Theology on the Web.org.uk

Making Biblical Scholarship Accessible

This document was supplied for free educational purposes. Unless it is in the public domain, it may not be sold for profit or hosted on a webserver without the permission of the copyright holder.

If you find it of help to you and would like to support the ministry of Theology on the Web, please consider using the links below:

https://www.buymeacoffee.com/theology

https://patreon.com/theologyontheweb

PayPal https://paypal.me/robbradshaw

A table of contents for *Journal of the Transactions of the Victoria Institute* can be found here:

https://biblicalstudies.org.uk/articles_jtvi-01.php

JOURNAL OF

THE TRANSACTIONS

OF

The Victoria Institute

OR

Philosophical Society of Great Britain

VOL. LXXIX

1947

LONDON:

PUBLISHED BY
THE INSTITUTE, 12, QUEEN ANNE'S GATE, WESTMINSTER, S.W.1

ALL RIGHTS RESERVED

870TH ORDINARY GENERAL MEETING

HELD AT 12, QUEEN ANNE'S GATE, WESTMINSTER, S.W.1, ON MONDAY, 24TH MARCH, 1947.

KENNETH WALKER, ESQ., M.D., F.R.C.S., in the Chair.

The following elections have been made: T. A. Hogg, Esq., Life Member.

THE SPHERES OF REVELATION AND SCIENCE. WHAT ARE THEIR LIMITATIONS IN RELATION TO EACH OTHER?

THE GUNNING PRIZE ESSAY 1946.

By R. E. D. CLARK, M.A., Ph.D.

I

IN the middle ages knowledge was a unity. Every branch of science was interpreted in terms of Theology, the queen of sciences. Free speculation was, indeed, allowed but only on condition that hypotheses that did not fit into the general framework were to be regarded as amusing pastimes rather than as sober truth. Men were free to work out the consequences of a heliocentric system in astronomy if they wished to do so but they were not free to say that the heliocentric system was true and the geocentric false. To adopt such an attitude was to set oneself up against the teaching of learned theologians and was therefore an indefensible act of pride. The task of the investigator was to invent hypotheses to "save appearances" (*salvare apparentias*), that is to say to cover the observed facts adequately, not to provide explanations of the nature of things (*in esse et secundum rem*).

Modern science was born when men like Bruno and Galileo boldly asserted that their hypotheses were not *mere* speculations but that their studies were actually leading to ultimate truth. It was this claim that at once produced friction with the church. In addition, the church has always stood for a policy of secrecy.

Speculations, even if they were not asserted to be true, could be published only for the benefit of learned men. Attempts to bring them to the attention of the masses were forbidden lest they should prove dangerous in undermining the church's authority. Much of the early friction between science and religion was caused by the fact that men of science had the temerity to assert, not only that experiments and observations could lead men to truth, but that truth, once discovered, was to be made available for all.

As Sir Henry Dale has pointed out,[1] the fact that science won one of its first great battles against the policy of secrecy, is not irrelevant to the situation in our modern world. Today, as in time past, we find that certain scientific ideas are regarded as dangerous by the politicians, so that there is once again a determined attempt to reimpose secrecy. What the outcome of the present struggle will be we do not yet know. but many leading men of science are reaching the conclusion that the welfare of science is once again at stake.

We have seen that, until the beginning of the modern era, theology had everything her own way. She knew no limitations. She claimed an absolute right to insist that the view-points in all other subjects should be so adjusted that nothing should conflict with the dictates of the Church. Science, on the other hand, had no real freedom. The man of learning was free to speculate for the sake of speculation alone, he was not at liberty to claim that his speculations corresponded with reality unless they were also in agreement with the doctrines of the church.

Into this world the scientific renaissance introduced what must then have appeared to be as a fundamentally new approach to knowledge. Our outlook has now altered so greatly that it is difficult to realise the degree of originality involved.

When, today, we begin the study of a new branch of knowledge we often try to examine the facts before us in what we call an "unprejudiced" way. By this we mean that we must make a deliberate attempt not to carry over from our previous studies a large number of preconceived notions into which the facts can only be made to fit with the aid of a good deal of "special pleading." Rather than "teach" nature how to work, we try to let nature "teach" us.

---

[1] *The Mission of Science.* Presidential Address to the Royal Society, Nov. 30, 1945.

This attitude has become thoroughly ingrained in our manner of thinking. Even among people who profess no academic outlook, it has become almost proverbial to say that facts are more important than theories, which is, of course, an expression of the same idea.

When we examine the matter in further detail, we find that there have been several phases in the development of the new approach. In their early days the various sciences developed more or less independently. The fundamental ideas of mechanics, of magnetism, of electricity, and of chemistry were each chosen in such a manner as to make the actual facts of these respective sciences as intelligible as possible. It did not matter if, for instance, the attraction of magnets for pieces of iron, or of the earth for the moon, seemed unconnected with the attraction of hydrogen for oxygen. Forces of attraction and repulsion, ethers to convey these forces, magnetic poles, electric charges, unconnected units of mass, length and time, new types of valency binding atoms together, and many other things, were simply invented *ad hoc* as and when required and their appropriate laws were then determined. In this early phase, little or no attempt was made to prevent the multiplication of arbitrary starting points for scientific explanation. A scientific worker was free to postulate a magnetic pole simply because the properties of magnets could best be described in terms of such poles: he did not come to the study of magnetism imbued with the principles of mechanics and determined, at all costs, to explain the force between two magnets in terms of a rate of change of momentum.

At a later stage a reaction set in. By the middle of the nineteenth century it was recognised, wisely, that if new principles of explanation were allowed to multiply indefinitely, science would, in the end, cease to explain anything at all. In consequence it came to be regarded as highly unorthodox to introduce even one new entity or principle of explanation. It was implicitly assumed that the first investigators of science had discovered all the basic principles that could possibly exist and any innovator who tried to introduce another was at once met with the well-worn Latin tag: "*Entia non sunt multiplicanda praeter necessitatem*" (entities must not be multiplied beyond necessity)—the principle usually referred to as "Occam's razor."

But entities had already been multiplied beyond necessity—

beyond necessity, at any rate, in the light of later scientific developments. As science advanced, the various pigeon-holed ideas upon which it had been founded were extended in various directions and, at length, inevitably, the different branches of science began to impinge upon one another's spheres of interest.

The results of this " clash " between the sciences are now well known[1]. The propagation of light could only be explained by supposing that light consisted of vibrations in an ether which had a density of a million million times that of water and a rigidity much greater than that of steel. Magnetism also required an ether, but this ether had to be pictured as capable of streaming along tubes of force and so was entirely devoid of rigidity. It is hardly necessary to discuss the subsequent history of these theories here. The important point is that, at first, the various branches of knowledge, each making use of concepts invented for its own benefit alone, led to contradictory results as the various lines of enquiry were independently pursued. What happened at the end of the 19th century, was only an example of what has happened many times, both before and since, and of what is, in fact, still happening.

