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799TH ORDINARY GENERAL MEETING

HELD IN COMMITTEE ROOM B, THE CENTRAL HALL,
WESTMINSTER, S.W.1, ON MONDAY, APRIL 6TH, 1936
AT 4.30 P.M.

DOUGLAS DEWAR, ESQ., B.A., F.Z.S., IN THE CHAIR.

Before proceeding with the business of the Meeting, the CHAIRMAN made reference to the death on March 29th of the Rev. Harold C. Morton, M.A., Ph.D., one of their most valued Members, and read a Resolution which had been passed by the COUNCIL at their Meeting that afternoon as follows :—

Resolution.

“The President, Vice-President and Council of the Victoria Institute hereby record their great regret and sorrow at the death on Sunday, March 29th, 1936, of the Rev. Harold C. Morton, M.A., Ph.D.

Dr. Morton, who had been a member of the Society since 1925, served also on the Council, his mature, wise judgment on many matters being held in high esteem by his Colleagues.

In addition, he placed the Society as a whole under great obligation by contributing many invaluable papers on Philosophical subjects and by participating from time to time in the discussions.

They desire to add an expression of their very deep sympathy with Mrs. Morton and her family in their irreparable loss.”

The Resolution was then endorsed by all Members, Associates and friends present standing in silence as an expression of their sympathy.

The Minutes of the Meeting of March 23rd were then read, confirmed and signed, and the HON. SECRETARY announced the following elections :—
Associates : Dr. W. Thomson Walker ; Col. N. M. McLeod, D.S.O., M.C., late R.A.

The CHAIRMAN then called on Dr. R. E. D. Clark to read his paper, entitled “The Present Position with Regard to the Origin of Species.”

THE PRESENT POSITION WITH REGARD TO THE ORIGIN OF SPECIES.

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

THE advance of science in recent years affords indications that a theory of special creation of species may once again hold the field. But such a theory is not likely to become a part of science, for it is becoming universally recognised

that science cannot make use of the idea of creation. The aim of science is to find relations between events, and this means that for every event science wants to discover a cause. But God and creation cannot be thought of as caused; if they are invoked the string of causes must cease. It is the same with the conceptions of purpose and mind in living creatures. Most people agree that these exist and religion and philosophy must take them into account; but they must not enter scientific textbooks. It is not sufficient that a fact should be true in order that it may form a part of science.

A little consideration will show that this is no novel outlook. There are many cases in which perfectly true ideas must not be allowed to influence our method of living. The Bible recognises this. It tells us that no Christian is free from sin, but that we must live without allowing this belief to influence us: we must seek to be perfect as God is perfect. It would be wrong to say: "Since I cannot be as perfect as God, I need not seek perfection." Large numbers of other examples could be given. Thus there is a definite place for ideas which, though true, must never influence practice.

Science is akin to practice. It stands, not for a complete system of all knowledge, but for a method of attack—in short, for experiment. Thus it is natural that there should be certain ideas which it cannot use. It can use no ideas which do not suggest experiments.

It is for this reason that it cannot find a place for God, and so cannot interest itself in special creation. Science could almost be defined as the study of that part of nature which goes by itself and does not need God or even the minds of human beings. An example may make this clearer. An engineer builds a bridge and calculates that it will withstand such and such a stress. He finds that it collapses under a lesser stress—his science cannot explain why. If he is a Christian man he will not say "Science cannot explain this, it must be the hand of God." Instead, he will go through all his workings again in the hopes of finding a mistake. He may believe strongly in miracles, but that belief must never influence his actions in such a case as the above. No one could expect him to listen quietly to arguments proving the existence of miracles, as though this were relevant to such a situation. It would be absurd to tell him that he was fighting facts, or that it was his duty to sit down quietly and accept the

breakdown as a miracle. It is equally absurd to ask science to listen to the evidence of the working of God. Such ideas do not belong to science, though they may very well belong to the scientist in another capacity. It is this which Christians have so often failed to realise.

If, then, a belief in special creation is ever to become accepted again among biologists, it must be accepted by them as men, not as a part of their science. Their science will have to go on doggedly looking for causes, pushing things back farther and farther. When it reaches a stop it will not be interested any more. That is what has happened in physics and astronomy. We can push the universe back between a billion and ten billion years, but further than that it is not possible to go. What happened then was an event which looks very like creation by a mind, but science can only be interested in what happened after that event. Moreover, the scientist holds that the universe must be about the age mentioned, for it is only then that the idea of cause fails, and science must find causes as far back as possible. Yet common sense says that if there was a miracle a billion years ago, there is no improbability in the view that the miracle took place in much more recent times. It is only science as science which cannot allow such speculations.

