocity better than that of force? Can we by our conceptions, by our words, completely represent the nature of anything? Certainly not. I fancy the difference must lie in this. With the terms 'velocity' and 'gold' we connect a large number of relations to other terms, and between all these relations we find no contradictions which offend us. We are therefore satisfied and ask no further questions. But we have accumulated around the terms 'force' and 'electricity' more relations than can be completely reconciled amongst themselves. We have an obscure feeling of this and want to have things cleared up. Our confused wish finds expression in the confused question as to the nature of force and electricity. *But the question is mistaken with regard to the answer which it expects.* It is not by finding out more and fresh relations and connections that it can be answered but by removing the contradictions existing between those already known, and thus perhaps by reducing their number. When these painful contradictions are removed, the question as to the nature of force will not have been answered; but our minds no longer vexed will cease to ask illegitimate questions.*

In making this comparison between an ordinary scientific problem and a philosophical problem we have given a special meaning to the term 'philosophy', emphasising the critical as opposed to the speculative activity of philosophers. Another way of stating the point of view is that the problems of philosophy are logical problems only, and that metaphysical inquiry is based on misunderstanding of the possibilities of language. To assert this is not to undervalue the work of the great metaphysicians of the past, but to point out the road along which progress is being made in modern philosophy. One might say that philosophy is emerging from the alchemy stage of asking for something it *cannot* have, into the disciplined age which corresponds to the era of chemical science, when the chemist, instead of trying to transmute base metals

* Introduction to *The Principles of Mechanics*, pp. 7–8.

into gold, is content to study them all and find their proper uses. The importance which has always been attached to philosophical questions is being attached now in a new way. It is no longer a matter of the halo of mysticism and of its intellectual counterpart, the unification of all knowledge, but is just the kind of importance which a carpenter sees in having his tools sharp or which an engineer has in mind when he says it is important to know how this or that machine works. It is the importance which every physicist feels in understanding clearly the set of ideas he has to use in describing physical phenomena.

In philosophy there are no physical facts which the teacher has to convey to the students under his guidance: whereas in physics, the student must be told what others have found to happen in the world. The student of philosophy already knows how to speak in the manner that is understood by his fellows in everyday affairs. When he begins philosophy, questions are asked which he can answer without learning new facts about the world. It is true the teacher may have difficulty in getting him to see clearly distinctions to which he had not previously given attention. Just as there are many things which we pass by the roadside without attending to them, but which we cannot fail to observe when we are told to look, so there are logical distinctions, prohibitions and possibilities which are exhibited to us when we reflect on the use of language, and it may often help to have someone give the hint where to look.

It must be the nature of philosophical problems that their solution does not have to await the becoming of facts. It must be irrelevant to philosophy what actually happens in the world. If this were not so how would philosophy differ from the sciences whose business is with facts? It has been suggested, evidently in order to leave a place for a philosophy concerned with facts, that somehow or other the facts of science require to be interpreted and that "everyone may claim the right to draw his own conclusions from the facts presented by modern science". As if to remove all possibility of doubt the same writer also states: "This chapter merely

contains the interpretations which I...feel inclined to place on the scientific facts and hypotheses discussed in the main part of the book."* We may ask what 'conclusions' can be legitimately drawn from the statement of physical fact that are not part of physics and are not or will not be drawn by physicists, and in what sense can it be said that a statement of fact requires interpretation? No one who understands the meaning of the sentence 'I had bacon and egg for breakfast this morning' feels the need of interpreting it. Yet physical facts are described in this way. Once the sentence is clearly understood no further statement is required to interpret it. The popular exposition of complicated physical and mathematical ideas is necessarily incomplete and leaves the reader bewildered whenever the explanation does not make the matter clear to him in language which he understands. It is this bewildered reader who is invited to make his own interpretation of the facts presented by modern science and to make an emotional reaction serve in place of the intellectual process of arranging his thoughts in clear order.

Whoever has grasped the point of view of the above criticism will see how it is a mistake to think of philosophy as a possible superstructure raised on the sciences. As an example of this 'super-science' theory of philosophy we may quote the following statement from the article on 'Philosophy' in the *Encyclopaedia Britannica* (13), vol. XXI, p. 41:

> Philosophy claims to be the science of the whole; but if we get the knowledge of the parts from the different sciences, what is there left for philosophy to tell us? To this it is sufficient to answer generally that the synthesis of the parts is something more than that detailed knowledge of the parts in separation which is gained by the man of science. It is with the ultimate synthesis that philosophy concerns itself; it has to show that the subject-matter which we are all dealing with in detail, really is *a* whole consisting of articulated members....The sciences may be said to furnish philosophy with its matter, but philosophical criticism reacts upon the matter thus furnished and transforms it. Such transformation is inevitable, for the parts only exist and can only be fully, i.e. truly, known in