In a sense the " clash " between the sciences is closely parallel to the " clash " between science and religion. As Professor Dingle has ably urged[2], the languages of modern science and of religion are both attempts to describe and explain our experiences in the terms which seem most appropriate to the study at hand—sense data and religious experience. It is not unlikely, therefore, that when these studies are pursued, borderline cases will be discovered in which, at first sight, disagreement is apparent. Such disagreements become possible when religious and scientific explanations of the early ages of the world, of apparent recorded miracles, of unusual events involving the minds of men (*e.g.*, the conversion of St. Paul), and put forward from the two different points of view.

However, just as the disagreement, between the various sciences, has often been reconciled by subsequent, and more extended examination, so the religiously minded person has usually felt that, if all the facts were known, no disagreement

---

[1] See E. T. Whittaker, *History of the Theories of Aether and Electricity*, 1910.

[2] H. Dingle. *Science and Religion* (Union of Modern Free Churchmen), 1945.

between science and religion would ultimately remain. The doctrine that such an inconsistency is ultimately inconceivable, has, indeed, received a great deal of support from the surprising, and indeed wonderful, way in which unification between some of the sciences has already been effected. It is this fact which, to many minds, makes the "modernist" approach to the Bible seem unreasonable. The "modernist" theologian gives the impression that whenever he finds an apparent inconsistency he feel that it is the duty of the religious part of him to retreat. If the religious explanations of the early ages of the world or of the psychology of the religious life clash with the best conjectures of present day science—well, it is taken as a sure sign that religion, and not science, is transcending its proper limits. The Christian is told that he must be humble enough to admit that he has used his religious concepts in a sphere to which they cannot be applied. But if theology and science are both attempts to describe and explain experiences, why should religious explanations alone be confined rigidly to their own field? If disagreements result—need they disconcert us more than do the numerous disagreements between different branches of science? How does the "modernist" come by his mysterious conviction that further knowledge will not result in perfect reconciliation?

II

Thus the development of the physical sciences in reality gave rise to two schools of thought—only it chanced that the two schools were not contemporaneous but historically separated. First of all there were those who insisted that, when a new subject was being studied, it was legitimate to allow the subject itself to dictate what ultimate units of thought would have to be used in its development. Later, as the principle of "Occam's razor" came to be ruthlessly applied this policy was reversed. Instead of inventing new entities, desperate attempts were now made to explain the new in terms of the old.

Both these points of view had their influence upon the newer non-exact sciences—but here the two schools of thought have for long existed side by side. As we shall have to refer to them frequently, we shall, for want of better terms, refer to them as the *mechanistic* and the *ad hoc* points of view respectively.

According to the first, or *mechanistic* view, biology, being a complex subject, can only be understood in terms of the simpler

ideas of physics and chemistry. The biologist has no right to invent *ad hoc* categories of thought to explain phenomena in which he happens to be particularly interested. This point of view was, of course, that adopted by the naïve materialist for whom man was simply a machine, complex perhaps, but a machine for all that.

According to the second or *ad hoc* point of view the biologist has perfect freedom to introduce whatever fundamental principles will best explain the facts with which he has to deal. The right to do this has, of course, been claimed since early times—we find it in Aristotle's *entelechy*, in all classical systems of logic and ethics and, in our own age, we see its influence in the form of the various life forces, instincts, etc., which have been postulated times without number.

In the earlier part of the present century there was a tendency for the more unemotional and disciplined thinker to show an active dislike of the *ad hoc* point of view. It was claimed, and claimed rightly, that it tended towards undisciplined thought. It was always easy enough to postulate a psychic entity arranging molecules in the body, to explain sleep by a dormative principle or to dismiss conduct in terms of instincts, but how could such unbridled speculation be subjected to any tests whatsoever? Were not all these supposed explanations mere verbal ways of restating the original facts in polysyllabic words? If physics and chemistry cannot yet explain the obvious facts of biology which call aloud for explanation, may this not simply be because the latter science is still in its infancy?[1]

Despite the cogency of these objections, there have always been many biologists who were prepared to ignore them and recent developments in the physical sciences have, apparently, greatly strengthened their position. Today it is at last possible to see the early development of science in its historical perspective. We can now appreciate how the various physical sciences, leading to different and apparently inconsistent sets of fundamental ideas, have been combined by the principle of relativity. Magnetic forces, postulated to explain the phenomena associated with magnetism, are now seen to be a property of electricity in motion. Chemical affinity, invented to explain the combination

[1] Compare the scathing and amusing denunciation of much *ad hoc* scientific thought in E. B. Holt's *Animal Drive and the Learning Process*, 1931.

of chemical elements, turns out to be none other than the familiar force associated with the interaction of electric charges. Statistical mechanics have shown that the two concepts of *amount of heat* and *temperature* can be derived from the ordinary laws of mechanics.

In these and numerous other instances we see how different sciences have created their own concepts and have developed the laws of connection between them. In the first place the concepts were of an *ad hoc* character, but, in time, they were seen to be consequences of other and more fundamental branches of knowledge.

Facts of this kind have naturally encouraged the biologist to do what has already been done so successfully in other fields. Accordingly, he is today more insistent than ever before that he has a right to choose the concepts which he finds most convenient in his work and to leave to future scientific workers the task of reconciling his newly invented concepts with the established principles of science.

Thus *ad hoc* science has received a new lease of life. As examples of its development we may cite the psychology of Freud, with its welter of *ad hoc* concepts (*unconscious mind, ego, id, libido, complexes, etc.*) ; the idea of *gestalt* in experimental psychology around which a vast literature has already grown up (Thorndike, E. S. Russell, Köhler, Koffka, etc.) ; the *entelechy* of Driesch postulated to explain the development of the embryo, the idea of *organism as a whole* developed by J. S. Haldane and of *teleology* in nature (to be taken as existing alone without any implication of a plan or mind at the back of nature) sponsored by L. J. Henderson. Finally, mention should be made of the idea of *evolution* which also cannot at present be correlated with non-biological principles.

In these and many other instances we find that men of science have boldy invented *ad hoc* concepts and have attempted, with varying degrees of success, to discover the laws connecting them with one another. But in nearly every case they have been content to shelve fundamental questions as to the nature of the new concepts which have been so easily, and often uncritically, introduced.