Evolution has been studied a great deal in recent years, and evidence is slowly accumulating that if it is pushed back far enough it will reach a position very like that of astronomy. People used to point to the fossils and see in them a gradual evolution. The ancestor of the horse started off the size of a dog, and by and by it grew in size and its toes decreased in number. In the course of ages a creature of modern dimensions resulted. Several well-marked series of shell-fish showed a similar story. Sometimes these evolutions are gradual, each generation differing from the last in a hardly perceptible way, but often there are sudden jumps. The horse is gradual with regard to its size, sudden in the diminution of the size of its toes. This sudden type of change was not recognised at first. When it occurred it was easily explained away—the evolution might have been continuous in some other part of the earth. But now both types of evolution are recognised.

These records from the rocks suggested that all life must have sprung from the lowest forms. Aristotle's observation that the foetus in the egg goes through stages resembling lower forms

of life seemed to favour such a view. Then widely different creatures were found to be built upon the same general plan, so much so that human anatomy could be taught from the bodies of animals. There were parts of the animal frame which seemed to serve no useful purpose, but corresponding organs were useful in lower forms of life. These things also gave colour to the above theory. There seemed no alternative save evolution or the view that the devil hid the fossils to deceive, if it were possible, the very elect. Most people accepted evolution. Many Christians embraced the idea and sought to reconcile it with their faith. Generally they abandoned the first chapters of Genesis and decided that Christ was severely restricted by the errors of His age.

But in recent times science has only gone to confirm what common sense indicated all along, that evolution cannot explain the origin of species. Reproduction of living things, or rather of the *physical parts* of living things (for science has no knowledge of the soul), is a mechanical process. The mere fact that monstrosities result and can be produced experimentally long suggested that this was the case. The irradiation of the nuclei of cells by X-rays produces perfectly random changes, and investigation has gone to show that these changes are precisely the same in character as those which take place in nature. The fossil records confirm the same absence of design. Race after race changed in ways which resulted in their extinction. There was no evidence whatever that the hand of God was ruling these changes in "evolution," as many of the theologians had supposed.

Experimental and mathematical work in genetics have gone to confirm the existence of the two types of evolution, the gradual and the sudden—both occurring without design, at random. The gradual is determined by survival of the fittest, as Darwin supposed, the sudden by changes in the cells similar to those produced by artificial means. Thus evolution on its *physical* side is not the result of miracle, but is subject to the laws of physics and chemistry like the inorganic world. That, at any rate, is the natural conclusion from these and many other facts, and it is the starting point of biological research. A few philosophically minded biologists have disagreed, as have the modernist theologians, yet their views command no respect among most scientists.

If this purely mechanical outlook is wrong, there is room for miracle—though some would like to hide it under the cloak of more difficult words. But if it is right, it is now becoming obvious that causes can only be pushed back a certain way. They cannot be pushed back to protoplasm or the primæval slime which generated protoplasm as our fathers had supposed. It is only possible to push them back to some ready-made species, and there the cause becomes baffling. It is like the problem of astronomy repeated. At some point the uniformity of nature went wrong, and science can get no further. It must go on asking for causes in vain, for it cannot allow miracle. Yet, just as in the case of astronomy, there are good grounds of analogy for supposing that creation of living creatures must have taken place. This idea is outside science in the sense that it must never influence science, yet it appears to be none the less true.

The evidence has come in the following way. *Cytology* (the study of cells) has shown that every cell contains a number of small particles called chromosomes. When the cell divides these particles reproduce themselves so that every cell in the body possesses identical particles. It has been found possible to connect various changes in the chromosomes with changes in the grown-up individual, so that as a result of direct experimental work it has become tolerably certain that the form, or at any rate the detailed structure, of an individual is determined by the structure of the chromosomes. These facts were first suggested by Mendel's observations on garden peas, where it seemed certain that there must be some structures in the cells which made plants tall or short. The chromosomes in some species are sufficiently different from one another to allow them to be distinguished easily. In such cases they can often be mapped out. This means that the structures in the chromosomes which are connected with the various characters, such as tallness, eye colour, hairs in different parts of the body, number of facets in the eye and so on, can be shown to exist in a definite order in the various chromosomes. The methods by which this can be done need not detain us here. The units in the chromosomes are known as *genes*. They must consist of complicated organic structures. The smallest of them appear to be at least a million times as heavy as a hydrogen atom.

It is now generally agreed that changes in the genes themselves, and in their positions with respect to one another, afford

the raw material for evolution. The evidence for this is good. Examples of the main changes which have occurred in the rocks can be produced in the laboratory. Take the case of an animal the size of a dog becoming one the size of a horse. Exactly the same kind of result has been observed repeatedly in plants where it may take place in different ways. By purely artificial means the number of chromosomes in the cell may be doubled, and this results in a large and sudden increase in size. A similar result might easily take place during long periods if natural selection were picking out the fittest. The records of fossils do not show any phenomena which are inconsistent with the experimental science of genetics. A far greater period has elapsed in geological time and, as would be expected, there has been greater opportunity for profounder external changes to result; but there does not appear to be anything radically different in kind.

