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JOURNAL OF
THE TRANSACTIONS
OF
The Victoria Institute
OR
Philosophical Society of Great Britain

VOL. LXXVI

1944



LONDON:

PUBLISHED BY

THE INSTITUTE, 1, CENTRAL BUILDINGS, WESTMINSTER, S.W.1

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856TH ORDINARY GENERAL MEETING

HELD AT THE NATIONAL CLUB, 12, QUEEN ANNE'S GATE,
LONDON, S.W.1, ON MONDAY, MAY 1ST, 1944, AT 6 P.M.

F. T. FARMER, ESQ., B.Sc., PH.D., IN THE CHAIR.

The Minutes of the previous Meeting were read, confirmed and signed.

The CHAIRMAN then called upon Mr. E. H. Betts to read his paper entitled "The Contribution of Science to Religious Thought" (being the Gunning Prize Essay, 1943).

The Meeting was later thrown open to discussion, in which Dr. White, Air Commodore Wiseman and Dr. Farmer took part.

The following election has been made: F. W. Martin, Esq. (Fellow).

THE CONTRIBUTION OF THE SCIENCES TO RELIGIOUS THOUGHT.

(being the Gunning Prize Essay, 1943.)

By E. H. BETTS, Esq., B.Sc.

IN two remarkable passages Scripture distinguishes for us the two spheres of human knowledge which may be known as science and Christian thought. We have, first, the statement that "The invisible things of him (God) from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead." (Romans i, 20.) The eternal power and deity of God, then, which are a class of invisible things, are to be apprehended from the contemplation of the visible things around us. The second passage reads: "We speak the wisdom of God in a mystery, even the hidden wisdom which God ordained before the world unto our glory;" and of this wisdom and its secrets, the writer adds, "God hath revealed them unto us by his Spirit" (1 Cor. ii, 7, 10). The knowledge here spoken of constitutes another class of invisible things and is attainable only by revelation.

The two spheres are differentiated by the two modes—observation and revelation—whereby the respective bodies of knowledge are attained. The former mode, observation, of course implies no development of the elaborate or exact methods which we see in modern science. It is simply the commonplace observation

of nature. But out of this, science, as we know it, has grown, for it is true that science is merely the prolongation and elaboration of plain observation, having for its function the enlargement of our sphere of observation and its reduction to order. The latter, the revelation to men of hitherto veiled mysteries (which will be found to be centred in Christ and to include the counsels and purposes of God for man) gives us Christian thought proper. For in one sense Christian thought can be engaged with any topic. Nevertheless it is legitimate to include with this inner sphere of truth, any instruction which has as its aim our adjustment to God in relation to the subject of instruction. Since for such instruction, as for what we have called Christian thought proper, we are equally dependent on revelation, our two domains are now sufficiently defined for present purposes. Science, Scripture asserts, provides unequivocal evidence of the eternal power and deity of God; revelation instructs us in the thoughts, the purposes, the ways and the very nature of that God and in our due relations with Him.

It is well at the outset to compare the nature of Christian thought with that of the knowledge derived from the sciences. The latter give us scientific laws which are, in brief, general statements based on experiment and observation. These processes assume something which is incapable of proof, namely, the principle of the uniformity of nature. If such an assumption underlies every scientific formulation it must then be admitted that scientific knowledge is of the order of probable belief. This is admittedly, in general, a probability amounting almost to certainty—a certainty upon which we do not hesitate to act and to stake our health, our safety and our very lives in a thousand ways in ordinary life and especially in industries based on scientific knowledge. Nevertheless scientific knowledge does not give us absolute certainty. It gives us highly probable belief.

Turning to religious knowledge, we note that it is based on faith, that is belief. It is apprehension resulting from the acceptance of testimony—the testimony of God. Both religious and scientific thought are, then, of the nature of belief, or something held by conviction to be true but incapable of logical proof. Nevertheless both are capable of verification by experience, and it is widespread and repeated verification that gives scientific knowledge the certainty it has. One's belief in God and in the truths of Christianity is deepened and confirmed by the experiences of life, just as one's conviction of the truth of, say, the

Principle of Equivalence in the study of heat, is confirmed by every physical experiment in which measured transformations of mechanical work into heat are involved.

Looking next at the field of view or the subject matter of the two forms of knowledge, we note that the sciences suffer a limitation to which Christian knowledge based on faith is not necessarily subject. Science may take as its object anything and everything within the range of observation, but Christian knowledge is limited only by the testimony it believes, and therefore takes within its scope fields of knowledge that are outside the scope of Science. This implies that what is characteristically Christian thought and what is characteristically science are complementary fields of knowledge. For although in places they may deal with the same material, their objects and their problems, as indeed their methods, are different. Christian thought, and of course pious Jewish thought as well, even when it deals with the objects of nature so treats of them as to relate them to God and to refer the mind observing them to God. No one would regard this as true of science.

It follows that, in considering the relation between religious thought and science and possible contributions of the latter to the former, there is a rule of profound importance to be observed—a rule derivable from consideration of the very nature of faith. It is this. If faith and science are brought into confrontation science has no primacy over faith. There can be no apology for this dethronement of science from the position often demanded by her worshippers, so long assumed by her when faced with the doctrines of Christianity, and even ceded to her by many whose allegiance is due elsewhere. "Let God be true but every man false" is of the very soul of faith. "That thou mightest be justified in thy sayings and mightest overcome when thou art judged," is faith's address of fealty to God, and science must enter the halls of religious thought cap in hand if those halls are to be owned as the dwelling places of true *Christian* thought. There science may *serve*—and serve honourably and competently as handmaiden to faith, but not dominate as queen or judge. At the risk of unduly labouring it, the point must be pressed and emphasised. Only when faith, that is unquestioning reception of the testimonies of God, is allowed primacy, can science function appropriately in the furnishing and adjustment of Christian thought. We cannot go all the way with the hypothetical declaration of the trusting old lady who avowed that if God

had said that Jonah swallowed the whale she would have believed Him—for the simple reason that it was merely hypothetical and expresses no real conflict between science and faith ; but if more students of Scripture had shown equal good will towards the testimonies of God there would to-day be notably less confusion of thought and more Christian stability and steadfastness.

Christianity is essentially and uncompromisingly theistic. It presents a single Supreme Being who is complete in Himself and who is the author and sustainer of the universe,* from which He is distinct and from which He is to be distinguished as a living, thinking, willing and therefore personal being. This view of the divine nature is virtually expressed in the opening verse of Holy Scripture : *In the beginning God created the heavens and the earth.* and is affirmed in the fundamental article of the "Apostles'" Creed : *I believe in God the Father Almighty, Maker of heaven and earth.* Let us endeavour first of all to see what modern science has to teach that is in any way related to these basic avowals of Christian faith. Theologians of repute waste little or no time nowadays seeking *à priori* "proofs" of the existence of God. It is felt that the only rational proof is of the nature of inference : a conclusion may be drawn from many kinds of data including the existence of the visible entities all around us. Now faith, as we have seen, is not inference. It is direct apprehension based on testimony. But while faith, as such, does not seek proofs, it is the basis of Christian thought about things which come also within the scope of the Sciences, and is therefore open to attestation, confirmation and clarification from them. Such must be the nature of the contributions that science may be able to make to these great beliefs which form the foundation and the footings of Christian thought. "He that cometh to God must believe that he is" (Heb. xi, 4) : that is faith ; "for the invisible things of him from the creation of the world are clearly seen, being understood by the things that are made, even his eternal power and Godhead" (Rom. i, 20) : that is the ratification of faith and the rebuke of unfaith, "so that they are without excuse" (*ibid.*). Holy Scripture, as we have already seen, in the above cited verse explicitly and elsewhere implicitly gives its abundant approval to the contemplation of nature as an activity calculated to con-

* The term is used in the old-fashioned sense, viz., *the whole created scheme of things*, and not in the modern scientific sense in which, e.g., our astronomers speak of "island universes."

firm the written utterances of Him whom we shall be led either in faith or through reason to invoke as the author of the phenomena of nature. "Through faith we understand that the worlds were framed by the word of God so that things which are seen (*to blepomenon*, the visible order as a whole—*Westcott*) were not made of 'things which do appear'" (*phainomenōn*, things which appear—cf. "phenomena"—as in contrast with the eternal, invisible things—see 2 Cor. iv, 18 (Gk.)).

The *undated* asseveration, "In the beginning God created the heavens and the earth" stands entirely beyond the frontiers of science. To this noteworthy fact science itself bears convincing testimony. Even the mechanical materialism of the nineteenth century recognised its truth.

"It appears to me," wrote T. H. Huxley, "*that the scientific investigator is wholly incompetent to say anything at all about the first origin of the material universe. The whole power of his organon vanishes when he has to step beyond the chain of natural causes and effects. No form of nebular hypothesis that I know of is necessarily connected with any view of the origin of the nebular substance.*"*

Huxley's view of the relation of science to the study of origins is illustrated and corroborated by the attitude of his contemporary Tyndall, who in his pensive "Musings on the Matterhorn" allowed, he relates, his thought to run back through molten worlds "to that nebulous haze which philosophers have regarded, and with good reason, as the proximate source of all material things."† Tyndall's thought ran back a long way but had to rest content (and yet perhaps hardly content) with the nebular haze as a "*proximate* source of all material things." And in the present century, to cite again an avowed materialist,

"Dialectical materialism does not state the nature of matter. 'For the sole property of matter,' wrote Lenin, 'with the recognition of which materialism is vitally concerned, is the property of being objective reality, of existing outside our cognition.'"‡

* *Nineteenth Century*, 1886, cited by W. R. Inge, *God and the Astronomers*, p. 241: italics here added.

† *Loc. cit.*

‡ *Dialectical Materialism and Modern Science*, J. B. S. Haldane, who cites Lenin, *Materialism and Empirio-Criticism*.