The new drift towards *ad hoc* science has naturally produced a corresponding philosophy. In this connection the *holism* of General Smuts and more especially important still the *emergent evolution* of Lloyd Morgan must here be mentioned. According

to the last named theory we must conceive of nature as a series of hierarchies. The lowest level is that of atomic nuclei and electrons. These produce atoms, these molecules and these crystals. "Liquid crystals," complex liquid, fat and carbohydrate molecules and, finally, living matter, form yet further representatives of organisation levels. Living matter itself, starting with the most simple forms and passing upwards until we reach the mind of man, provides the more developed subdivisions of the hierarchy. At each level, so we are told, scientific laws appropriate to that level may be found. Some of these laws, so Morgan says, are deducible from the laws of matter found to hold at a lower level, but many are not and then the laws can only be discovered at the levels, or on levels still higher than those in which they begin to operate.[1]

In the so-called philosophy of dialectical materialism we find a closely similar attitude. Engels and Lenin had no patience with traditional materialism.[2] They claimed that when a physical quantity (heat, light, complexity, etc.) is gradually increased in a system, there must come a time when a new and unpredictable phenomenon is suddenly encountered. This is, of course, a statement of the Hegelian law that "quantity turns into quality" and on this view life is simply a property of chemical molecules which have a certain degree of complexity.

III

We have now considered two of the three possible attitudes which a scientific worker may adopt towards a new branch of study. When we ask questions about the limitations of science, it is obvious that we must first of all possess clear ideas as to what we mean by "science." If, on the one hand, our approach is primarily mechanistic, we shall very soon find that science is faced with limitations when it seeks to advance into new fields of investigation. Not only will limitations of a purely practical

[1] The physical examples Lloyd Morgan cited in order to illustrate these assertions were generally unfortunate. Thus, he was of the opinion (Gifford Lectures. *Emergent Evolution*, 1923, p. 66, etc.) that no amount of study of single atoms would enable us to predict the way in which they would group together to form a crystal or a liquid at a lower temperature. The very thing which Lloyd Morgan deemed to be impossible has since been accomplished. A study of the deviations of gaseous argon from the classical gas laws has enabled the exact positions of the atoms in the crystal lattice to be predicted successfully.

[2] See F. Engels *Dialectics of Nature*, 1940, etc.

kind be encountered immediately—for our science may be at too early a stage of development to enable it to deal with complex phenomena—but there will also be the much more fundamental difficulty that it will be unable to deal with sets of ideas of an unfamiliar character.

If, on the other hand, we are always prepared to adopt the *ad hoc* approach in science, it is clear that our science can know no limitations whatsoever. No matter with what phenomena we are dealing, it will always be possible to invent suitable categories of thought for the sole purpose of describing these phenomena and, if we can find (or think we can find) relations of any kind between the concepts so facilely invented—well, they constitute the embryonic form of a developing science. Clearly even religion is not immune from such treatment. The old mechanistic science was disposed to argue away the existence of spiritual values, the newer *ad hoc* science is simply prepared to accept them at their face value.

We must now consider briefly a third attitude which we may adopt towards a new line of scientific enquiry—the attitude implied by the word *positivism.*

According to the doctrine known as *positivism,* we can never know the real world behind appearances. All we should do, therefore, is to confine our attention to the things that we *do* know, the *sensa* of experience. It is useless, in physics, to try to find out anything about the ether, so we must express all our facts in the form that observers would see them and this involves giving up the idea of a velocity of an electromagnetic wave with respect to the ether. Similarly we cannot know, because we cannot determine, the precise position or velocity of a small particle so we must express ourselves only in terms of probabilities which, by taking a sufficient number of observations, can actually be measured.

Positivism has long had a certain vogue but the new developments in physics—though they have hardly tended to revive Mach's thoroughgoing scientific positivism—have had interesting repercussions on anti-theological thought. Many writers and thinkers are beginning to state quite blatantly that since man cannot reach the ultimate truth about things, spiritual values must just be accepted as we find them without asking any questions as to where they come from or how they arise. Olaf Stapledon[1],

[1] O. Stapledon. Essay in *Freedom of Expression.* Ed. H. Ould, 1945. p. 16. See also *In Search of Faith* Ed. E. W. Martin, 1943, etc.

for instance, compares these values to the primitive beliefs about the stability of the earth. We can accept the earth, he says, without having to believe that it rests upon the back of a tortoise which is, in turn, squatting on the back of another tortoise and so *ad infinitum*. So why not accept spiritual values without asking questions as to their origin ?

Precisely the same point of view has been put forward repeatedly with regard to the universe[1]. If we follow the tradition of positivism it becomes quite illegitimate to ask where the universe came from or how it was created. The only relevant fact is that the universe is here, so that there is no need to ask where it came from. In the same way teleology in nature can be accepted without attempting to account for its origin.

In recent years even right and wrong have been defined in terms of their influence upon evolutionary progress—a right course of action being of assistance to evolution and *vice versa*[2]. In this way the unobservable principles of right and wrong can be eliminated and in their place we are simply left with observable (or potentially observable) effects on evolution.

For the same reason it is often asserted[3] that the old discussions about mind and body are now completely out of date. No longer is it necessary to ask whether scientific evidence supports the view that mind is a spiritual entity inhabiting a material body, for from the modern point of view such a question is completely meaningless. Positivist science must confine itself to tangible things : the phenomenon of mind is definite enough but it is unscientific to invoke intangible souls and spirits which may prove to have no more objective existence than the 19th century ether. To ask questions about discarnate minds is to come to nature with preconceived ideas whereas the true investigator should keep his mind open and be prepared to learn from nature, not to force nature to conform to pre-arranged grooves of thought. "The chances are thousands to one that all our most carefully conceived ideas on these subjects are more false than true."[4]

[1] See, for example, H. Levy, *The Universe of Science*, 1932. Also H. Dingle, *Through Science to Philosophy*, 1937 and *The Laws of Nature*, (*Nature*, 1944, 153, 731, 758).

[2] C. H. Waddington, *Science and Ethics*, 1942.

[3] For example by W. W. Carington, *The Meaning of Survival*, Myers Lecture, 1935. Also by behaviourist psychologists in general.

[4] O. Stapledon in *Freedom of Expression*, *Vide supra*.

IV

From this discussion it will be seen that the *ad hoc* and the *positivist* attitudes towards science may both serve for the repudiation of theological ideas and, in point of fact, we often find that the two attitudes are held together in a single person's mind while both are supposed to represent the culmination of 20th century scientific thought. But, for all this, they are strange bed-fellows as we shall shortly see. The only real agreement between them lies in the fact that both of them enable people to avoid all discussion of the old problems of science and religion. Souls, discarnate spirits, freewill and the Deity Himself are unnecessary postulates if we are at liberty to invent *ad hoc* causative principles which operate only at the levels of organisation at which they are invoked. They are equally objectionable if it is the duty of the scientist to keep his science free from unobservables.