Suppose, then, that orthodox views—natural selection, the correctness of the series of fossils, and so on—are accepted. Does that lead to abandonment of the special creation doctrine? In the past people have answered in the affirmative, but it is now becoming abundantly clear that that answer is incorrect. All that is observed in genetical experiments, and all that is observed in the rocks, appear to be nothing more than chance variations of already given structures. This can be called evolution if evolution merely stands for change, but it is not the kind of evolution which could make an animal out of dead matter. It is not constructive evolution. The variations are often large so far as the external form of an animal may go—but both in the rocks and in the laboratory they are more often destructive, and end in extinction, than constructive. How did the original chromosome structures arise? One authority calculates that the chances against any particular arrangement of the genes in the chromosomes must be 10^{1000} at the minimum,* and it is probably much higher. But that is only for the arrangements of the genes when formed. The actual building of a gene in a particular way must involve an enormous number of possibilities, probably at least as great as the above number. This

* Sewell Wright. "The Roles of Mutation, Inbreeding, Crossbreeding and Selection in Evolution," International Congress of Genetics, Ithaca, 1932, vol. i, p. 356.

means that the production of a chromosome by random movements of molecules involves that this occurrence will happen once in not less than $10^{10^{85}}$ times.

If the matter is not considered from the point of view of a chromosome being built up suddenly, but natural selection is allowed to work all the time, so that a given chromosome structure can become more and more complicated through the course of ages, the chances are of course greatly reduced; but the power to which 10^{10} must be raised is negligibly reduced. $10^{10^{45}}$ is enormously greater than $10^{10^{84}}$, but that makes no difference to the present argument.

It is impossible for natural selection to result in more and more complex structures unless the number of individuals is greater than the number of the chances against the constructive change, and on the most liberal basis it is impossible to get the chances low enough. The number of electrons in the entire universe is only about 10^{79} * and the chances against the formation of these structures in the chromosomes are unimaginably greater. Thus the whole situation suggests that differing kinds of species were created at remote epochs: first the simpler forms of life, later the more complex. That is what geology indicates, but with the evidence at present available it would look as if arguments that an evolutionary connection existed between them should be viewed with much suspicion. No doubt the number of species created was small, and each gave rise to many others in the course of time.

Lastly, it must be emphasised again that creation is not a scientific idea. Science can only go back to the moment of creation and reach an *impasse*. It has reached that *impasse* in the problem of the creation of the universe, and it appears to be in the same position in the case of biology. What happened before the point to which science can look back was in each case something suggesting mind and purpose—unscientific ideas, it is true, but none the less real. And philosophy and religion must be founded upon the whole of reality, not merely upon the parts with which science can deal.

Thus it looks as if the long controversy with regard to evolution and Christianity might soon close. The Christian has been perfectly right in demanding a special creation, and the scientist

* A. S. Eddington, *The Expanding Universe*, 1933, p. 68.

has been equally right in denying that such an idea ought to constitute a part of science. Evolution *may* be a perfectly necessary idea for science, but on viewing the world as a whole it must be seen to have the same kind of meaning as in such an expression as "the evolution of the petrol engine." The truth to which the evolution of science points may be an evolution of the ideas in the mind of God, rather than any direct physical connection. But since science cannot deal with God it must rightly ignore such possibilities.

DISCUSSION.

The Chairman, Mr. DOUGLAS DEWAR, B.A., F.Z.S., said : Dr. Clark has given us a valuable and suggestive paper—one eminently suited to a philosophical society.

He shows himself greatly in advance of modern scientific opinion in that he boldly says there are indications that a theory of special creation of species may once again hold the field. He describes with admirable clarity what he holds to be the correct attitude of the scientific biologist. I do not agree with him that this is the right attitude. I do not accept his contention that it is not sufficient that a fact be true in order that it may form a part of science. In my view science ought to take cognisance of *every fact*. It is the business of the biologist to survey the living world, or some corner of it, and try to discover how plants and animals are made, how they live, their relations to one another and how they have come into being. The biologist ought to set out on this quest with an open mind, not wedded to any theory, though willing to consider all hypotheses advanced. This survey shows that, despite the great variety of animals and plants, each species can easily be fitted into a scheme of classification based on morphological grounds. The biologist ought to try to discover why this is so and how each of these species originated, whether each from the beginning exhibited its distinctive features, or is descended from a very different kind of ancestor. In other words, one of the chief aims of the biologist should be to discover whether the great variety exhibited by the organic world is the result of separate acts of creation, or of a process of evolution or transformation, or of both.

Unfortunately for the science of biology, this method has not been adopted. A belief that all species are the result of evolution has been adopted as a creed on *à priori* grounds.