* Sir James Jeans, *The Mysterious Universe.*

their relation to the whole. A pure specialist, if such a being were possible, would be merely an instrument whose results had to be co-ordinated and used by others. Now though a pure specialist may be an abstraction of the mind, the tendency of specialists in any department naturally is to lose sight of the whole in attention to the particular categories or modes of nature's working which happen to be exemplified, and fruitfully applied in their own sphere of investigation; and in proportion as this is the case it becomes necessary for their theories to be co-ordinated with the results of other inquirers and set, as it were, in the light of the whole. This task in the broadest sense is undertaken by philosophy, for the philosopher is essentially what Plato, in a happy moment, styled him, συνοπτικός, the man who takes a 'synoptic' or comprehensive view of the universe as a whole. The aim of philosophy (whether fully attainable or not) is to exhibit the universe as a rational system in the harmony of all its parts; and accordingly the philosopher refuses to consider the parts out of relation to the whole whose parts they are. Philosophy corrects in this way the abstractions which are inevitably made by the scientific specialist, and may claim therefore, to be the only 'concrete' science, that is to say, the only science which takes account of all the elements in the problem, and the only science whose results can claim to be true in more than a provisional sense.

First, as philosophy, according to this view, is to be based on scientific descriptions of the world, it is to be based on theories. Any of these is liable to be discarded in favour of another whenever new facts require the change. This means that such philosophy would decide nothing, for it is the scientists who will put forward the theory and decide whether it is convenient to adopt it. In the second place—and this really excludes the need for making the preceding criticism—whatever we say or write is *on the same level* as a statement of scientific fact or it is nonsense. For if we add to the statement of fact, what justification can be made of what we add—as opposed to something else we might have added but did not? In science we pass from facts and theories to other theories by the process of induction and justify the step either by comparing the new theories with new facts, or by deciding that, for reasons of economy of thought, the new theories are

more convenient. But a philosopher would have to offer a different kind of justification. He is not occupied with practical affairs. Consequently he cannot say 'if I do *so-and-so* then *such-and-such* would happen and of course I do not want that', or 'you see I wanted *so-and-so*, therefore I had to do *this*', which are examples of the forms of speech in which one justifies actions and decisions in everyday life. Whatever logical relation the philosopher asserts of the statement of fact and what he adds to it, he cannot escape the need to justify his use of the particular system of ideas in which, indeed, the logical connection in question is already set up. And to justify the choice of any particular system, he has no means which is not irrelevant to the purpose on hand and dependent on the accidents of his actual experience. This is what is meant by stating that everything that language permits us to say is on one level of admissibility.

Just as the superstructure theory of philosophy is untenable so is the notion that science is based on philosophy. It is true that science is based on a theory of a very general kind, but this theory is used for practical reasons and not on account of its plausibility to philosophers. In spite of recent attempts to set up idealism in place of the matter-of-fact view that there is an external world of things which we know through our senses it cannot be said that the materialistic conception has ceased to permeate the manner of thought of scientists. By its insistence on the atomic nature of facts, materialism provided a point of view for scientists which enabled them to restrict themselves to definite parts of experience which could be studied in sufficient detail to develop thoroughly tested theories. In spite of this, philosophers still argue in the following way (*Encyclopaedia Britannica*, *loc. cit.*):

> For it is evident from what has been said that the way in which we commonly speak of 'facts' is calculated to convey a false impression. The world is not a collection of individual facts existing side by side and capable of being known separately. A fact is nothing except in its relations to other facts; and as these relations are multiplied in the progress of knowledge, the nature of the so-called fact is indefinitely modified. Moreover, every statement of

fact involves certain general notions and theories so that the 'facts' of the separate sciences cannot be stated except in terms of the conceptions or hypotheses which are assumed by the particular science. Thus mathematics assumes space as an existent infinite without investigating in what sense the existence or the infinity of this *Unding*, as Kant called it, can be asserted. In the same way, physics may be said to assume the notion of material atoms and forces. These and similar assumptions are ultimate presuppositions or working hypotheses of the sciences themselves. But it is the office of philosophy, as a theory of knowledge, to submit such conceptions to a critical analysis, with a view to discover how far they can be *thought out* or how far when this is done, they refute themselves and call for a different form of statement, if they are to be taken as a statement of the ultimate nature of the real. The first statement may frequently turn out to have been merely provisionally or relatively true; it is then superseded by, or rather inevitably merges itself in, a less abstract account. In this the same 'facts' appear differently because no longer separately from other aspects that belong to the full reality of the known world. There is no such thing, we have said, as an individual fact; and the nature of any fact is not fully known unless we know it in all its relations to the system of the universe, or in Spinoza's phrase *sub specie aeternitatis*. In strictness there is but one *res completa* or concrete fact, and it is the business of philosophy as the science of the whole, to expound the chief relations that constitute its complex nature.

It would be a profitable philosophical exercise to examine what meaning must be given to the word 'fact' in each of its appearances in the above passage, in order to elucidate the confusion in which it stands at present. Many philosophers have attacked materialism on metaphysical grounds, but none of those who have done so has succeeded in producing a theory (or even admitting that what must replace materialism is a theory) which working scientists could be induced to use in thinking of their subject. The failure of all these attempts is to be traced to the fact that philosophers wanted to settle something that could not be settled in the way they adopted.

The business of philosophers has always appeared to be to settle questions of wide variety, but only in recent times has