Nevertheless, despite the superficial agreement, the *ad hoc* and *positivist* attitudes are really mutually contradictory. This is at once obvious when we reflect that such ideas as *unconscious mind, psychological complex, evolution,* and many other similar concepts refer to things which are unobservable and should therefore be repugnant to the positivist. It is difficult indeed to resist the conviction that many modern writers use which ever of the two attitudes best serves the purpose of the moment when they wish to discredit theology. Professor J. D. Bernal's remark to the effect that " the invocation of God . . . . just because it can be done when faced with any intellectual or moral difficulty whatever removed any necessity for a rational treatment of the world "[1] is every bit as much a criticism of *ad hoc* science as of theology. Yet the *ad hoc* scientist often thoughtlessly repeats the criticism.

V

We have seen that both *ad hoc* and *positivist* science are all-inclusive schemes of thought which by their very nature can know no limitations in respect of theology or of any other branch

[1] *Aspects of Dialectical Materialism,* Watts, 1934, p. 92. Bernal is careful to explain that his criticism applies to many forms of science as well as to theology.

of study. The first invokes new principles as required, in order to explain phenomena in complex cases and in this way it succeeds in avoiding ultimate issues. The pious hope that a future Einstein will one day discover the fundamental relations between the new ideas and the old is a hope only and, as we shall shortly see, it is a hope that can never be realised. *Positivism*, on the other hand, avoids the asking of fundamental questions by the simple expedient of denying that they are of any interest and insisting that attention should be focused entirely on the things of sense. It is all-inclusive because it denies the existence of theology.[1]

The deficiences of these types of science are such that we may well ask why they have become so popular, seeing that neither of them really achieves the most fundamental aim of science —the satisfaction of human curiosity.

The reason is probably to be sought along the following lines. In the present century mechanistic science has reached an *impasse* —a fact freely admitted by nearly everyone today. The early hope of the materialist that mechanistic science would prove all-embracing has turned out to be false for its limitations have become obvious in a number of directions. The discoveries of the past twenty years have, in fact, made it practically impossible to conceive that any possible modification of the old science will enable it to explain all phenomena.

In this connection the work on the brain initiated by Lashley is particularly relevant. At one time it seemed possible to conceive of the brain as an enormously complex telephone exchange. Experiences made more or less permanent connections between the "wires," thus setting up "conditioned reflexes." Today this view is universally considered to be quite untenable. If memory is dependent upon connections between nerve fibres then, when the brain is partly destroyed, the fibres connected with a particular reflex, should either be disconnected or not disconnected. Now if a rat learns how to extricate itself from a particular maze, and a part of its brain is then destroyed, the memory loss is found to be dependent upon the *amount* of destruction and *not* upon the position of that destruction. Again, in man, there is only one part of the brain in which there is a rigid point to point connection between sensory fibres

[1] For a methodological type of positivism in which this is not the case, see later, p. 157.

and the cells of the brain, and that is in the occipital region, the cells of which are individually connected with the rods and cones of the retina. Yet, even here, when a squint develops, or when one half of the retina is destroyed, the mind can reorganise the entire meaning of the impulses which reach the brain, despite the fact that the physical connections remain unaltered.

Facts of this kind, to which we should add the experimental proof of telepathy in recent years, show only too clearly that mechanistic thought is unlikely ever to explain even the simplest mental phenomenon, let alone the existence of spirtual values or the sense of right and wrong. Bearing in mind the long history of enmity between science and religion that was stirred up in the latter part of the 19th century, it is natural enough that rationalistic scientists of today have abandoned mechanistic science which, by its very failure, obviously opens the door widely for the entry of theological ideas. It is no wonder that the *ad hoc* and even the positivist attitudes to science have found favour.

We must never forget, however, that in extending its scope in these ways, science is weakening its powers. *Ad hoc* hypotheses become increasingly of a purely verbal kind, affording no real understanding of the factors involved. Moreover, from the point of view of the traditionalist the new attitude is simply a case of special pleading. Instead of trying to find out whether such entities as minds do in fact exist apart from matter, it is pretended that all such questions are meaningless, whereas they are actually assumed to be untrue. The new attitude of empiricism is not what it professes to be—an attempt to let nature "teach" us. The *ad hoc* scientist is at least as guilty of coming to nature with his mind already made up as ever the traditionalist was.

VI

In the preceding sections we have examined, mainly without comment, arguments which can be brought forward in favour of the *ad hoc* and *positivist* attitudes in science. Since a study of the limitations of science is so largely bound up with the type of science under consideration, it will not be out of place if at this point some brief comments upon these arguments are introduced.

We saw in the first place that the *ad hoc* attitude can be justified by an appeal to the early history of physical science. Here *ad hoc* concepts have often ultimately become absorbed into the main body of knowledge and, in any case, progress would have been impossible without them. How far is this analogy justified ?

First of all it should be said, at once, that physics itself has not been unified to the extent that is commonly imagined. It is still impossible to understand how gravitational forces are related to magnetic and electric forces. Even when we come to those branches of physics which have been unified by relativity, it is important to notice that the unification is numerical only. The history of science shows how relatively easy it may be to get numerically correct results on the strength of false premises —the ancients were able to calculate the speeds of rotations of the heavenly spheres which were supposed to carry the stars and by this means they were able to predict astronomical phenomena successfully. In modern times, as O'Rahilly[1] has reminded us, the mathematical equations of modern electromagnetic theory can be derived from quite a variety of mutually inconsistent starting premises. By way of example it is well known that both corpuscular and non-corpuscular theories of electricity give rise to the same equations of flow when a relatively large amount of electricity is under consideration.

Physical science sometimes deals with concepts which are so far removed from everyday life and so difficult to correlate with one another, that the attention of the physicist is often devoted, not towards effecting a true unification of ideas, but towards achieving numerical agreement only. This is particularly the case in the well-known method of *dimensional analysis*. In this, after a physical phenomenon has proved too difficult for analysis, a mathematical method shows how its *magnitude* may be expected to vary when a change is made in the magnitudes of the various physical factors with which it is supposed to be connected. Remarkable numerical predictions are thus obtained but the agreement throws little light upon *how* the phenomenon in question occurs. For instance, we may discover by dimensional analysis, that the drag on a ship moving through the sea will vary with the square of its velocity but we

[1] A. O'Rahilly, *Electromagnetics. A Discussion of Fundamentals*, 1937.

may still be in the dark as to why there is any drag at all. Only in a very Pickwickian sense can it be said that a problem solved by a dimensional method is a true unification of science.