Had biologists adopted the correct scientific procedure they would, when considering origins, have taken the species, the smallest of the recognised natural groups of organisms and asked themselves: Is the species a group of animals or plants enclosed within an impassable barrier? In order to be able to answer this question, much time should have been spent in (a) trying by breeding operations to change one species into another and (b) in trying to discover whether in nature any species has been transformed into another. If, as the result of experiment and observation, it were found that the species is not a group circumscribed by an impassable boundary, the genus should have been the next group to which similar tests were applied. If it were found that the barriers that separate genera are not impassable, then, and not until then, would the theory of evolution have something approaching a scientific foundation. In that case the family should be dealt with in the same way.

The rejection of the scientific method and the acceptance of the theory of evolution as a fact, without proof, has had disastrous results. Much time that ought to have been spent in experiment and observation has been devoted to the weaving of fantastic theories as to how evolution has been effected; this is to try to cook the scientific hare before it has been caught!

Nor is this the worst; instead of taking nature as they find it, biologists persist in seeing it as they think it ought to be, and, in order to make facts fit in with their theories, have mishandled these. Only discoveries that appear to be favourable to the concept of evolution are attended to; all others are set aside; all lines of investigation that seem to lead to results not in accord with transformism are abandoned, and only those that appear to lead to a conclusion favourable to it are followed up.

Nor is the excuse usually given for this abuse of scientific procedure, viz., that the admission of the possibility of special creation would stifle scientific inquiry, a valid one. Indeed, the failure to admit this has in fact tended to stifle inquiry, particularly in the matter of origins; no attempt has been made so far to try to discover the units of creation. Some branches of biological science have been

more adversely affected than others by this abuse of the scientific method. Among these are anatomy and physiology. The body of every animal contains a large number of organs and structures ; the utility of most of these leaps to the eye ; but the use of others is not immediately apparent. Instead of setting himself laboriously to discover the use of such, the average biologist is quite content to regard them as useless legacies inherited from supposed remote ancestors to which they were useful, because the habits and form of these are supposed to have been very different from those of their present-day descendants.

Professor Vialleton closes his monumental book on the limbs and girdles of quadruped vertebrates with the remark that, properly dealt with, morphology, which is supposed to be exhausted because it has been turned rashly from its proper course to be made to illustrate a premature conception, will, when properly handled, recover a new vitality, rich in the promise of luscious fruits.

Dr. Clark states that " creation is not a scientific idea. Science can only go back to the moment of creation and reach an *impasse*." This is unfortunate from the scientific point of view, but surely it is better for science to face facts than to work in a world of make-believe, and to waste time in trying to discover the undiscoverable. In any case, biology has a long way to go before it will be able finally to determine what were the units of creation in the organic world. The determination of this is sufficient to tax to the uttermost the resources of this and many future generations of biologists.

In conclusion, I should like to emphasise that the criticisms I have made are against the methods of modern biologists, not against Dr. Clark's paper, which I have no hesitation in saying is of the greatest value, the more especially as it stimulates thought, and I propose a hearty vote of thanks to him for an invaluable contribution to the transactions of the Victoria Institute.

MR. PERCY O. RUOFF said : The remarkable and interesting claim, in the opening sentence of the lecture, that a theory of special creation of species may once again hold the field receives rather scant treatment for so great a thesis. It is a matter of supreme importance in connection with the Bible account of creation, and

more evidence supporting Dr. Clark's claim would be welcomed by Bible students.

It is no doubt true, as the lecturer points out with clear distinction, that creation cannot strictly be brought within scientific survey, but belongs more properly to the domain of philosophy and religion which embrace the whole of reality. This, however, is only a question of accurate classification. It does not mean ignoring facts of creation, but identifying them with their proper sphere.

When Dr. Clark seeks to draw a parallel from life, and illustrates the point that true ideas must not be allowed to influence our method of living, he appeals to the Bible to support the view. But his illustration is unfortunate and fallacious. The Bible is a book of truth, and so far from teaching (as he supposes) that we must live without the belief that the Christian is not free from sin to influence our living, it takes full cognizance of the fact that sin is present, and provides the antidote side by side with this fact, viz., "He that abideth in Him sinneth not."

Col. T. C. SKINNER said: May I associate myself with the cordial vote of thanks to the author for his interesting paper this afternoon. As one who has not a little to do with embodiment of the papers and discussions in the Transactions, I would like also to compliment him on its brevity, and commend the same to our fellow-Members and Associates as a pattern worthy of more general adoption. Indeed, our author might well have expanded at greater length without the least fear of tiring his audience, and I hope he will view this first effort as a *ballon d'essai* and renew the benefit later on.

Turning to the theme of the paper, the position adopted by science has been clearly stated and is patent to all; there can be no question as to the fact. But with the legitimacy of that position we may well concern ourselves, and I desire to comment on one issue only, viz., the rigid exclusion from scientific thinking of the operation of a Divine Creator and of His subsequent intervention in human affairs.