Thus the newest phase of materialist philosophy—which bases itself on a very wide sweep of modern science*—is forced, as was the older materialism, to regard matter as *given*, and to shelve all questions of its origin. This recognition of the impossibility of an interminable causal regress is science's tacit and grudging admission of a limit set to its investigations into origins and therefore of the presence of mystery in the universe—of the inexplicable, the occult. Faced with this, the *malaise* of men of science is apparent. To come down to very recent days, Sir Arthur Eddington displays not a little discomposure, quite losing, in fact, his logical coherence, when, compelled by consideration of the great Entropy Law to admit that the universe must have been once "wound up," he immediately repudiates the idea as incredible and lugubriously admits, "But I can make no suggestion to evade the deadlock."† Sir James Jeans keeps rather better faith with his own findings. In view, *inter alia*, of the universality of the Entropy Law he asserts that, "Everything points with overwhelming force to a definite event, or series of events, of creation at some time or times, not infinitely remote,"‡ and again, twelve years later, "There must have been what we must describe as a 'creation' at a time not infinitely remote."§ The present Astronomer Royal's comment on this reads thus,

"What preceded this uniform distribution of matter? How did it come into existence? Was a definite act of creation involved? *I do not pretend to be able to give any answer to these questions. . . . Astronomy cannot take us any farther back in time. I am writing as an astronomer, not as a metaphysician or as a theologian, and I prefer therefore to leave these questions unanswered.*"||

These citations from men of science unite in demonstrating that in following the causal regress—a pursuit which is legitimate and proper to science—there is forced upon the mind, sooner or later, the recognition that the recession is endless. But the human mind revolts against the "infinite regress" and requires a resting place of some sort somewhere in the chain. The materialist, whether mechanical or dialectical, finds this as we have seen in matter as his ultimate datum. This however leaves

* See, e.g., Haldane, *loc. cit.*

† *Nature of Physical World*, Ch. 4.

‡ *Eos, or the Wider Aspects of Cosmogony*, 1928.

§ *Mysterious Universe*, Ch. 5 (1940 reprint).

|| H. Spencer Jones, *Worlds without End*, pp. 248, 249. Italics here inserted.

the problem merely thrown back and still unsolved. Where candour rules the problem is admittedly insoluble to science. *There is in the very existence of the material universe that which is beyond the power of science to explain.* There remain two alternatives to human thought, and only two. Either we must adhere to the methods of science and leave the universe unexplained or we must step outside the sequence. This latter course Christian thought takes. It admits, or rather it asserts, complete dependence on a Prime Mover who must be essentially of another order and therefore, and again, essentially, beyond the range of scientific thought. "If you think strongly enough," wrote Lord Kelvin, "you will be forced *by science* to the belief in God which is the foundation of all religion."* "By faith," declares the writer of the Hebrews Epistle, "we apprehend that the worlds were framed by the word of God, so that *things that are seen were not made of things which do appear.*"

We see then that the very rationalism of science in its search for origins lands us into the irrationality of the "infinite regress." Human thought in its frailty, as exemplified by the very organon of research, is proved incompetent to settle the question of origins, which thus stands out as the great prime surd of nature. Owing the frailty and confessing its dependence, Christian thought turns to One who transcends both nature and science—the Creator, and in so doing accepts its true place before Him, its creaturely place of *dependence*.

We may now well ask whether science throws any light on this creaturely dependence to the confession of which it has been, all unintentionally, instrumental in leading us. That Holy Scripture makes the point should hardly need mention. It is difficult to turn to a single chapter in either the Old or the New Testament in which it is not either asserted or implied, or both. And, further, the principle is in Scripture not limited to the need for revelation concerning the origin of the heavens and the earth. It will be found, though this cannot here be entered into in detail, that it is regarded as such an essential and fitting creaturely quality that all our relations with God and all our service for God should be marked by it. The Holy One who served as none other has served said, "Preserve me, O God, for in thee do I put my trust . . . thou maintainest my lot" (Psalm xvi, 1 and 5), while holy men of all ages have delighted in

* *Nineteenth Century*, June, 1903, cited by Inge, *loc. cit.* (italics added).

the principle. And what, then, of Science? *Its recent teachings lay bare such conditions in the universe as to impose on man a sense of his utter physical insignificance, his utter helplessness under the contingency of even relatively slight physical changes and of the impending if distant termination—divine intervention apart—of both himself as a race and of everything that conditions his existence.* It is the amazing disclosures of our astronomers and physicists, mainly, that have forced all this upon our often unwilling ears. First, we learn that from the material and spatial point of view we must banish geocentrism from our thoughts not only, as taught by Copernicus, of our own solar system, but also of the galactic system of stars of which the sun is merely a rather more than average-sized member—which galactic system is itself only one amongst millions of “island universes.” The earth is not the hub of the solar system. The solar system is not centrally placed in the galaxy. The galaxy is only a tiny portion of the whole universe. Actually the centre of the galactic system is estimated to be some 30,000 light years* away from us and is placed in the direction of the dense star clouds to be observed in the constellation Sagittarius. The diameter of the galactic system is about 150,000 light years. *In this universe, the earth, the home of man, is not the material centre of things.*† Further, the earth, metrically regarded, is relatively a minute body in the extreme. It may be likened in magnitude to an invisibly small speck of dust relative to the multitudinous and unimaginably immense orbs by which it is surrounded in space. And the space in which the earth and these greater bodies—as well as other and lesser ones—move, is so immeasurably vast in comparison with the bodies themselves that “even if every one of them were known to be crowded as full as it could hold with perfectly happy creatures, it would still be difficult to believe that life and happiness were more than a bye-product to the power that made the universe.”‡ *In this universe, the earth, the home of man, is, materially speaking a minute and insignificant speck.* Further, in all probability, life as found on the earth, is not and could not be found on any other planet of our system or indeed anywhere else in the uni-

* A light year is a unit of length invented to reduce the number of figures required in stating the immense astronomical distances. It is the distance traversed by light in a year, that is nearly six million millions of miles.

† This, as we shall see later on, does not preclude the doctrine of anthropocentrism.

‡ Citation from C. S. Lewis, *Problem of Pain*, p. 1.

verse. Astronomers are not unanimous on this point, but at any rate, only in a slender temperate zone surrounding our sun are the physical conditions requisite in their co-ordinated totality to sustain life actually found. As far as science can reveal, gravitational force, atmospheric composition, atmospheric pressure, surface temperature, the existence and the proportions relative to land of oceans of water—one or more of all these fall below or exceed the limits critical for life in every other region of the universe; and in the vast and illimitable reaches outside the almost infinitesimally narrow friendly belt the divergences from the critical limits are so great as to be utterly destructive of all physical life. *The narrow orbital zone in which life flourishes is surrounded by a universe marked by conditions most bitterly hostile to life.*

The suitability to life, and particularly human life, of the physical conditions on earth, environed though this earth is by worlds and systems totally unsuitable and totally unadapted for the support of any life at all, has often been noted, and details made available.* One or two *samples* only of striking arrangements and balancings can be given here. The mass of the atmosphere and hence its pressure, adapted as this is for the support of human life by breathing, is determined by gravitational force which itself is determined by the mass of the earth which is in turn determined by the size of the earth. If a decrease of 800 miles (one-tenth only) in its diameter were effected, the earth would be reduced to three-quarters of its present mass and the atmosphere then gravitationally retained would be so lessened that the greater part of the earth's surface would be covered with thick layers of ice and snow, and the remainder subjected, on account of the rarefaction and therefore diminution of the heat-retaining properties of the atmosphere, to such extremes of temperature that at most low forms of life, such as lichens only, could survive. *The maintenance of the temperature suitable to life is dependent on the size of the earth.* Further, we have a calculation concerning the relative proportions of terrestrial waters to the surface area of the globe. To double the mass of

* Reference may perhaps be made to a paper by Dr. Brian Porter Sutherland on "Inanimate Nature, Its Evidence of Beneficent Design," read at the Victoria Institute on May 12th, 1941; also "The Bible and Modern Science," by Lt.-Col. L. Merson Davies; "Man's Place in the Universe," by Dr. R. Russell Wallace, is full of "arguments from design" which could never be attributed to bias in favour of the Scriptures.

the earth and therefore at least double the volume of water contained in it, the diameter would have to be increased by some 2,000 miles (one-quarter) only. But such an increase would extend surface not to double, but only to one and a half times the present surface. This ratio change would result in miles-deep oceans covering the whole surface of the globe. Terrestrial life would have no footing. *The dimensions of the earth are just what they should be to give a dry surface as a home of life.* Actually, as Russell Wallace points out, a study of the larger planets seems to indicate that the mass of water varies more rapidly than the mass of a planet itself with increasing size. This makes the water-land ratio-change even worse than above indicated, and, into the bargain, the problem of adaptation itself a matter of much finer adjustment. But, further, the atmosphere also would be, by any such increase of terrestrial mass, rendered too heavy and dense to support human life as our bodies are now constituted. *The atmosphere is of the correct pressure for the support of life in virtue of the earth's suitable size.* Now, further still, a consideration of the above (somewhat condensed) statements suggests—what is true—that a “designer” in adapting the size of the earth to suit the atmospheric density to the needs of life might have difficulties about the mass of water. The facts of geo-physics show, indeed, that a *smooth spherical globe* of size sufficient to retain by gravitational attraction the correct atmosphere for human beings would contain enough water to cover its whole surface to the depth of two miles. This additional problem is solved by the shaping of the ocean beds, which are so hollowed out—with their abrupt deeps (35,400 ft., near the Philippines; mean depth of ocean floor, 12,000 ft.) as compared with the elevation of the land (29,000 ft.—Everest; average elevation above sea level 2,300 ft. only) that not only is there plenty of dry land-surface, but the proportions of water-surface to land-surface are also found so adjusted as to produce the amount of evaporation and therefore of deposition, viz., rainfall, snowfall, etc. (and therefore again the degree of glaciation) to make the earth well suited as a home for life. *The size and the shape of the earth are co-adapted to the needs of human life.*

These samples of modern scientific investigation are a very fragmentary selection only from multitudes. They present a commentary from recent science on the age-old words of Job in which he writes of the designing of the earth in terms borrowed from those descriptive of the planning of a residence: “Where

wast thou when I *laid the foundations* of the earth? Declare if thou hast understanding. Who *determined the measures* thereof, if thou knowest? Or who *stretched the line* upon it?" (Job xxxviii, 4-5, R.V.).