Now relativity is a special case of dimensional analysis.[1] It ignores the true physical connections between various branches of science but, by a mathematical device, it shows how correct magnitudes of physical quantities can be calculated. This is the true significance of Einstein's achievement and, looking at the matter from this point of view, we can at once see how foolish it is to suppose that the theory of relativity will ever have its counterpart in biology. Few, indeed, of the new *ad hoc* ideas of the inexact sciences provide us with anything that can be measured and so it becomes impossible to understand how any future investigator will ever be able to side-track the scientific connections between them and the older science, and confine his attention to measurements.

Of course, all this is no argument against *ad hoc* science as such. It would certainly appear that an *ad hoc* approach to reality is often necessary, and indeed unavoidable, though some will prefer not to use the word "science" in connection with knowledge obtained in this way. At all events, if we build up a system of knowledge based upon *ad hoc* ideas, we must learn to recognise it for what it really is—a mere gleam of light in an all-prevailing darkness. Moreover, we must never forget that if knowledge gained by the *ad hoc* method is to be dignified by the term "science," then we also have every right to speak of theology as a science, for theology also demands that we should recognise and use a set of concepts suited to its own field.

It is profitless, of course, to debate the meaning of mere words: the important point is that *if* we use the word *science* to cover the inexact as well as the exact sciences, we must remember that the meaning of the word is not the same in the two cases.

Nowhere, perhaps, can this difference in the meaning of common words be better illustrated than in connection with the study of causation.[2] Let us suppose that a physical experiment which involves, shall we say, the flow of a liquid through

[1] J. Mackaye, *The Physical Cause Back of the Relativity Equations.* Journal of the Franklin Institute, 1934, 218, 343. In this connection the interesting criticism of relativity by A. Eagle (Trans. Victoria Inst., 1938, **70**, 177) should be noted.

[2] See R. O. Kapp, *Science versus Materialism,* 1940, p. 202 ff. for an able discussion of the meaning of causation and explanation in scientific thought.

a tube, is carried out in the laboratory. A mathematical analysis indicates that the flow should take place at a certain rate but experiment shows that the actual rate differs from that calculated by a significant amount. What is the attitude of the exact scientist to this result? Does he claim to have explained the phenomenon on the ground that he can put forward various plausible suggestions as to the factors which ought to be considered? Of course he does not. He admits candidly that the phenomenon cannot yet be explained.

The *ad hoc* scientist, on the other hand, claims to have explained a phenomenon if he can show, even in the vaguest way, how it might be connected with other factors. In sociology, biology, and most forms of psychology, there is no pretence whatever at numerical agreement: it is enough to point to certain antecedents and it is not even considered necessary to say why these supposed causes should have produced what, in fact, they did produce and not something totally different. The existence of man, for instance, is explained on an evolutionary basis but no one asks why man as we know him and not some totally different creature was formed: far less is an attempt made to show that an evolutionary process would necessarily produce men of a particular size. Biological "explanation" is clearly what the physicist would describe as a lack of explanation. The word *explain* is used in different senses in the exact and inexact sciences.

Again, this is not of course said in criticism. Biological problems are so complex that little better could be achieved in any case. The mistake that has been made is one of *attitude*. The *ad hoc* scientist sometimes lacks a sense of humility: he takes over the words of the exact sciences and forgets their original meaning. He fails to notice that even the best explained fact of biology must, from a physicist's point of view, be regarded as unexplained.

The different language employed by the two kinds of science is confusing to the layman. In some instances the old language of the exact sciences seems to have been taken over quite deliberately to create such confusion—rationalist writers at all events frequently trade on the confusion. All arguments to the effect that science can explain, say, religious experience or some historic miracle, are at root dishonest attempts to make the public believe that the word "explain" here has the very definite meaning that it possesses in the exact sciences, whereas

those who make these claims should know very well that this is not the case.

Of course if, by *explain*, we only mean that we can suggest antecedent partial causes, no dishonesty is involved. In this limited sense we commonly "explain" the acts of a criminal by pointing out that he did not have a fair chance in life owing to his bad home conditions. Again, we "explain" the conversion of St. Paul by saying that, after watching the heroic death of Stephen, his unconscious mind must have been hard at work and that a sudden realisation that he was "kicking against the pricks" was not unlikely to occur in the case of so intelligent a man. All "explanations" of this kind are legitimate in their way, provided we realise fully what we mean by "explanation." If our ideas on this point are clear we shall not be tempted to argue that other causes must be excluded—we shall not be so self-satisfied as to suppose for one moment that our tentative suggestions imply that the criminal was not responsible for his acts or that God did not reveal Himself to St. Paul at an opportune moment.

The degree to which people can become satisfied with a fragmentary explanation is often quite surprising. It is worth while pointing out that even in physics no one would think of arguing in so careless a manner. If we discover that the period of oscillation of a drop depends on the radius of the drop raised to the power of one and a half, we do not dream of supposing that the radius "explains" the period or that other factors, such as the physical properties of the liquid out of which the drop was made, are not involved. Thus scientific explanations often cannot be treated as comprehensive even when exact numerical agreement with prediction is obtained. We should naturally be all the more on our guard against a claim to understand every factor involved when we are dealing with inexact sciences and *ad hoc* concepts.

Another point, all too little realised, is that by employing scientific concepts at all, we are selecting material for which scientific explanation is possible. To use a well-worn analogy due to Eddington, we do not expect a fisherman with a net of very large mesh to argue that there are no small fishes in the sea because he never catches any. No more can we discover truths about a spiritual world if our methods of investigation precludes them from the start. And this is precisely what the

modern *ad hoc* method is deliberately designed to do. Lloyd Morgan is honest enough when he says: "From a strictly emergent point of view any notion of a so-called 'alien influx into nature' is barred."[1]

However, provided all these points are kept in mind, there is no reason why certain types of *ad hoc* science should not be welcomed by the Christian. Nor can we set any bounds upon such science which may freely invade the field of theology and revelation if a clearer understanding is thereby attained. When God has seen fit to reveal His truths to men, we may be sure He has not done so arbitrarily—often, as in the conversion of St. Paul, the way is prepared by antecedent factors which it is the business of science to discover. It is not science itself but the fantastic and ill-thought out claims that are often made in its name that merit opposition from all reasonable men.

VII

Something may now be said about the doctrine of *positivism.* According to the positivist, modern physics has shown us that it is not possible to reach the "absolute truth" about what lies at the back of nature. We should not, therefore, waste time in attempting the impossible: we should confine ourselves to discovering relations between things which we can actually observe.

This argument rests on a failure to distinguish between measurable and purely qualitative truths. No statement of the value of an incommensurable number, such as π, is absolutely true, but it *is* absolutely true that the ratio of the circumference to the diameter of a circle is constant in a two dimensional world. Similarly, statements about function and form may often be absolutely true—a correct statement of the function of a kidney or the structure of glucose will remain true for all time. It is only when we seek the answers to purely numerical questions, such as, for example, "what is the velocity of the earth through the ether?" that we find that we cannot reach answers which are true for all observers.