The words "must," "must not," "cannot," "must never," "cannot allow," etc., etc., run through the paper almost like a slogan, and without doubt they do reflect the attitude assumed by a great

many scientists, perhaps the majority, towards things spiritual as affecting their particular quest, geology, astronomy, biology, or whatever it may happen to be. But why this imperative? Who has decreed it? Scientists, in common with all other humans, are endowed with free will—initially at all events—freedom of choice as to what line they shall take; and if to-day they are failing to exercise that birthright freedom, to the extent of binding themselves to this rigid rule of exclusion, does it not suggest that they are no longer free agents, but are under some form of hypnotic obsession, a “blindness in part”?

I take as reasonable our author’s postulate that “science stands not for a complete system of all knowledge but for a method of attack—in short, for experiment.” But surely this does not comprehend the whole business of science. Is it not the business of science to collect facts and correlate them, with a view to tracing the causes at work and forecasting the trend? All facts of observation are therefore germane to science, and if we are to draw a vertical line and say that facts on one side of that line are to be considered, while those on the other may not be entertained—must not such a method inevitably issue in theories at once lopsided and untrue?

Now I submit to your judgment that the facts of spiritual experience are not a whit less capable of demonstration and investigation than are any material facts you like to name. It is impossible to read the life of a George Muller, for example, without deriving convincing evidence of Divine intervention, while the records of missionary societies the world over abound in such evidence, in fulfilment of the Divine command and promise.

Turning in direction opposite; trickery apart, do not the manifestations of spiritism afford proof of working of a spirit of evil sufficient to demand recognition; or at least to call for investigation by competent men, themselves not ignorant of the devices of Satan, who can keep their heads and not lend themselves to the working of error as some have done? Alike with the phenomena of dæmon-possession familiar to many trained medical men in Africa, India and the far East.

But if these things fail to convince, then what of the devilry of war, repudiated by everybody and indulged in by all? How explain this phenomenon of race annihilation on any other supposition than

that of an arch-enemy, bent on destruction of mankind, a personal power of evil, for whom, without Divine aid, science is no match ?

Moreover, is not the line between *material* and *spiritual* becoming more shadowy every day ? and are not some of our best thinkers in science, to-day, the least hide-bound in this matter ? What of Jeans, of Eddington, of Fleming ; of a host of devout scientists who recognise that it is not possible to push Almighty God out of His own universe and yet hope to solve its mysteries ; who, if they provisionally accept the self-imposed rule, do so in full realisation that it is nothing more than a convention sooner or later to be abandoned if real progress is to be made.

Granted that it would be wrong and absurdly unscientific to invoke miracle where phenomena can be adequately explained by natural causes, and that a scientist's first quest is for such ; is it not at least futile to close the eyes to obvious evidence of Divine intervention in answer to believing prayer ? Does it not betray lack of sincerity, or of scientific thoroughness, or of both ?

Writing to *The Spectator* in November, 1927, on "The British Association and Darwinism," I used these words :—

" A science that ransacks the universe for material facts, yet ignores the facts of faith, is working in blinkers, incapable of shaping a true course, and must sooner or later finish up where it began, on the rocks."

We seem to be nearer the rocks to-day than we were eight years ago.

Mr. GEORGE BREWER said : When scientists ask us to accept their theory of Evolutionary Descent, the least that can be required is that some evidence should be forthcoming.

True science is the knowledge of facts ascertained by observation or experience reduced to an orderly system ; but much of what is now popularly called science is pure speculation, the evolutionary theory of descent being based on supposition and assumption and unsupported by any real evidence.

Charles Darwin says himself in *Life and Letters*, " When we descend to details we cannot prove that a single species has changed." Professor Virchow, who was for 30 years president of the Berlin

Anthropological Society and once a pronounced advocate of the evolutionary theory of descent, said in his lecture on "Freedom of Science," "It is all nonsense. It cannot be proved by Science that man descended from the ape, or any other animal. Since the announcement of the theory, all real scientific knowledge has proceeded in the opposite direction." And later, at Vienna, he said, "The attempt to find the transition from animal to man has ended in total failure. The middle link has not been found and never will be."

Dr. Etheridge, the fossilologist and curator of the Natural History Museum, says "In all this great museum there is not a particle of evidence of the transmutation of species; nine-tenths of the talk of Evolutionists is sheer nonsense, not founded on observation and wholly unsupported by facts. The museum is full of proofs of the utter falsity of their views."

This theory, which cannot be treated as science, but rather as philosophy, and admitted by its adherents to be incapable of proof, is held tenaciously as being the only alternative to special creation. Thus it becomes a refuge for the natural man, who desires to exclude God and reject the revelation contained in His Word, and can therefore only be regarded as the delusion of Satan.