But if science exposes the littleness and frailty of man and the relative minuteness of the earth as his abode, Holy Scripture teaches precisely the same doctrine, and, moreover, bases such teaching, just as science does, on astronomical considerations. "When I consider thy heavens, the work of thy fingers, the moon and the stars which thou hast ordained, what is man that thou art mindful of him, or the son of man that thou visitest him?" (Psalm viii, 3 and 4; cited also in Heb. ii, 6). There is no geocentrism here. Science and Scripture are in harmony and the former abundantly ratifies and indeed re-inforces the "moral" of utter humility in the presence of the works of God taught by the latter. Nor does the passage selected stand alone. Psalm xix puts forward the impressiveness of the heavens as a fitting background against which is to be viewed *inter alia* "the fear of the Lord, standing fast for ever." If the science of David's day, science which stood at the early descriptive stage, led his mind to adopt an attitude of reverential fear and humility, modern science, far from contradicting the lesson, re-inforces it a thousand-fold. And Psalm xxxiii says "By the word of the Lord were the heavens made, and all the host of them by the breath of his mouth . . . let all the inhabitants of the world stand in awe of him" (vv. 6 and 8). Nor is the view here seen to be common to science and scripture a strange thing to theology as distinct from Holy Writ itself. Many commentators of many ages draw from the same considerations of celestial phenomena the lessons here stated—the recognition of man's littleness and the propriety on his part of humility and owned dependence on the Great Ruler of the universe. Incidentally, how splendidly free from all the absurdities of astrology is Holy Scripture whenever it touches on astronomical topics. In this respect how unlike the laxity and limpness of the modern untaught mind was that of the equally "untaught" shepherd psalmist! Modern Science as distinguished from popular retrograde thought scorns this pseudo-science just as three-thousand year old scripture refused to defile its pages with the least suggestion of it.

There is a significant analogy between the physical savagery and malignity towards life of the universe outside the restricted

belt known to be fitted to support life on the one hand and that "great and terrible wilderness wherein were fiery serpents and scorpions, and drought, where there was no water" on the other hand, into which latter the Lord, the God of Israel, *deliberately* led his people with the express object of teaching them humility and dependence on himself. To this end God not only selected the wilderness route, but detained Israel in it for forty years, and through Moses urged upon them to *remember* "all the way which the Lord thy God led thee these forty years . . . to humble thee and to prove thee . . . to do thee good at thy latter end" (Deut. viii). Far from apologizing for the apparent cruelty of his ways, the Lord specifically and purposely draws attention to them. Likewise, far from shunning the exposures afforded by modern science of the apparent unsuitability to life of the physical conditions of the universe in general, Christian thought sees in them fresh evidences of a planning disciplining Mind, the mind of One who would have man walk in ways of conscious dependence, drawing all his strength and security from the proper Source—from Him who has with such grandeur displayed his eternal power and Godhead. Unfaith, viewing the physical antagonism to life of the vast stretches of cold dark space and the inexpressibly cauldron-like material concentrations sparsely scattered throughout that space, regards the universe as no suited dwelling-space for life and is prepared to say that life "freakishly" and "by accident" must have "stumbled into it."* Faith, and faith-engendered thought, in full view of all the same scientific data, but not leaving out of due account, as does unfaith, the maintenance of those fine balancings and correlations of the physical factors on which life so narrowly depends, sees in the apparent environmental anomaly superlative Design—design which has as its object to keep man in moral nearness to God and to give even to the votaries of scientific research demonstration of man's utter dependence. Beyond the physical environment faith sees an "other" who is acclaimed as the real environment and responds to Him, "Lord, *thou* hast been a dwelling place for us throughout all generations" (Psalm xc).† We have here, surely, not merely a splendid contribution of the sciences to Christian

* *The Mysterious Universe*, Ch. V. But, be it noted, these phrases, to Sir James Jeans, represent an outworn theory now discarded.

† Slightly nearer, in literal rendering, to the Hebrew. Italics also added. Note that the name of God here significantly used is Adonay, the Universal Ruler.

thought, but an instance, *par excellence*, of the mutually complementary nature of the two spheres of knowledge.

The analogy could be somewhat developed, for the wilderness journey was for the Israelites, a temporary episode, to be superseded by the congeniality and plenty of the promised land. So too the present heavens and earth are to pass away, folded up as a discarded vesture, and in their place "we according to his promise look for a new heavens and a new earth wherein righteousness dwells" (2 Peter, iii, 13). Here also the plain bold Scriptural prediction is elucidated by modern science. We refer at this point to no universal "heat death" resulting from the perpetual and uninterrupted validity of the law of entropy, for no instructed Christian gives such a supposed demise for the universe a place in his scheme of prophecy. It is the electronic theory of the atom and the resultant conception of the "insubstantiality" of matter that furnish the contribution of science at this point. The epoch-making researches of Sir Joseph Thomson, Professor Niels Bohr and Lord Rutherford—to mention only three outstanding workers amongst a host during the last forty years—have shown that the atoms of matter are not only not "hard" and indivisible but are highly penetrable and divisible. Their components are protons or centres of positive electric charge* and electrons or centres of negative electric charge in part combined with the protons to form a central nucleus and in part probably revolving around the nucleus, the electrons varying in number according to the position in the table of chemical elements of the particular substance † The number of electrons in the make-up of the atom is therefore an important factor determining the chemical properties of each particular substance. Determinations of the mass and size of protons and electrons indicate that the atom is largely constituted of "emptiness." It is further revealed to be the seat of tremendous stores of electromagnetic energy—energy which science has not learned to tap, although it has witnessed its effects. It is probably due to the tapping of the enormous reservoirs of energy stored up in atoms

* The term "charge," carried over from the physics of massive bodies to atomic physics, should not be allowed to mislead. In macroscopic science it necessarily implies the existence of something material bearing the charge. This must be discarded in thinking of the constituents of the atom.

† Neutrons and positrons are left out of account as it is not yet certain that they are permanent constituents of the atoms. Their existence may yet lead to serious modifications of our ideas about the status of the other constituents, viz, protons and electrons.

that the sun is able to supply radiation at such a prodigious rate as it has done for a great length of time. The same source of supply would of course be available in other stars like the sun. A rough idea of the magnitude of atomic energy may be gained from the observation that if, instead of relying on the ordinary chemical combustion of coal in the furnaces of a transatlantic liner we were able to release and utilize the internal energy locked up within its atoms, a handful of coal-dust in the bunkers of the largest existing liner would suffice for many Atlantic crossings. Now this picture of the internal architecture of the atom together with accompanying theories of the "annihilation" of matter, or better its transformation into radiant energy, serves to clarify the mental imagery in terms of which the scientifically informed Christian pictures out the foretold dissolution of the heavens and the earth and the making of all things new. The passage of matter into energy would scientifically account for the "dissolution" of the universe predicted for a day to come. The consequent unlocking of the stupendous stores of atomic energy never yet tapped by science would account for the heavens being "on fire" and for the "fervent heat" with which the elements shall "melt," these very words describing the results of a process almost certainly known to be actually taking place in the indescribably hot interiors of the sun and other large stars. The Apostle Peter (see 2 Peter iii, 10-13) was doubtless not instructed in modern physics and did not attempt to deal in naturalistic explanations of the mechanism of fulfilment of the prophecies of which he was the instrument. Consistently with the character of almost all the rest of scripture he wrote of events both past and future in such manner as to point the mind and the conscience to God.* But modern science as we have hinted has a function complementary to this. It enables the believing mind to "think" these changes. It strongly denies to the unbeliever any right to level at these predicted shapings of things to come the charge of being "unthinkable."

Tentatively, and with reverence, we suggest that the Christian's thoughts about the resurrection of the body also may become more vivid and more acceptable to the active believing mind through an acquaintance with the modern theories of the con-

* But some of the older Scriptures, as Job and certain non-Davidic Psalms, give hints of a knowledge of Nature apparently hidden from (or lost to) other writers.

stitution of matter. The attractively naïve Biblical accounts of the resurrection of the Lord Jesus Christ are apt to raise problems in the minds of thinking Christians who are only acquainted with the superficial properties of matter. Who indeed has not lingered with wonder, if not difficulty, over the union in one risen body of apparent materiality and immateriality? "Handle me and see", said the risen, Lord "for a spirit hath not flesh and bones as ye see me have" (Luke xxiv, 39); but the same risen Lord "when the doors were shut where the disciples were assembled . . . came . . . and stood in the midst" (John xx, 19). Now we do not claim that a knowledge of the electronic theory will itself completely resolve the discord, but it will certainly help the mind in a way in which, say, nineteenth century ideas could not help. On the contrary these imposed further real difficulties; for how could a solid body composed of hard substantial atoms compressed together into a mass be thought of as passing through another similarly composed body? But if we think of the modern atom with its fine-spun texture of distantly spaced infinitesimal whirling points of electric force—for it offers nothing more "substantial" than that—at least half our difficulties vanish, for our matter, so constituted, becomes plastic and tractable, readily assuming various forms and properties, *given the required control*. We have already seen that the control of atomic energy is beyond human reach. This is only one of the many limitations set to human power. But faith attributes all power to the risen Lord. Not merely atomic energy but all the forces, electromagnetic or otherwise which hold electrons in their orbits or regulate the electronic "jumps" from one orbit to another—with release or absorption of radiation in determinate quanta of "action"—all are within his control, "by whom all things consist" (Col. i, 17).* It is easy then to visualize a "changed" or a risen body to be subject to fashioning into tangibility or intangibility, to susceptibility to gravitation and the laws of dynamics, or insusceptibility to them, to high penetrability or the most resistant solidity—in fact to perfect mutability of properties and perfect versatility. We gratefully accept the contribution of modern science to our thought-forms as we more deeply enter into both the feelings and the thoughts of the Apostle Paul when he says

* This has been rendered "All things subsist together in Him," and is not necessarily less true of the parts of the atom than of the parts of the universe as a whole: "all coheres in Him." (Moffatt.)