Again, as Max Planck and Bavink have pointed out,[2] the positivism of Ernst Mach and his followers only ended in

---

[1] *Emergent Evolution*, p. 13.

[2] See B. Bavink, *The Anatomy of Modern Science*, 1932, p. 31 ff.

scientific stagnation. The chemist Ostwald, even so late as 1904,[1] was arguing that since atoms were not observable, science must do without them. With great ingenuity he tried to show how Dalton's classical proofs of the atomic theory could be understood in terms of the facts of observation alone. But the existence of atoms was soon confirmed without a possibility of doubt. The amazing faith of the organic chemist who had not hesitated to draw plans of thousands of complicated organic molecules constructed out of unobservable atoms, proved to have been more than justified. Since that time every science can add scores of instances in which unobservable postulates were later found to have a physical reality.

Attempts have sometimes been made to separate observables into two classes, those *theoretically* unobservable (*e.g.*, motion through the ether) and those *practically* unobservable (*e.g.*, the back of the moon or the inside of the earth). It is claimed that physics is only concerned with the elimination of the first kind. A detailed discussion of this subject would be out of place here but it would seem to the writer that such a distinction assumes that we possess an infallible way of distinguishing between the two kinds of unobservables. We must not forget that until the beginning of the present century it was supposed that atoms and molecules, being far smaller than the wave length of light, were theoretically unobservable. Again, in our own day, the violent controversy which has been aroused by Milne's cosmological theories has largely centred round differences of opinion as to how various classes of unobservables should be classified.

The frantic attempts[2] which have been made by a few writers to restate the Machian heresy that science is only concerned with observable entities, nearly always breaks down when it is asked whether a star exists before it has been seen through a telescope. Interminable discussion as to the meaning of the word "exist" in such a case is profitless: the fact is that positivism is not a tenable attitude and even the philosophers

---

[1] *Journal of the Chemical Society*, 85, 506.

[2] Professor Dingle, in his *Through Science to Philosophy*, never really faces this issue. Dr. Philipp Frank, who still bravely adheres to the positivist faith in his book *Between Physics and Philosophy* (1941), writes as if encumbered by unanswerable perplexities and frankly admits that very few, if any, scientific workers in the world, outside the original Vienna circle, agree with him.

and the very few scientists who sponsor it rarely or never apply it consistently. Few of them would, for instance, be prepared to consider a criticism of history or of evolution on positivist lines.

Thus, although we may willingly admit that positivism has a certain value when we are dealing with the purely numerical problems of physics, it would seem that there is little reason for extending the principle. Science, like religion, must often use the eye of faith and seek to peer into realms which lie beyond anything about which our senses can give us direct information.

One further remark on the subject of positivism may be made before leaving. Positivists may be of two kinds. Probably most of them would claim that all discussion of what lies beyond our senses is profitless. This is the variety of positivism which we have been discussing up to the present point. But sometimes we find positivists (Professor Dingle is an example) who claim only that *science* should not discuss an unobservable world but allow that religion has a right to do so.

As the grounds for believing in positivism are, in any case, so slender, this point of view hardly merits detailed discussion here. But it is of interest because this second type of positivism involves the view that science and revelation are confined to different realms. According to this view, therefore, science and religion must be kept in idea tight compartments of the mind and cannot impinge upon one another.

VIII

We must now turn to consider the sphere of revelation and its limitations, if any, with respect to science.

When, at the beginning of the scientific era, science first began to meet with conspicuous success in its attempts to explain the workings of nature, organised Christianity reacted towards it with a tragic lack of wisdom. At times attempts were made, by persecution and threatening, to restore the *status quo*. When that failed the church gave way on point after point.

A case[1] can be made out for supposing that the church systematically fought every new scientific idea which impinged, even in a remote way, upon theology or the Bible, until her opposition became so ridiculous that it had to be abandoned.

[1] A. D. White, *History of the Warfare of Science with Theology*, 1896, etc.

It has, however, been shown[1] that this interpretation is unfair. At any given epoch, radically new scientific ideas were always opposed to the prevailing science of the time and it was only natural that the church, in common with all other non-specialists in scientific matters, should have accepted the best available evidence of the time. Even in the case of the evolution controversy, perhaps the most bitter and tragic controversy that ever took place between science and religion, the battle was at first confined to powerful personalities in the scientific field and in no way involved religion.[2]

Whatever the historical truth on such matters may have been, the impression was created among the masses and deliberately fostered by rationalist propaganda, that the church was fighting a losing battle. The fantastic definition of a miracle as "an event that cannot be explained by science"[3] was exploited to the full. The rationalist press presented the public with the spectacle of science cheerfully explaining every new problem with which she was confronted, so that the number of events which could properly be called miraculous became fewer and fewer. Obviously science was conquering all along the line. Religion—once the proud possessor of all knowledge—was now, we were told, being forced to take refuge in one very small compartment of human experience—the part that deals with mysticism and religious intuition. And the science of psychology was already invading this sacred sanctuary. No reasonable person ought to doubt that it would ultimately be as successful here as it had been everywhere else.

Such is the picture drawn by the self-satisfied rationalist. We have already examined its falsity from the scientific side. We have now to examine the matter from the religious angle.

It is clear that religion has involved itself in difficulties through its attempts to find a rigid definition of miracle. To a discussion of this question we shall therefore now turn.

---

[1] J. Y. Simpson, *Landmarks in the Struggle between Science and Religion*, 1925.

[2] C. E. Raven, *Science, Religion and the Future*, 1943, R. E. D. Clark, *Darwin: Before and After*, 1948.

[3] Unfortunately this definition has often been seriously put forward by Christians. Thus C. A. Row, in a well-known popular work of Christian apologetic, defines a miracle as "an event for the occurrence of which no forces, or combination of forces, is able to account," (*A Manual of Christian Evidences*, 10th ed., 1899, p. 8). Examples of such indiscretions could easily be multiplied.

At this point a consideration of the idea of causation in the Bible is of great importance. Throughout the Scriptures we continually observe that no systematic attempt is made to distinguish between the direct and the indirect working of God. Let us take a few examples, almost at random, from the Book of Psalms. God is the cause of storms (xxix); all nature is full of His loving kindness (xxxiii, 5); He created the heavens (xxxiii, 6) and now fashions the hearts of all men (xxxiii, 15); He sends calamities (lx, 2), rain and harvests (lxv, 9) and performs wonders for the sake of His people (lxvi, 6, lxxvii, 14, lxxviii, etc.); He provides food for the young lions when they roar after their prey (civ, 21); He has beset us behind and before and laid His hand upon us (cxxix, 5).