In Gen. i, 12, we read, "And God brought forth grass and herb, yielding seed after his kind, and the tree yielding fruit, whose seed is in itself, after his kind." (v. 21) "And God created great whales and every creature that moveth, which the waters brought forth abundantly after their kind, and every winged fowl after his kind." (v. 25) "And God made the beast of the earth after his kind, and cattle after their kind, and every thing that creepeth upon the earth after his kind."

In Acts xii, 26, Paul on Mars Hill declared "God hath made of one blood all nations of men"; and in his first epistle to the Corinthians, chapter xv, stated, "All flesh is not the same flesh; but there is one flesh of men, another of beasts, another of fishes, and another of birds."

While the Evolutionary theory cannot dispense altogether with a First Cause, it puts that First Cause, which we know to be God, so far back as to be altogether removed from human responsibility,

thus fulfilling the words of Psalms xiv, 1, "The fool hath said in his heart 'No God.'"

WRITTEN COMMUNICATIONS.

The President, Sir AMBROSE FLEMING, D.Sc., F.R.S., wrote: This paper by Dr. Clark has in it much that is interesting and suggestive. On some points, however, I am not quite in agreement with him.

First, as to the definition of what constitutes science and the scientific method. Science is not merely experiment. We gather the raw material of science, viz., the facts, by experiment, observation, or deductive or inductive reasoning. But our chief object is to correlate them. We do this by hypothesis or theory. We make a guess at some form of machinery which may show us the observed phenomenon as a consequence of some more general or fundamental principle and we test our guess by comparison with other facts. To do this we have in general to make measurements or quantitative assessments. Hence, Lord Kelvin once said "Science is measurement." The facts and measurements may be a permanent possession, but the hypotheses as to their connection or cause are in a continual state of flux. The history of science is a long story of discarded theories; for instance, in chemistry that of phlogiston, in physics those of caloric and the elastic solid æther and in astronomy the Ptolemaic theory.

The unscientific public are, however, prone to mistake the theory fashionable for the time being as scientific knowledge, especially if they have insistent statements by those they regard as eminent, that such and such explanation is accepted by all men of science. Moreover, science, as Dr. Clark contends, has its proper and limited field of operation, which is the collection of facts as regards the phenomena in Nature, the deduction by strict logical reasoning of inferences therefrom and the application of such knowledge for the use and benefit of mankind. When it goes beyond this and attempts to deal with or discuss final causes it may lead to error rather than truth and obscuration instead of illumination.

Also the strictest definition of words or categories is essential and much confusion and wrong thinking is due to the use of the same word in different senses by those who use it.

Especially is that the case with the magic word "Evolution." It can be quite appropriately employed to describe a process, as when we speak of the evolution of wireless telegraphy, for instance, as its gradual improvement. But if it is used to imply a self-acting or automatic agency, impersonal and yet having attributed to it originative powers which can only be postulated of Mind, it is a misleading word. It has to be recognised that there are limits to the region in which the ratiocinative powers of the human mind can usefully act and that outside these limits other faculties of our human nature have to come into play.

We have no right to say that we can attain to no truth other than that reachable by the human intellect.

Science cannot, therefore, deal with final causes or with the beginnings of things because there observation, experiment or measurement are impossible. It is for this reason that much modern use of the word Evolution is pernicious. It tries to substitute for a Personal, Purposive, Creating GOD who is a Spirit, the idea of an impersonal agency which, operating on a supposed uniformly diffused material, the origin of which is not known, and by actions or methods the source of which is also not known, has in course of vast time brought into existence the material Universe and provided this earth with an almost infinite variety of vegetable and animal life in forms due to accidents and a struggle to keep alive; above all, has populated it with human beings possessing rational minds capable of appreciating the adaptations and beauty of it all.

This evolutionary theory is, therefore, atheistic in its tendency. What we are entitled to infer is that Divine Creative Power has proceeded by stages and is purposive in operation but also to recognise clearly that the details of that operation are not capable of being discovered by the unaided powers of the human mind.

Lieut.-Col. Sir F. E. FREMANTLE, O.B.E., M.D., F.R.C.S., wrote : I regret that a Parliamentary engagement prevents my attending the meeting next Monday for the discussion of Dr. Clark's paper.

While thanking Dr. Clark for his effort to reconcile Science with Religion by establishing an unbridgeable gulf between the two, I would venture strongly to disagree with his proposition. Dr. Clark

makes the common mistake of regarding Creation as the industrial output of the Divine factory, each unit of it as separate from its Creator as a Ford motor car is from Mr. Ford. On the contrary, it is surely clear that each living unit is not only fashioned after the outward likeness of God but contains in itself the essential qualities of its Creator in varying degree.