—not perhaps without a touch of wistfulness—“and we shall be *changed*.” If, finally, we be criticized for resting mentally on the already superseded Bohr model of the atom rather than utilizing the equations of wave mechanics we plead first, that the ablest exponent could not extract a helpful “picture” from these equations, and, secondly, that at any rate they would certainly add nothing of substantiality to the picture of the atom to which we have given preference.

But paradoxically enough, Holy Scripture, even in the very passages in which it remarks the littleness and insignificance of man in relation to those great works of God, the celestial bodies, affirms man’s dignity and exalted standing—his uniqueness indeed as compared with the remaining works of God’s hands, particularly the animals of the lower creation. “Thou hast crowned him with glory and honour; thou hast set him over the works of thine hands. Thou hast put all things under his feet, all sheep and oxen, yea and the beasts of the field, the fowl of the air and the fish of the sea and whatsoever passeth through the paths of the seas.” (Psalm viii, 5-8* ; Heb. ii, 7-10). Man was created, indeed, Scripture teaches, in the image of God and after his likeness, and being constituted lord of creation was to subdue the earth. Primarily he was himself a truly noble creature fitted to be a creature-companion of God. Such was man in Adam in the intention of God. Such—and much more—man in Christ will be in the redeemed scheme of things. *According to Scripture man is dominant and unique.* And what says science? It supplies evidence abundant and convincing of man’s constitutional fitness for the position given him. The temptation is irresistible, at this point, to cite a formidable opponent of Scripture and of Christian theology who is also a consistent and inveterate protagonist of evolutionary theories which teach that man is but a developed animal; for such testimony can be relied upon to give the conclusions of science free of pro-Christian bias. In his recent book “The Uniqueness of Man”† Dr. Julian Huxley develops at length the thesis that *man is unique*. In outline what he propounds is as follows:—“Man is unique in virtue of his power of conceptual thought and his correlative employment of true speech; in the development (as a consequence of his powers of thought and speech) of a cumulative

* Need it be pointed out that the Psalmist gives the Divine view of man, in retrospect and in prospect, rather than describing man as he now is?

† Published 1941.

tradition (that is, a constantly enlarging educational heritage); in the employment and progressive improvement of tools and machinery; in the dominant position held by him among organisms, leading as this does to further numerous unique characters, viz., greater variability than any other ('wild') species, a far wider range than any other species, dominance in type without splitting into separate species; in being continuously sexed and not discontinuously sexed like the higher mammals other than man; in his reproductive variability; in the length and relative importance of the period of post-maturity; and, finally, in the numerous consequences of his possession of a brain capable of conceptual thought with the consequent increase of flexibility (as opposed to fixity of instinctive actions of the lower animals). These consequences include greater intelligence (adaptability and control), uniqueness in being subject to psychological conflict, proneness to laughter, unification of his mental processes as against the much more rigid compartmentalization of animal mind and behaviour, existence amongst mankind of social units such as tribe, nation, party, church, each with a continuity of its own based on organized tradition and culture, and in such 'by-products' as pure mathematics, musical gifts, artistic appreciation and creation, religion, romantic love and such everyday but still unique activities as conversation, organized games, education, sport, paid work, gardening, the theatre; conscience, vice, penitence." Surveying this account, condensed as above, of man's biological, psychological, social, moral, and æsthetic characters and activities, our authority adds the comment "*The trouble is to find any human activities which are not unique.*" It would seem then quite fair to say that *biological science teaches emphatically that man in relation to the lower creation is unique in every respect that is demanded by the position accorded to man in the Bible—a position of dominance and overlordship. This superiority, science asserts, exists in man, and that uniquely, and once again we see scripture and science to be in accord, and the latter serving vividly to elucidate and clarify the former.*

It would also be tempting, if it were a little more apposite, to turn aside at this point to challenge Huxley's groupings. Christian thought does not, of course, and is not prepared under any circumstances to view religion or conscience as a "by-product." Few philosophers, indeed, would be any more ready to allow this of mathematics, music or artistic appreciation and creation.

Huxley's actual words, viz., "By-products of the change from the pre-human to the human which are unique biologically" indicate that this *faux pas* of his is an immediate result of his philosophical pre-determination to set unquestioned facts, themselves the ripe fruit of admirable and praiseworthy scientific investigation, into a framework of evolutionary theories which they will not fit. The facts remain.

We have already hinted that anthropocentrism is by no means synonymous with geocentrism. Of the latter there is no real trace in Scripture, whatever may have crept in to a false and now disowned medieval theology—just as it was to be found, before Copernicus, in a now rejected mediæval "science." It is of course true that the undeveloped astronomy of Bible times used descriptive terms and expressions of the type common in and appropriate to the early stages of all the sciences. But even our exact nautical and other scientific almanacs still give the times of sun-"rise" and sun-"set," and good elementary text-books written by authorities even now speak of the "track" of the sun in the heavens and the like without any fear of implied ignorance on the part of the writer. While the Holy Scriptures are replete with such descriptive expressions as those connoting movement of the sun across the heavens, there is a complete absence from them of *any* formal or informal induction from a scientific scrutiny of the observed facts; much less is there found the formulation of any such proposition as "The sun moves round the earth as a central body once every day." The writers of the Scriptures quite unsophisticatedly and simply described what they saw. But the Bible is, *per contra*, candidly anthropocentric throughout. The passage itself which brings out tellingly the puny physical measure of man in relation to the great celestial works of God speaks of him literally in the same breath as the central object of the interest and activity of God. "When I consider the heavens . . . what is man that thou art mindful of him . . . thou hast crowned him with glory and honour; thou madest him to have dominion over the works of thine hands" (Psalm viii, 3-6). Man was formed in the image and likeness of God. The whole scheme of redemption is focussed in man. The Redeemer became man. Divine joy is the heavenly resultant of man's recovery to God and divine activities concentrated in effecting this recovery (Luke xv). God by-passed angels and "took hold" of the seed of Abraham (Heb. ii, 5, 6). Recovery to God is effected not only by a man,

but in a man, the last Adam (1 Cor. xv, 45). Man is to rule and subdue all enemies until the eternal state supervenes in which God is all in all. And further, man is not only shown to be an object of the greatest importance and concern to God personally, but the world of nature—the physical world, may we say?—is originally established, subsequently modified and finally adjusted with reference to the changing needs and states of man. The sun, moon and stars are ordained for signs and for seasons, for days and years, and to give light upon the earth—for man. When man falls the ground is cursed, the terrestrial flora modified and thorns and thistles appear. The rainbow is appointed for a sign of God's renewed covenant with man. The shadow returned backward ten degrees in token of the certainty of God's promise to lengthen the life of one man by fifteen years. The sun stood still and "hasted not to go down about a whole day" at the prayer of a man. The same sun was darkened when the Redeemer of man, Himself become man, suffered unrelieved judgment on sin—the sin of man. It shall in common with the moon and the stars be the bearer of signs when man is plunged in a future day into heavy judgment of distress and perplexity. And it is in immediate relation to the final closing up judicially of the sinful history of man at the final ASSIZE, that, at the call of the Judge proclaiming "I make all things new," the present heavens and earth are to be dissolved and reconstituted: *In Scripture the heavens and the earth are viewed as initially constituted, subsequently modified and finally to be reconstituted in relation to man. The universe of the Scriptures is anthropocentric.* Can we produce anything from the world of science to confirm, clarify or elucidate this conception? First, we have already seen that in the whole universe there is no known life except on earth, and no certainly known potential home for life except in the narrow orbital zone in which the earth moves. The planets are all now fairly definitely ruled out with the possible exception of Mars, which *may* support life under stress of great difficulty—of which life, however, there is no clearly admissible evidence.* The stars themselves are, of course, like our own sun, impossible; and the extreme improbability, according to recent theories of planetary origins,† of the existence of any

* The "canals" of Mars are not *certainly* more than optical illusions. The name given to the appearances first observed by Schiaparelli is a question-begging one, at any rate.

† For popular accounts see the various works of Jeans.

planetary systems other than our own renders it unlikely that any other star than the sun serves as a central sun to an inhabited earth. *Life, and especially human life, which with all its richness and variety of the higher values is the most exalted phenomenon within the whole range of scientific observation, is only known on earth.* It will probably be argued that this leaves the stars and nebulae largely out of positive account. But it is true, as Eddington well said, that "the contemplation in natural science of a wider domain than the actual leads to a far better understanding of the actual." So the contemplation of the extragalactic nebulae, the galactic system of stars, the sun and the planets supplies a background to our knowledge of the earth as the home of life which leads to a deeper understanding of the meaning of life. It furnishes us with the "wider domain" in which we see spread out and eventuating before our eyes all the actualities and potentialities of material systems. We see unstable systems surrounding our own planetary system which astronomers believe is relatively stable for a lengthy period. We see in the interiors of the sun and its fellow stars and in the nuclei of the giant nebulae the ineffably mighty forces and the unspeakably vast ranges of temperatures and pressures associated with matter in states neither known to exist naturally nor able to be produced artificially on earth—matter in which we know that owing to the extreme intensity of these pressures and temperatures not merely is every molecule in a state of dissociation, but every atom is highly ionized and the majority even stripped of most of their electrons. And yet the earth is maintained steadily and temperately, but without lack of local variety, in conditions suitable for life. We are thus enabled to think concretely of matter in states which to us are abnormal. Not only may such states be predictive, as we have already seen, of mechanisms of "dissolution," but we can in virtue of our knowledge of these states of matter, and in the light of the quantum theory, conceive the reduction of atoms to a limiting condition of "stripping" beyond which although stored with enormous supplies of energy they cannot yield up any of it—a limit recognized by science but incomprehensible to it. And here, surely, is another of nature's "irreducibles" or surds! The material universe would vanish in an instantaneous flash of radiation if this limit were surpassed! This, we repeat, man is able to conceive in the light of his scientifically acquired knowledge of the great universe outside and around his tiny home.