In the New Testament we encounter precisely the same outlook. We are frequently reminded that God showed His power throught the miracles of our Lord and that He finally raised Him from the dead. Nevertheless, according to the teaching of our Lord in the Sermon on the Mount, it is God who sends day and night, who clothes the lilies of the field and who sends His gifts of rain and sunshine upon the evil as well as upon the good.

From a study of these and similar passages the conclusion has been reached[1] that neither the ancient Hebrews, nor the Hebrew Christians of a later day, were familiar with our sharp distinction between the natural and the supernatural. This view certainly cannot be correct, for if this were really the case it is difficult to see why *particular* works of God—the plagues of Egypt or the resurrection of our Lord—should have been regarded as more significant than, shall we say, the clothing of the grass of the field. It is certainly clear that from time immemorial a distinction has been drawn, at least occasionally, between the natural and the supernatural. Even the Egyptian magicians (Ex. viii, 19) were prepared to say "This is the Finger of God" about certain events but not about others.

Nevertheless, the passages that have been cited certainly show that in the Hebrew-Christian tradition nothing like the stress was placed upon the distinction between the natural and the supernatural that came to be placed upon it in later times. The Bible says fearlessly that all events which are for the good of

[1] John MacMurray, *The Clue to History*, 1938.

man and beast are done by God. As a rule it does not attempt to distinguish clearly as to whether these events are performed by God in a direct or an indirect manner. Our Lord knew well enough that each day and night was not *separately* planned ahead by His Father: what He stresses is the fact that the general ordering of nature is the work of God.

Thus we see that, for the early Christians, as also for the Jews, God was seen to be at work throughout the whole of nature, sometimes directly but more often indirectly—for nature itself was His handiwork. In some cases (as in the resurrection of our Lord or the giving of the spirit at Pentecost) God's work was so immediate and so obvious that no one could reasonably doubt that direct interventions had taken place. But at other times—who could tell whether events were really miraculous? And, in any case, what did it matter? Enough that God had made the laws of the universe so that everything that happened for the good of His creation was a revelation of His character.

The rigid distinction between the natural and the supernatural is a product of later times—a natural development of the Biblical teaching to be sure, but not there from the beginning. The problem must soon have come to the fore in early Christian ages in connection with the miracles of the saints—for the church came to regard miracles as a prerequisite for canonization and it naturally became important to know whether unusual events in the lives of the saints were genuinely miraculous.

But as in other familiar instances, doctrinal development created serious difficulties. After centuries of argument, when the distinctions had at last been made with infinite subtlety and apparent finality, the development of science created a bewildering mass of new problems. The old astronomy, with its angels pushing the stars through the sky, collapsed like a house of cards. In time even the odour of sanctity—the miraculous sweet smell which exuded from the bodies of many of the mediaeval saints shortly before they entered Paradise—turned out to be nothing other than the production of acetoacetic acid and acetone caused by faulty metabolism in the diabetic. Even the bleeding host, that most awful of miracles in which the transformed element of sacramental bread revealed the sufferings of our Lord, turned out to be nothing more startling than the invasion of a bacillus. These and many similar instances showed how tragically the church had failed to draw the correct dis-

tinctions. No wonder that the growth of science seemed to place the Christian faith in a ridiculous light and to furnish the religious antagonist with the most effective weapon he had ever possessed.

The claims of rationalistic science against religion are thus seen to have been the result of an attempt on the part of the church to be wise above that which was written. Had Christians resolutely refused to pretend that they knew enough about nature to be able to distinguish between the natural and the supernatural, difficulties would never have been encountered. The Christian would have thanked God for every manifestation of His goodness: he would have spoken naturally of God who made the lilies of the field, the stars, the lightnings, the mountains, the rivers, the sunsets, the mineral veins and the works of good men. But he would never have pretended to know whether these works of God had come directly from His hand, or whether they might not have been innumerable stages between God the First Cause and the effects which give joy and gladness to the hearts of men. As a result he would have welcomed every reverent attempt to understand the means God has employed to produce the wonderful things that we see around us, and all arguments of the type "Natural law can explain this or that, so God is an unnecessary hypothesis" would have seemed stupidly irrelevant.

Thus, if the Christian Church could have been saved from the purely verbal wisdom of the middle ages with its almost unlimited intellectual conceit inherited from the ancients, no warfare between science and religion would ever have come about. Even the suggestion of the possibility of such a warfare would have appeared fantastically impossible. How irrelevant it might have been may be illustrated by means of a simple analogy. Suppose a girl receives a present through the post from her lover, what would she think of a sceptically minded person who told her that since she had only received the present from the postman she should cease to attribute it to the original sender? Would she not at once reply: "What does it matter whether he gave it to me himself or whether he used collectors, sorting officers, the railways and finally a postman to send it to me? His motives are the same in either case." In the same way science studies the means whereby God fulfils His purposes and no amount of study of the means can ever explain away the purposes themselves.

The Christian must insist, therefore, upon his right to interpret nature in the light of the revelation of God given by Jesus Christ. He must be completely free, even as Jesus was, to see the workings of God in any direction in which the teleological evidence indicates that He has been at work. There must be no question whatever of invoking God as an explanatory principle only when science fails to produce an explanation : the Christian outlook can recognise no limitations in relation to science. Only when our minds are free to see the working of God in any and every direction in which He may have been at work, shall our hearts overflow with thankfulness for the beauty of the world in which He has placed us for His glory.

This is the true Christian attitude towards the matter we have been discussing. When once it has been wholeheartedly adopted, it creates its own safeguard against narrowness and prejudice. For the Christian will realise that science also has an unlimited right to pursue her investigations of the immediate causes of things and he will rejoice in every fresh discovery she makes—unless it be a discovery for evil.

The Christian who returns to the early Hebrew-Christian tradition of thought will never forget, moreover, that when, in Holy Writ, we are told that certain things were done by God we are not told whether God saw fit to use natural means for accomplishing His purposes. So if it should turn out that some of the things which are generally thought to involve God's immediate creative power could, in fact, have come about by natural means, he will accept the discovery joyfully. In some cases this has already occurred—there is no reason to think that God performed a *special* miracle when He set His bow in the cloud as a token of His covenant that he would not again destroy the earth with water. But the Christian—and let us hope not the Christian alone—will rightly complain if, on the one hand scientific explanations are misused to eliminate God from His creation or if, on the other hand they turn out to be mere verbal subtleties which are neither scientific nor explanatory.