The right view, at least to a biologist, is that of creative action as continuous and particulate, appearing historic and miraculous only when summed up in space and time and propounded in imaginative and symbolic language.

Science is either comprehensive or false. It cannot consider biology without reference to the life which is in essential contact with or even is an essential part of the Godhead, branches of the one Vine.

Christ showed us the connection, both between God and Man and between the living and the inanimate Creation. The Incarnation is not confined to Jesus of Nazareth but in Him is symbolised as illustrating the Divine principle which is found in all living things and is at the root of all scientific biological study. The inductive approach to God is, to the scientific mind, a most helpful aid to a true religious appreciation of the Divine reality.

Mr. ALAN STUART, M.Sc., F.G.S., wrote: I would like to say first of all how interesting and stimulating I have found Dr. Clark's paper to be, and believe that it is a timely reminder of important things which are liable to be ignored by Christian apologists who often have hard things to say about scientists and their science, when the findings of the latter are apparently antagonistic to some belief or interpretation.

As to the first point raised by Dr. Clark. It is true that science *qua* science finds no place for Creation in its scheme of things. This is not because of the obtuseness of scientists, but because of the character and methods of science itself. These are largely confined to (1) technical experimental means by which phenomena are studied, and (2) logical and mathematical treatment of the results of observation and experiment in order to discover the nature and relations of the phenomena studied. For example, all

attempts to produce life from inorganic material in the laboratory have failed, and it is scientifically true that all living things have their origin in other living things. It is therefore only logical for the scientist, simply as a scientist, to conclude when viewing the ordered sequences of fossil forms from Cambrian to Recent times, that they are somehow genetically related. *Scientifically* no other conclusion is possible. When, like the physicists and astronomers mentioned by Dr. Clark, the biologist or palæontologist gets back as far as he can go causatively, his science cannot help him, and if he then falls back on the idea of creation as an ultimate cause he does so not as a scientist but on philosophic or religious grounds. It has been very interesting to notice recently the excursions of physicists and astronomers into philosophy, because they have been forced to interpret things from an idealistic or spiritual point of view. This is not science discovering God as many think, but that science, being unable to investigate ultimate causes, forces the scientist, because he is also a man, to answer the questions raised on other non-scientific grounds.

Again, it is recognised that science is limited in its scope because it can only study abstractions or selected properties of things. The weight or acceleration of a body are only parts not wholes. A Bach fugue or a joke may be analysed scientifically but the analysis does not produce the same emotional effects, because only certain selected aspects of the phenomena are presented. So science is rigidly limited in its scope and really only provides the raw material for the philosopher to work upon. Philosophy may be regarded as man's unaided effort to explain the riddle of the universe, but religion in general takes into account the existence of a Creator and the possibility of a revelation from Him to His creatures. In the search for ultimate truth science is only the first step upwards, and next come philosophy and religion, and science is now not in a position to deny that ultimate reality may be spiritual. Next, observation shows that many related series of phenomena follow one another by a series of alternate crises and processes, and whereas miracle finds no place as such in science, crises do. Take, for example, the crisis of conception, the process of gestation, the crisis of birth, the process of growth, the crisis of death; the

alternate processes of growing stresses in the earth's crust and the crises of earthquakes during the growth and decay of mountain ranges; the process of the work of the Spirit of God upon an individual, the crisis of conversion, the process of growth in grace and knowledge of the Lord Jesus Christ, the crisis of the freeing of the spirit from the body, the crisis of resurrection, etc. It would appear that science may investigate certain aspects of some processes and relate them to definite crises, but many crises have eluded explanation. In Genesis, chapter i, certain crises stand out and are denoted by the use of the word *bara* (create), for the creation of matter (v. 1), lower animals (v. 21), and man (v. 27). Where *asah* (make or develop) is used, a process *may* be indicated.

I tend rather to disagree with the author when he says that "the fossil records confirm the same absence of design." The orderly sequence suggests purpose and design to me, and the development of certain extravagant forms which paid the price by extinction, and the appearance of carnivores in Palæozoic times, suggest to me that even before man appeared an attempt was being made to frustrate God's purpose. This I put forward, however, not as a scientist but as a possible interpretation of the facts based upon what I believe God's will to be as revealed in Scripture, that He did not intend nature to be "red in tooth and claw," but that the lion should lie down with the lamb.

To sum up, science because of its nature and methods cannot know God or miracle, but a scientist can believe in both God as Creator (the Living One from whom all life takes its source), and therefore in miracle. The two are not antagonistic but complementary. Certain anti-religious scientists will always use what knowledge they may gain against religion, and anti-scientific Christians will always cavil against scientists who come to conclusions which appear to run counter to their beliefs, but on both sides honest inquiries are beginning to compose some of their differences. The evolutionist who explains mutations in species by the action of some cosmic ray which may produce analogous changes in the chromosomes to those made experimentally by X-rays, may (and often does) believe that God is the controlling power behind the ray, and says "evolution does not get rid of God, it shows His manner

of working." This is a great advance on the old materialistic evolutionary teaching, and shows that the evolutionists are rapidly reaching the *impasse* to which physics and astronomy have come. Science may answer the question "how?" at times, but can never answer "why?" The scientist, like any other mortal, must humbly await God's revelation as to this.