And in all the gargantuan sphere there is no trace of intelligence to comprehend its meaning except on this little earth! *Science in all its universal scope reveals nothing to counter the anthropocentrism taught in Holy Scripture.*

It has often been observed that science reveals the reign of law in every natural sphere. By scientific law we mean the tabulated and formulated regularities observed in the working of nature. It is to be noted, indeed, that the very existence of uniformities in nature is a pre-requisite to scientific work. We have previously remarked that the generalizations or laws of science assume the principle of the uniformity of nature. Thus, for example, underlying the publication of all tables of experimentally determined physical and chemical properties of substances is the expectation that such substances will behave themselves in the future as in the past—an expectation enshrined in the very term “physical constants.” It is obvious that such regularities are requisite if man is to have the necessary control over nature to live. The same observation relates, with less scope, to the lower animals, indeed to all living beings. For the concept of a “being” is itself hardly possible apart from the postulation of uniformities, since a “being” must have a constitution or a mode of existence implying regularities in its relations with its environment. This idea of the need of regularities is not only a philosophical necessity, nor is their existence only a discovery of science, but it is recognized by Holy Scripture—in the broad and plain way in which Scripture speaks of natural conditions—as an essential condition for life, and is spoken of as the ordering of God. At the restoration of the rhythm of the seasons after their derangement by the Deluge and its accompanying convulsions, we have the promise “While the earth remaineth, seed-time and harvest, and cold and heat, and summer and winter and day and night shall not cease” (Gen. viii, 22). And Psalm cxxxvi, with direct reference to the “rule” of the sun, the moon and the stars and other elements of nature, adds its re-iterated refrain “For his mercy endureth for ever.”

It is easy to see the necessity and the purpose of such uniformities as those formulated for example under the laws of sound. Regularities in wave propagation through material bodies provide means of communication which in the external world correlate closely with man’s power of conceptual thought and his related need for and powers of speech. On a lower plane the same considerations apply to the calls and songs of the lower animals.

On a culturally higher plane we find man's creative and appreciative activities in music which have also religious application in the worship of his Creator. The possibility of a musical scale depends on the laws of sound which control the determination of pitch and these in turn depend on the fixed nature of matter. The note given out by a string—a violin string, for instance—varies with temperature, tension, density of the material, etc., but it varies according to fixed and discovered laws and therefore in a controllable way. If we could imagine air—to restrict our attention for simplicity's sake to the atmosphere only, which however is not the sole medium serving for the transmission of sound—of totally irregular density and elasticity and having properties of heat-transference varying from point to point and molecules of different dimensions in different parts, we could still possibly imagine the production of "noise" but not of notes of music. The noise would probably be more intolerably raucous than anything yet experienced, and speech, song and any sound signal less primitive than a clap of the hands out of the question. (Perhaps we could allow a *repetition* of claps but they would be dissimilar and would reach the ear at irregular intervals!) Science—in particular, the science of acoustics—reveals that *not only all the bare necessities of oral communication of both man and other creatures but all the ministry and cultural amenities of music depend not only on those regularities in nature expressed by the laws of sound but on the regular and continued maintenance of those properties of matter which give rise to them.* An exactly parallel statement, but one of perhaps even deeper and fuller significance to the life of man and the lower animals, could be formulated of the laws of light. Its wave-like properties resulting—apart from small-scale diffraction phenomena—in its rectilinear propagation present us with the prime means of acquainting ourselves with the external world of nature and various means alternative to speech of effecting communications at a distance. The high velocity of light—186,000 miles per second—which in relation to any other attainable speed is practically instantaneous, confers an immense practical benefit since in virtue of this velocity any visible terrestrial event is seen, practically speaking, at the moment of its occurrence. The constancy of this velocity, without which—at least if the variability were within appreciable limits—our knowledge of spatial relations would be confounded, furnishes in addition a means of measuring vast astronomical distances. The chromatic properties of light, also a result of

its complex wave-like nature and the laws of wave motion, are the natural basis of what must be surely the greater part of our aesthetic enjoyment of both natural and artistic beauty. The co-existence and co-operation of those properties of light and of chlorophyll in green plants (and probably of living proteins as a third active factor) enabling green plants to produce the essential plant foods, the carbohydrates, from the carbon-dioxide of the air, in the presence of water from the soil, with the greatest ease—a process not yet successfully imitated in our laboratories—are an example of correlated natural powers which should make us wonder. But our concern here is more with the reign of law than with the resultant properties in detail. The ordered and regularly graded properties of light, which extend to those of all electromagnetic waves—infra-red and Hertzian (wireless waves) at the one end and ultra-violet and X-rays at the other end of the actually visible spectrum—render orderly, calculable and regularized living both possible and pleasant. *The sustentation of these uniformities is a basic and essential condition of such life, which sustentation, though coming within human observation, is entirely above and beyond human or other natural power to effect.*

And these considerations could be extended in every direction. But it is to be feared that the more extensively the regularities of nature touch the ordinary affairs of our life the more easily do men become oblivious of them. What of gravitation? We do not have to walk on the floors of our houses on Mondays and on the ceilings on Fridays. If gravity were reversed or its constant varied occasionally we should appreciate perhaps more duly the steadiness and “accountability” of nature’s arrangements and the stability which we at present enjoy. It is to be noted that for the moment we are dealing not so much with the laws of science themselves as with their constancy and with the maintenance of the order of nature. In this connection we observe also that there now exist few, if any, “regularities” touching the layman’s life at everyday points, which have never been explicitly formulated into laws. Nevertheless the work of science is not complete, for its aim is ever towards a more comprehensive law and an all-embracing synthesis. If a curtain blows about at an open window we think of the laws of motion and of dynamics; if crops keep character with sowings, we are reminded of the botanical laws of heredity; the resemblances of a son to his father have their scientific expression in the Mendelian laws; and so forth. The laws of science are not all at the same

level, but form a hierarchy. The laws of kinematics describe or state in shorthand form the properties of moving bodies apart from consideration of the forces engaged therein; but at a higher level we have the laws of dynamics. These by virtue of Newton's laws of motion which interpret change of motion as "impressed force," absorb and incorporate those of kinematics. (It is true that Newton's statement is now to be replaced by its equivalent in terms of relativity, but the fact of the difference of level is unaffected.) The tendency is ever upwards—from the observation of simple regularities to the comprehension of these into great generalizations of ever widening embrace. Just as Kepler's wonderful work collected into three brief mathematical formulae the then known phenomena of planetary movements, and these were only to be swallowed up by Newton's more amazing universal law of gravitation, so these same features of movement towards wider scope plus greater "simplifications" (e.g., two "elements," protons and electrons, instead of 92) continue to characterize the science of the present century. A simple regularity known to physicists is expressed in the law discovered and stated by Sir George Gabriel Stokes. As originally stated it asserted that in fluorescence *the refrangibility of light is in general reduced* by the dispersion caused by the fluorescent substance. This remains true, but its more general statement under the wave theory was *that light absorbed at a certain wave length was always re-radiated by the fluorescent substance at a longer wave length.* This also remains a correct statement of the rule. But the quantum theory brings in a yet freshly worded law. It is that *light quanta incident on the surface of any fluorescent body have part of their energy absorbed (in effecting change of electronic orbit) and are therefore re-radiated as smaller quanta: but since the quantum constant (Planck's constant "h") is fixed it must therefore be the frequency ("γ") that has undergone reduction.* Hence, the change in colour towards the red. Comparing these three "explanations" it should be observed that they are statements of an empirical truth in terms of theories which are not merely different and alternative but which are successively wider and more comprehensive. The first hardly invokes a theory but speaks only in terms of experimental observation of the facts of variation in refrangibilities of lights of different colour; the second widens out to the wave theory—capable of "explaining" not only refrangibility but interference, diffraction, etc., etc., and indeed all the optical phenomena of its day. But the third

faces and accounts for all these and in addition subsequently observed phenomena which presented insuperable difficulties to the mere wave theory—for instance, the temperature-distribution of radiant energy in hot bodies, the photo-electric effect, and the varying photo-chemical effects of light of varying frequencies—as well as the phenomena of fluorescence. Science ever thus aims at its ideal of unification—and in the very act of progressing towards this is presented with new dilemmas for solution.* The regularities remain, however, and their scheduling is a permanent, notable and highly valuable result of science. Christian and Jewish thought has always recognized these, though on the level, not of formal science but of ordinary common-sense observation (out of which, however, science of course grows). The contribution science makes is to hand to the religious thinker a developed picture of these orderings in their intricate detail and dovetailing so that if the Christian was once moved to say, “Give thanks to him who alone doeth great wonders: for his mercy endureth for ever; to him that by wisdom made the heavens: for his mercy endureth for ever,” when he had surveyed the world as an ordinary observer, he can, accepting all the verified findings of modern science, repeat the words with a thousand-fold more fervour and depth of significance. He can, moreover, live in restful, yielding dependence on Him “in whom we live, and move and have our being” knowing him so much more fully in the endless variety and richness of his creatorial work, and, above all, in the faithfulness of his continuing and sustaining mercy.