In addition to the danger of misusing religion in order to oppose science, there is also another danger. In science we sometimes find that a principle, sound as far as it goes, is misapplied to realms of knowledge for which it was never intended with results that are often harmful and ludicrous. Those who would see the working of God in nature are faced with an exactly parallel danger. Clearly we must not feel it incumbent upon

ourselves to suppose that *everything* in nature is to be explained in terms of the plans of God. Indeed, this will clearly not be the case. In achieving one plan, a score of unintended results may also follow of necessity. If we suppose, for example, that God deliberately made the world beautiful, then the beauty perhaps, of submicroscopic forms of life, which is unlikely to make man happy, may also have followed from necessity. Clearly every point must be considered on its own merits and we must be careful never to force facts into grooves into which they do not naturally fit. As an example of the type of detailed explanation of Providence of which we must ever beware, we may cite the mediaeval theory that God made the bed-bugs to wake us up in the morning and thus to save us from laziness!

While we must always be humble in our supposed understanding of the *details* of Providence, this does not mean that the religious interpretation can itself be thrown overboard on account of a few facts which do not fit readily within the general scheme. When we find that science fails to explain a phenomenon we do not abandon science. No more should we abandon our Lord's interpretation, because, on rare occasions, we do not understand how it can be applied to a particular problem. Rather must we continue to look for light and remember that the mass of evidence in support of a Divine plan in nature cannot be set aside because *we* are too dull-witted to see our way through certain difficulties.

Finally, just as the scientific approach fills our minds with humility when we contemplate how little we know, so the religious approach will produce the same effect. God's ways are greater than our ways and His thoughts than our thoughts, nor can we ever hope to do more than scratch the surface of the vast oceans of unknown truth that lie around us.

Discussion.

The Chairman said: Dr. Clark has performed a very useful service in defining the methods and the scope of science. Much of the conflict between science and religion has arisen from confusion on the subject of what is science and what is religion. It is therefore of the utmost importance that we should have a clearer idea of their respective provinces. In former days it was the church that stepped out of its province and dictated to men what they should believe

about the physical world around them. In these days it is often the scientists who repeat this error. The mistake is made not so much by the great scientists as by those of lesser calibre. Because science now speaks with great authority many people are misled by these irresponsible statements. Science has such great achievements to her credit that uncritical people have implicit faith in her pronouncements. It is therefore of the utmost importance that everybody should have a clearer idea of the *modus operandi* and the limitations of the scientist. Some people have made the definition of science so wide that they consider it to be tantamount to organised knowledge. If this were true, then, everything would come within the scope of the scientist, including what was once called the Queen of the Sciences, theology. As Dr. Clark has said : " It is not science itself but the fantastic and ill-thought-out claims that are often made in its name that merit opposition from all reasonable men."

I regard it as being the function of a Chairman to encourage discussion and I now leave it to others to speak on this important subject, " The Spheres of Revelation and Science." I am glad to see that there are many young people present and I would particularly invite them to give us their views.

Mr. CHARLES H. WELCH said : In the paper submitted by Dr. Clark is the statement : " If all the facts were known, no disagreement between science and religion would ultimately remain."

It should be held before the mind constantly that " Truth " is " Relationship," and when all relationships are known, all truth will be known also. If I say " No. 12, Queen Anne's Gate " I make a statement, but I can scarcely say that I have uttered a " truth." Such a statement cannot be approved or refuted, it neither affirms nor denies, and it is impossible to act upon it. If, however, I say " No. 12, Queen Anne's Gate is the address of the Victoria Institute," I utter a " truth," because I have discovered and affirmed a relationship.

The paper submitted by Dr. Clark while insisting on the separate spheres of Revelation and Science, very wisely urges all, whether Scientists or Theologians to remember that their discoveries, until related, will not lead them to the goal unto which each in his separate way hopes to attain.

WRITTEN COMMUNICATION.

Mr. W. F. SPANNER, wrote: When Dr. Clark states that the "church" has always stood for a policy of secrecy, I presume he means the Roman Catholic church. His statement is not wholly true of the Protestant Reformed churches which have insisted generally on freedom for learned men to investigate the truth, and have also been prepared to tolerate unlearned speculations by men who desired to air their own opinions. Such investigations hold out the possibility of enlarging the church's understanding of the sacred scriptures; but whilst this is true the churches loyal to the Reformed tradition have never allowed the special revelation given in the Holy Scriptures to be wrenched from their grasp. Care has also to be taken in exercising discrimination between what is genuine learning based on concrete evidence and what is merely fanciful speculation. I think the value of this paper would have been increased had Dr. Clark distinguished between the attitude of different branches of the church (*i.e.*, Roman Catholic, Lutheran, Reformed, and Anabaptist) to the question of freedom for science and speculation. Perhaps he will deal with this point in his reply.

It seems to me that whilst this paper has many excellences and Dr. Clark has placed us under a debt it does not quite succeed in giving a clear view of what it sets out to do, namely, define the limits between revelation and science. I think more attention is required to defining our terms. I take it that science is simply "classified knowledge," or "systematised knowledge"; and it has to be carefully distinguished from what is merely speculation. I think that theology is still rightly to be regarded as the "Queen of the sciences" becauses it deals with the systematisation of the highest knowledge of which man is capable, namely, the knowledge of God. Such theology falls naturally into two departments; natural theology which deals with the general revelation God has given to us through the ordinary course of nature, and special theology which deals with the special revelation of Himself which God has given in the Holy Scriptures, which revelation was added because of sin. Again, true theology must be distinguished from mere philosophical speculation dressed up as theology.

Revelation, I take it, is God's revealing of Himself to mankind and consists of general revelation given through the ordinary course

of nature, and special revelation given through the medium of the Holy Scriptures. The voice of conscience and the sense of the beauties and the joys of life (What man is there anywhere who does not count life to be valuable? This being so all men are under a self-confessed obligation to give thanks to God) are part of general revelation and if man were untainted by sin would be sufficient to give a complete knowledge of God as his Lord and Creator. The Holy Scriptures were necessarily added because of sin and to reveal God as Redeemer.

Agnostic scientists may benefit us greatly insofar as their efforts are genuinely devoted to an appraisal of the true facts of nature, but we may be seriously led astray if we do not take care to separate the facts from the fancies. We live in days when there is a strong tendency to endeavour to force facts to fit into preconceived fanciful theories in the interests of the prevailing Modernist philosophy which has as its root principle the glorification of man in place of the glory of God.

I have poorly expressed what I wanted to say, but trust it may assist towards a better harmonising of modern knowledge with faith.

To sum up on the basis of the foregoing remarks, I suggest that true science (carefully checked by close attention to the facts, and sifted from fanciful speculation) is best considered as the intellectual aspect of revelation. All of us according to the measure of the understanding which God has given unto us may behold something of the glory of God in the intellectual mirror called science.