AUTHOR'S REPLY.

I should like to thank those who have taken part in this discussion, especially our President and Mr. Alan Stuart, whose contributions have greatly enhanced whatever value my paper may have possessed.

The other speakers have, between them, raised so many points that it is impossible to reply to them adequately. I should, however, like to make a few brief comments.

1. Several speakers appear to agree with Sir F. E. Fremantle that "science is either comprehensive or false." Now no one would assert that religion is false because it does not deal with the working of dynamos, and I cannot understand why anyone should suppose that science is false because it does not discuss the working of God. It is surely obvious that we have different attitudes towards the outside world and full truth is reached by employing them separately. The attempt to mix them must, so far as I can see, lead either to an anti-religious or an anti-scientific frame of mind. So far from hearing how this dilemma may be met we have heard several vehement condemnations of current science.

2. Col. T. C. Skinner lays stress on the idea that the line between the material and the spiritual is becoming more shadowy every day. With all due respect to Col. Skinner and Prof. Eddington this, so it seems to me, is quite untrue. Matter is not turned to spirit by thinning it! I question whether 1 per cent. of scientific workers would endorse such an opinion.

3. I do not quite understand how Mr. Ruoff's objection to my illustration of "methodology" drawn from the Bible disproves what I said. But supposing he is right, Hans Vaihinger in *The Philosophy of As If* (Trans. C. K. Ogden. London. 1924) has collected hundreds of other examples of the principle in question, any one of which might have served for my argument.

4. Sir F. E. Fremantle further criticises me for being a Deist, and I admit the charge. If each living unit is indeed "fashioned after the outward likeness of God," it is clear to me that God has no moral character, for evil as well as good becomes an expression of His activity. But a perfect God could create machines which, for various reasons, might fail to function properly—just in the same way (to use a well-worn analogy) as a good watchmaker might make a watch which eventually goes wrong. This, to me, is all but conclusive in favour of Paley's original argument. It does not solve the problem of evil, but it seems to show that no solution is possible save on Deist lines.

5. Mr. Alan Stuart rightly remarks that gene mutations do not *necessarily* exclude God if they can be explained mechanically. Yet it is surely a legitimate inference that God is not at work (I speak as a Deist) if we find that the result of such a process is very much what we should expect if the units were merely "shaken up in a hat." But this is an inference only and mind might be at work just now and again—so rarely that statistical averages are not altered.

Of course this is an extremely materialistic position which few will be disposed to follow. It is, in fact, just what the rationalist scientist of to-day would like. But what I have sought to show in my paper is that, even if we go to the last resort in thinking of reproduction and evolution materialistically, we shall still be forced to believe in God. Though I have not had time to develop the theme, I believe it can be shown that the God we must postulate under these circumstances is, in all essentials, the God of Christianity.

I would even go further than this and claim that not a few rationalist writers have guessed the truth of what I have said. This accounts for the retreat into unintelligible mysticism which we find, for example, among Communist philosophers who do their very best to pretend that they are anti-materialists. The same attitude is found, however, among scores of other anti-religious writers who, forty or fifty years ago, might well have been thoroughgoing materialists.

The fact is that when anyone thinks clearly, either along religious or scientific lines, he must end up by believing in God. But if an

atheist has already decided what he does not want to believe in, he immunises his reason by mixing his religious (or it may be philosophical—it all depends upon the definition) and his scientific attitude. It is thus that dialectism, instinct, monads, zell-seelen, élan vital, holism, evolution (in one of its senses), emergent evolution, organicism, vitalism, hormism, “gods, demons (Maxwellian or otherwise), signalmen, locomotive drivers, archæi, souls, entelechies and all kinds of little beings hidden in the stuff of life” (Needham) come to be dragged into science falsely so-called. And when once this has been done (with the aid of a well-sounding word) matter has been discreetly endowed with properties akin to mind and would-be philosophers start regretting that there is such a thing as the second law of thermodynamics or (like Sir Arthur Keith on a recent occasion) quietly ignoring its existence.

Such mysticism is only to be expected as science advances. The evidence for the existence of a transcendental God is becoming so enormously enhanced with every fresh discovery of the complexity of nature and every fresh confirmation of the great general law (of which the second law of thermodynamics is but one small aspect) that order does not increase of its own accord, that it is only by muddled thinking that the inevitable conclusion can be avoided. But since this is the case it seems to me a great pity that so many Christians support these curious combinations of philosophy and science.