Let us consider another law of nature. Perhaps one of the most noteworthy is the biological Law of Biogenesis, *Omne vivum ex vivo*, or, as all biologists of repute hold, life flows from previously existing life and arises in no other way. This principle became firmly established through the work of Louis Pasteur in 1860. Before his time many believed and taught that living creatures may arise spontaneously—maggots from meat, worms from mud, microbes from soupy vegetable infusions. But by

* The quantum theory, itself invented to solve difficulties, raised others. It had a tough nut to crack, for instance, in accounting for the energy of a quantum after emission. Does it spread out continuously, as does the “classical” wave-front and thus become continuously weaker? Or does it “keep together,” corpuscle-like? In the former case it would lose the concentration of energy necessary in the work of smashing atoms; in the latter we should have to revert to the classical theory and lose the simplicity, continuity and harmony of quantum optics. The dilemma is cleared—but not very satisfactorily to the plain man—by appeal to relativity theory.

experiment after experiment Pasteur demonstrated that if living creatures are strictly excluded from the experimental chamber no living creatures ever appear in it, however favourably supplied it be with meat, mud or infusions. It is now universally accepted that so far as human knowledge reaches living organisms are generated only by previously existing living organisms. This principle is an empirical law, that is, one founded on observation and experiment. It could be upset only by a competently observed and reliably attested instance of spontaneous generation or the production of life otherwise than from previously existing life. It is at least implicitly a tenet of Christian thought as much as an article of scientific doctrine. "It is," we are told, "one of the foundation stones of the modern doctrine of evolution,"* for, of course, if life can be spontaneously generated or new species arise apart from the mediation of existing species, the ground is cut from under any such developmental theory. And yet there comes a point at which both Christian thought and atheistic philosophy depart from the principle. "This is the finger of God," say the magicians of Pharaoh's court at the generation before their eyes of swarms of lice: and Christian commentators agreeing with them cite the occasion as one of a signal action of God. And evolutionary biologists who write "We can say now with an entirely reasonable confidence that all life which exists to-day has sprung direct from pre-existing life," follow this up immediately with, "But, of course, this apparent impossibility of spontaneous generation applies only to the world as we know it to-day. At some time in the remote past, when the earth was hotter and its air and crust differed, physically and chemically, from their present state, it seems reasonable to believe that life must have originated in a simple form from lifeless matter."† We have here a contrast of modes of thought which is most illuminating. Life admittedly arises from pre-existing life. How then are we to account for the first life of all? "Invoke a Power of a *different order altogether*, a Creator," says Christian belief; "Invoke the well-known *natural* processes," says atheism, "but *endow them a little more richly: give them efficacy such as our research has long sought but convincingly failed to detect.*" This is not an unfair characterization. Biology is acquainted with the whole range of conditions of temperature, pressure, chemical atmosphere and potential environment known

* E. S. Goodrich, Ency. Brit., Art "Evolution."

† "Science of Life," Wells, Huxley and Wells, p. 496.

to physics and astronomy. It has ceaselessly experimented for more than three hundred years,* but has never known or caused dead matter by natural or laboratory processes to spring into life. These speculators therefore appeal to times *remote* from the present, to conditions *remote* from actuality and imagine a generation of life from dead matter *remote* from all experience or knowledge. This is not science: it is bias wearing a "scientific" mask. True science respects its own hard-won laws too highly to jettison them at the whim of *any* philosophical system. It does not blow hot and cold over the same doctrine, admitting life to be biogenetic as revealed by "interrogative observation"† of nature and making it abiogenetic to satisfy a wish to provide a naturalistic account of its origin. The very shiftiness and illogicality thus displayed is a testimony to man's need of a revelation on this point. And this we have in the words "And God created . . ."

We have maintained that scientific laws are the tabulated and formulated regularities observed in the working of nature. Heat expands gases, iron sinks in water, sound is reflected by cliffs and walls: these are examples of very ordinary recurrences and these statements although in crude form are scientific laws. Science, of course, even its elementary stages seeks to give them precision and mathematical form. For instance the first is elaborated into the Law of Charles which says that under constant pressure the volume of a gas is proportional to its absolute temperature. This is only the same regularity more elaborately observed and more precisely stated. Now science proceeds by observing, hypothesizing, experimentally testing its hypotheses and verifying (or disproving) them. A hypothesis that has survived such a probation becomes a standing part of the stock-in-trade of the particular science to which it belongs and if of wide range may be dignified as a Law or a Principle (spelt with a capital!). Such are the Law of Gravitation, the Principle of Equivalence or First Law of Thermodynamics, the Second Law of Thermodynamics—*alias* the Entropy Law—the Law of Biogenesis, the Laws of Mendelism, the Laws of Chemical combination, etc. What needs to be emphasized is that *all* scientific laws are merely more or less elaborated, more or less refined and more or less mathematically

* Harvey described the circulation of the blood in 1628; Wöhler artificially prepared urea in 1828; bio-chemistry was in the heyday of vigour by 1928.

† The phrase is approved in "Science of Life," Huxley and Wells, N.B.!

stated assertions concerning discovered and verified regularities in the working of nature. Muddled thinking has already shown itself as a result of failure to apprehend this plain truth. The muddle particularly arises from play of thought around the idea of *kinds* of scientific law. It has repercussions on religious thought which amount to a blunting of the testimony borne by the sciences to religious truth. For instance, Eddington asserts that violation of the so-called "field laws" is *unthinkable*: not merely "improbable" or even "impossible" but unthinkable. Now the field laws include gravitation, and the inconceivability of their violation implies the impossibility of their infraction even by God Himself. Thus a miracle such as that whereby according to Scripture the axe-head was made to "swim" (2 Kings vi, 5-7) is lightly brushed aside as not to be thought of. The Scriptures are thus discredited by "science." But are they? Let us see where the confusion really lies. In dealing with scientific laws Eddington first recognizes the fact that "certain regularities and recurrences are noticeable in every sensory experience." He calls these "laws of Nature," and says of them that "physics would never have originated if it were not that . . . regularities . . . are noticeable."* Instead, however, of allowing to this truly remarkable phenomenon of regularity in nature the recognition it merits as a great *fact* of science, he treats it as if it were merely a condition making science possible.† He goes on to give a classification of laws of Nature, viz., Identical, Statistical and Transcendental Laws. The identical laws he says are truisms and "include the great field laws which are commonly quoted as typical instances of natural law—the law of gravitation, the law of conservation of mass and energy, the laws of electric and magnetic force, and the conservation of electric charge."‡ The statistical laws including the laws of gases and thermodynamics are the laws obeyed by crowds independently of the characteristics of the individuals composing the crowds. The transcendental laws are those of atomic structure and the quantum laws "which so far as we know may be true laws of governance."§ Now this classification grows out of and is

* *New Pathways in Science*, p. 8.

† Would it not strike a visitant from any *other Nature*, if there were such, with extreme wonder?

‡ *Domain of Physical Science*, p. 215, in "Science, Religion and Reality."

§ Eddington's opinion in 1925. He subsequently changed his view and regarded the laws of quantum phenomena as statistical laws. (*Relativity Theory of Protons and Electrons*, p. 329.)

bound up with Eddington's view of the aim of science which is to "construct a world which shall be symbolic of the world of commonplace experience."* This, of course, if granted, is science at a high level and very far removed from the familiar world from which, however, as he admits, "the whole scientific inquiry starts" and to which in the end science "must return." Now in the course of this construction of a symbolic world the constructor postulates certain elements—*relata*—as few as possible, and certain *relations*—as few as possible; assigns to these the required properties—again by postulation and again as few as possible; and from this minimum of ideal bricks and cement builds his "world." From the definitions of the postulated *relata* and relations he deduces his field laws. Now a statement which follows immediately from the definition of a term is admittedly a truism. Let us notice however the important fact that the definitions from which Eddington's "field laws" spring as truisms are ideal definitions and so far have *no relation* to the world of sensory experience. The identification of energy, momentum and stress with the ten principal "curvatures" of this ideal world, this mental construct, is *assumed*, and yet only if this identification is correct is it true that the laws of conservation of energy and momentum can be viewed as mathematical identities or truisms. *If it appears that the physical laws are deduced from a pure mathematical basis, such appearance is illusive.*† It becomes clear, further, that at least in the term "identical laws" Eddington is using the word "law" in a new sense—a deductive sense; and not in the inductive sense of an observed and formulated regularity in the working of nature. *These great laws remain as valid inductions*, however they may subsequently be shown to be deducible from a scheme based on a minimum of ideal "world-building" elements. The Christian thinker may continue to regard them justly as *laws of governance*.‡ In this light their classification as (i) laws of provision (ii) laws of regulation (iii) laws of limitation offers a suggestive study—devotional of course, rather than strictly scientific, although

* "Nature of the Physical World," Ch. XV; but we prefer the more realistic aim of Niels Bohr: "The task of science is both to extend the range of our experience and to reduce it to order" ("Atomic Theory and the Description of Nature," p. 1).

† Chapters X, VI, and VII of Eddington (*ibid.*) carefully read and critically weighed will bear out the truth of this assertion which is here necessarily based on an extremely condensed argument.

‡ Eddington does not deny this of them, "when approached in the way in which the mind looks out on the world" ("Nature of Physical World," Ch. XI).

based on the findings of science. The Second Law of Thermodynamics, for instance, sets a limit to the amount of energy that can be converted by man to the purposes of his will and service from the all but boundless stores of heat energy by which he is surrounded in the atmosphere, soil, etc. The laws of Mendelism are equally of the "limiting" type. Those of gravitation and motion, and the sound laws are of the type of "regulating"—in virtue of which the outside world is maintained as a smoothly working "accountable" mechanism available for the service of mankind. The laws of plant metabolism are a sample of laws of "provision," whereby food is provided for the animal world in an assimilable form. Christians rejoice in Him who, as such stable laws demonstrate, is "not far from every one of us" "in whom we live, and move and have our being"; they further rejoice that the maintenance of his age-long mercies should receive at the hands of the sciences the elucidation afforded by ever increasingly detailed knowledge.

The standing of psychology as a recognized science is doubtful since its very data are questioned, whereas every true science "is concerned with data on which normal people are agreed."* Nevertheless, there are some generally accepted results from both academic and the newer psychology which contribute weightily to Christian thought. Psychology is now showing greater willingness to treat mind as being *sui generis* and to admit that the physical evidence has been wrongly allowed to outweigh the purely psychical. Mind as mind is now much more consistently taken for granted as an unquestioned reality. Few people nowadays really prefer to think of themselves as nothing more than a swarm of whirling electric charges. Most of us feel that we have identity and personality and agree that mind cannot be described in physical terms. Thought may possibly always result in physical activity of some kind; nevertheless, thought itself is independent of physical considerations, *i.e.*, it is psychic. One pertinent observation of the older psychology tended to support these views and to exhibit mind as a unique thing. It was the fact of the insularity of consciousness. While body may have direct contact with body, mind does not in general have direct communication with mind, but only through speech, gesture, etc., which are indirect, and, actually, physical

* See a brief critical survey by Prof. H. Dingle in "The New Learning," p. 236.

channels.* Thus A's sensation of "blue" can never be known directly to B or even known to be the same as B's in spite of the use of the same label for it. These results of psychology seem to testify to the trustworthiness of the Holy Scriptures which consistently view personality as a precious thing and mind or spirit as a secret thing having in turn its own secrets. "For what man knoweth the things of a man save the spirit of a man that is in him," and "He that is spiritual discerneth all things, yet he himself is discerned of no man" (1 Cor. ii, 11, 15).

Of those results of the newer psychology which have bearings on religious thought only brief mention can be made. Detail must be sacrificed. The nature of the contribution is that of proof that methods of dealing with temptation, sin, "self"—methods of inducing peace and poise of mind long ago urged upon Christians by the inspired writers, have received the approval of modern mental science and successful mental therapy. But a strong disclaimer must first be put in against any suggestion that the aims of Christianity and psychoanalysis coincide or that psychic evil is a synonym for sin. Holy Scripture defines sin to be *anomia* or lawlessness, *i.e.*, creature independence—not only transgression (see 1 John iii, 4, Gk.). Sin is essentially a disturbance of creature relations with God. Psychic evil may be a result of this, but in itself is a disturbance within the mind and may originate from causes having no bearing on religion. The aim of Christianity, at least as far as the individual is concerned, is recovery to God. The peace and mental wholeness are inevitable consequences of such restoration,† and of such quality that the most successful psycho-therapy can never even imitate.

Some parallels between Christianity and the new psychology are here given. Ambivalence, or the simultaneous activity of two mutually antagonistic impulses neither of which is able to assume complete uncontested control—a condition clearly recognized by modern psychology,‡ is perfectly paralleled in the attitude towards the law of God of the distracted man of Romans vii, 15-23. "For the good that I would I do not: but the evil that I would not that I do" (v. 19). And psychology's way of escape, *viz.*, the strengthening of the activity of the

* We leave out of account ill-understood and often questionable telepathic phenomena.

† It is only a certain defective type of evangelistic Christianity that regards the results to the individual as the *primary* aim of the Gospel.

‡ See Freud, "Totem and Taboo," for a clear description of its origin.

“ego ideal”—the “charging up of the ideas” centred in the higher impulse—until the old ideal dies through lack of expression and its hormic “drive” and associated emotions become transferred to the new—this is also the way of Scripture. The whole of Romans viii illustrates the application of this method. It enlarges on the ideal of being “in Christ” and its incomparable results. And in chapter vi, the apostle had already urged “Reckon yourselves to be dead indeed unto sin and alive unto God in Christ Jesus our Lord” (Gk.). Again the “disintegrated” man* of Romans vii found complete “re-integration” in the constraining influence of the love of Christ—which was the “master sentiment” under which alone, as MacDougall teaches,† perfect integration can be accomplished if the sentiments be organized in an ordered system dominated by it. Such a dominating “master sentiment” is perfect love as seen in Christ, the ideal of character. (See 2 Cor. v, 14-17, remembering that in this chapter as in Romans vii, Paul wrote of himself.) “Sublimation” as an ennobling and controlling process, again, is not new. Psychology may have investigated the theory and invented the term, but the process is quite biblical. The practical sanctification of the marriage bond is a perfect case of sublimation. From mere sexual gratification the Christian teaching concerning that mystic and indivisible union of Christ and the Church, of which marriage is a divinely given figure, has lifted it to a bond of unselfish love and mutual devotion—to a “bond,” indeed “of perfectness,” illustrated in thousands of joint Christian lives and homes (Ephes. v, 25-33; Col. iii, 14).

And so with comparison after comparison. “Abreaction” has scope in Christian confession of sin to God and of faults to one another as a cure for breaches of Christian mental wholeness. Confession is the New Testament counterpart of Freud’s method of treating the “repressed complex,” viz., “making the unconscious conscious”—and the parallel is capable of lengthy development. In the healing grace of Christianity we see its immense superiority to the Law of Moses which offered nothing better than “repression” leading to the “conflict” we have already considered.

Sufficient suggestive examples have been given to show that it is possible to develop and sustain the thesis that the methods

* This was only partial disintegration—not, of course, amounting to “dissociation.”

† See “Outline of Abnormal Psychology.”

and principles applied by psychotherapists in assisting men into harmony with themselves were long ago used by the Spirit of God to lead men back into harmony with God first and so into internal harmony. And once more modern science adds the weight of its testimony to the efficacy of Christian teaching and to the truth of Christianity.

To sum up, we have seen that in the search for origins the sciences are compelled to admit that sooner or later their quest must be given up in despair. Science, therefore, bears witness to the need for a revelation. Such revelation is forthcoming in the Scriptures, which proclaim God as Creator and man as a dependent Creature. Science, in its turn, shows the reality of this dependence in its physical aspects, by revealing the narrowness of the limits within which life is possible in the universe, and the co-ordinated complexity—and so, incidentally, the designed character—of the proportions and adjustments in the physical world on which, in their totality, life depends. The relative minuteness of the earth, emphasised by modern astronomy, supports the Scriptural teaching that man should take a lowly place before the Creator of the vast systems viewed in the heavens. Physics brings to light intra-atomic forces of surpassing magnitude and extreme ranges of temperature, pressure, dissociation and “atom-stripping” found in giant stars and remote nebulae but unknown on earth which serve to bring the predictions of Scriptural eschatology within reach of our powers of conception; while biology witnesses to the superiority of man in relation to his fellow creatures and thus corroborates the unique place given to man in the Scriptures. Further mutual ratification between science and Christian thought is seen in that while in Scripture man is declared to be the centre of all God’s plans and purposes in Creation, he is, in full accordance with this, revealed by the whole sweep of scientific observation to be the only known intelligence in the universe able to take account of either its vast physical magnitudes or the lofty ideals and values of the life which it holds. Both the existence and the cultural amenities of life are dependent on the maintenance of uniformities which are recognized in science as the laws of nature and in Scripture as the enduring mercies of God. Attempts to represent these laws as deductive and their breach as unthinkable are illusory and are caused by confusion as to the logical status of law and ignoring the existence of certain formidable assumptions. The laws are in origin and actuality simply

inductions soundly based on the results of wide and long-continued observation and are invalid therefore as objections to competently observed and attested miracle. On their general maintenance all life and the continuance of the material universe depends. The law of biogenesis, which has known no exceptions since its formulation, requires us to accept the Scriptural belief in a transcendent Source of life. All the laws of Nature, and not some of them only, may justly be viewed as laws of governance. This is admitted by science and claimed by Scripture, which declares that "The living God which made heaven and earth and the Sea and all things that are therein . . . left not himself without witness in that he did good and gave us rain from heaven and fruitful seasons, filling our hearts with food and gladness" (Acts xiv, 15, 17). Turning to psychology we find that it stresses the uniqueness of mind and thought, and thus endorses the Christian view of the dignity and importance of the human spirit. The recognition of the insularity of consciousness, as such, is science's testimony to Christian belief in the significance of human individuality. Many processes and states recognized and named by modern psychology, such as ambivalence, repression and disintegration are described in the Scriptures, while methods and factors of mental healing such as abreaction, the domination of a master sentiment and sublimation, commonly regarded as triumphs of modern psychological discovery, were long ago known and taught by Scriptural writers as efficacious means of spiritual therapy.

We submit that it has been demonstrated that revelation fills up the deficiencies of science, that science reinforces and illuminates Christian doctrine and that the two spheres of knowledge while differing in data and distinguished in method, not only supplement and reinforce each other but both furnish their characteristic and complementary contributions to Truth.

DISCUSSION.

The CHAIRMAN (Dr. F. T. FARMER) said: The interrelation of science and religion is a vital subject at the present time. For it is a fact, whether we like it or not, that thousands, indeed millions, of people have lost their faith in the Christian religion because they believe that science has undermined its very foundations. A recent census among thoughtful, intelligent people showed that more than half had had their faith destroyed by this cause, and it is impossible

to estimate the effect on the testimony of the Church of this modern conception.

The Victoria Institute has taken a part in trying to unravel the position and get at the truth as regards the link between these two spheres of knowledge. For we believe that only by facing the situation honestly and objectively will it be resolved. If Christianity is true, the more we enquire into it the more we shall find our faith substantiated, and the more we shall bring it into harmony with the particular knowledge of science. Nothing could be more disastrous to the progress of the Gospel than the type of stalemate that was reached in Darwin's time, when it seemed that an insoluble conflict had arisen between Christianity and science, and each party agreed not to encroach on the other's field of thought. Fortunately, we have got past that stage, and we can see now that much of the conflict was illusory. Yet there remains much to be done to straighten out the position, and for this reason I welcome very heartily Mr. Betts' thesis this evening.

I think the time is particularly ripe for such intensive efforts. The plain, bald materialism of the last century, with its closed universe and mechanistic nature, has gone. And people are groping in all directions for something to fill the void which is left; they are inventing new philosophies of life, new "isms" of countless different forms. And it is our opportunity to show the place of the Christian Gospel in such a world of bewilderment and misunderstanding. I should like to thank Mr. Betts on your behalf for the contribution he has made in this direction this evening.

Dr. ERNEST WHITE said: One of the great difficulties in the attempts made to reconcile Scientific and Religious thought lies in the fact that these two spheres belong largely to different categories. Mr. Betts suggests this when he says that "Few people nowadays really prefer to think of themselves as nothing more than a swarm of whirling electric charges." If we consider a work of art such as a picture, although a physicist may measure the size of the canvas on which it is painted, describe the chemical composition of the various pigments, give an account of the length of the light waves reflected by the various colours in the picture, etc., he is thereby selecting certain features from the whole, but is leaving out of account

the beauty of the work and the æsthetic feeling produced in the artistically trained mind of the beholder. As Eric Gill says in a recent book ("The Necessity of Belief"), "You could never know what a human face really looks like if it were only possible to examine it with a microscope."

Science, from its very nature, leaves out of account certain values, and can never attain to certain great synthetic assertions such as that with which the Bible opens—"In the beginning God created the heaven and the earth."

I was sorry to hear the author say that "the standing of psychology as a recognised science is doubtful." Psychology has its data and its hypotheses, and during the last few years an immense amount of experimental work has been done both in the laboratory and in clinical work, leading to the formulation of definite laws of mind. Although it is the youngest of the sciences, since it was definitely separated from metaphysics about the middle of last century, it may surely now claim to occupy a place amongst its elder sisters.

In giving parallels between the new Psychology and Christianity there appears to be a little misunderstanding of Freud's use of certain terms. It is true that different psychologists do not always use terms in the same sense, and there is a real need at the present time for some genius to arise who would synthesise the various schools of thought and standardise the meaning of terms used.

To say that "confession is the New Testament counterpart of Freud's method of treating the repressed conflict," seems to me to be a misunderstanding of the word "repression" as Freud uses it. Repression means that some idea, with its associated emotions, is not present in consciousness, and can only be brought into consciousness by the special technique of psycho-analysis, including dream interpretation. It is therefore a very different process from confession, for the latter can deal only with the conscious thoughts, and leaves the unconscious untouched.

Again, sublimation in the Freudian sense is an unconscious and not a conscious process, and so cannot be achieved by voluntary effort.

A good deal of the misunderstanding arises from a confusion of the word "suppression" with the word "repression," and I am afraid that psychological writers are not always free from this error.

I should like to express my gratitude to Mr. Betts for his very interesting and thought-provoking essay.

Col. SKINNER invited attention to the significant change in recent years in the outlook of science. There was a time when scientists, under urge—quite legitimate—of thinking out their problems in their own way, had broken away from restraints of religion. Man was created a free agent and, notwithstanding warnings and prohibitions, had perfect liberty to choose his own line. Unfortunately the latitude was stretched to extreme, and in absence of any recognition of divine authority, it has led to gross materialism, with ultimate result in the present world chaos which threatens destruction of the human race.

But to-day there are welcome signs of recovery and return; the pendulum is swinging back. Among purely scientific thinkers there are not wanting men who have reached a hilltop from which they see a vast land, unknown and out of reach, but earnestly to be desired; the best of scientists, Jeans, Eddington and the like. They have come to their scientific horizon and there confess that something other than material science is needed for exploration beyond the limit of purely human thought. In this way, it seems to me, science is likely to help religion in future more than in the past.

WRITTEN COMMUNICATIONS.

Rev. Principal H. S. CURR wrote: I have read Mr. Betts' essay with great profit and pleasure. In these days when the conflict between science and religion seems to wax hotter and hotter in proportion as it becomes less acrid, it is reassuring and refreshing to receive such a reminder as this paper furnishes that, in the last analysis, science and Scripture must make one music, since both deal with the ways and works of the same God. When Kepler made his great discovery that the path followed by the planets in their unceasing voyages in the sea of space is elliptical and not circular, he is said to have exclaimed that he was thinking God's thoughts after Him. The devout student of Mr. Betts' pages must feel disposed to echo these words as he surveys some of the great conclusions in the field of scientific research so clearly expounded therein.

I must, however, confess that I had hoped that the paper would have had something to say about the bearing of the scientific method on the formulation and elucidation of theological problems. The modern mind is so familiar with it that its presence and power are not adequately recognised. That is to be regretted, since theology, which is so often defined as the science of religion, owes a great deal to the characteristic methods of the scientist.

There is, for example, the collection of data on which a judgment may be made. When the foundations, on which certain beliefs, held more or less widely, are examined, one is driven to the conclusion that the man of science would hesitate to formulate a hypothesis upon a quantity and quality of evidence so slender and dubious. A few passages of Scripture are deemed to be a sufficient basis for theories whose consequences may have very large implications. Thus inferences are drawn by the exponents of modern Biblical criticism from phrases and fragments which hardly seem to be justifiable. The same is true of doctrines and dogmas such as Our Lord's Descent into Hell between His Crucifixion and Resurrection. I use advisedly old-fashioned terminology in this reference.

Again, there is the uniform and universal insistence by modern science on the principle that every effect must have a sufficient cause. Much scientific investigation is nothing more or less than the tracing of causes. Theologians might well borrow a leaf from the scientist's book in this connection. To state the idea in popular parlance, they are tempted to cure an earthquake with a pill.

Yet another direction in which modern science has made a mighty contribution to religious thought may be described as the elimination of the irrational, the absurd, and superstition of every description. That is illustrated even in the interpretation of Holy Scripture. Explanations which are obviously far-fetched and foolish have often been championed with unhappy results. But with the diffusion of the scientific spirit and standpoint that problem has diminished, although much still remains to be done.

Arising out of these observations, mention may be made of the services of science to religion in exposing and exploding quack faiths and teachings. Phineas T. Barnum, the great American showman, used to say that the public likes to be fooled, and to few aspects of human life do these words apply more aptly than to religion.

Freak religions are always plentiful, and one of the contributions of science has been to lay bare their unspeakable folly and futility. That is but one count in the great debt which true religion and sound theology owe to the rise and growth of modern science.

MR. E. W. BATTERSBY wrote: "Scientific knowledge does not give us absolute certainty. It gives us highly probable belief." One might say that scientific knowledge can give us no *direct* proof of the supernatural, although it may supply us with evidence making certain beliefs highly probable. Once science has pointed out to us what lies beyond the natural world, her descriptive functions must of necessity cease. In this world we cannot experience pure causes, except the Prime Causer, for every cause is really only the effect of a previous cause.

Scientific knowledge has further limitations in the sphere of morality, mind and value, for which, according to Professor C. E. M. Joad, in "Philosophy For Our Times," it cannot account, and in the region of the Absolute, to which it cannot attain, as Kant and other empiricist philosophers have proven.

We might likewise elaborate on the fallibility of the testimony of science to the senses in the realm of the physical, if we chose to go into logical hair-splitting epistemological arguments, such as the fact that we can never find identical things in our experience, but similar things, even though we meet our brother half an hour after he has left the home. But laying stress on such problems will in all probability land us into the unfortunate situation of the Greek Academics who, would neither affirm nor deny a fact for fear of having passed a wrong judgment (*vide* "Discourses of Epictetus," Chap. V, Appendix Note 1, in Everyman's Series).

Parallel arguments, although of dubious practical value, purporting to show the unreliability of the witness of science in the domain of physics, can be produced, such as, for instance:—

(a) The unnoticeable rest-spots in reading;

(b) Fading or "acoleuthic" sensation—*e.g.*, when you can't see the minute hand of a watch moving because it is in several appreciably different places within the short time ("specious present" of Professor Broad) that is required for one sensation

to fade so that you do actually at one moment see it in several places ;

(c) The relation between a word spoken and a word heard. Bertrand Russell, in his "Outline of Philosophy," writes of this : " We usually take for granted the relation between a word spoken and a word heard. ' Can you hear what I say ? ' we ask, and the person addressed says ' Yes. ' This is, of course, a delusion, a part of the naive realism of our unreflective outlook on the world. We never hear what is said ; we hear something having a complicated causal connection with what is said. "

AUTHOR'S REPLY

Dr. Farmer's remarks about the mutual relation between science and the Christian religion are pertinent and serious. I am obliged to him for them.

I most heartily agree with Rev. Principal H. S. Curr in his strictures on hasty formulations of hypotheses and unjustifiable conclusions based on fragmentary and unrelated scraps of evidence, especially in things theological. Theology is often honeycombed with such procedure. But, regrettably enough, it is not true to say that " the man of science would hesitate to formulate an hypothesis upon a quantity and quality of evidence so slender and dubious, " for we have with us to-day, alas ! undoubted men of science who are only too prone to fall into such intellectual sins. The sciences themselves, not excluding mathematical physics, badly need rescuing from unscientific method. Principal Curr has invitingly sketched material for a whole paper on the rational examination of evidence and legitimate working up of data. I regret that my interpretation of the terms of reference led to a failure to deal with this, to me, attractive subject.

I thank Colonel Skinner and Mr. E. W. Battersbey for their completely acceptable and suggestive notes. I also greatly appreciate Dr. White's remarks, particularly the fine illustration he gives of the limitations of science—another subject capable of considerable development. The question whether psychology is of undoubted standing as a science may well become an empty logomachy. My

own doubt arises from the fact that eminent psychologists do not agree about the fundamental data of their subject. Some disregard consciousness. Others give it a central place. But agreed data are an essential to any "science." Of course, no one doubts the value and importance of psychology or the strides it has made this century, and especially the last twenty-five years. A unification of psychology is a great desideratum, it is agreed; but those who sigh for a synthesis should not press in the meantime for an exclusively Freudian use of psychological terms. Sublimation, for instance, is viewed by prominent psychologists as an *interaction* between the unconscious and the conscious. MacDougall says even that "sublimation is civilisation." Again, a reasonably careful reading of my paper would hardly justify the conclusion that I labour under a misunderstanding of the Freudian term "repression." I distinguished carefully between "psychic evil" and sin. My parallel was between N.T. methods of dealing with the latter and psycho-analytic methods of dealing with the former, and did not descend to the details of technique. The process of "making the unconscious conscious" is clearly and repeatedly set forth in Romans vii and viii. The former chapter describes the history of a soul which finds within itself a once unsuspected but now clearly recognised sump of evil—a dynamic source of sin. The immediate result of the discovery was horror and despair. But the grace of God in Christ enabled the apostle—for it was he, of course—to recognise the internal source of evil and, in that it was something already divinely dealt with ("condemned"), freely confess it. Deliverance and peace and poise resulted. If this is not a clear parallel there can be none short of complete identity which I did not claim. Unconscious repression and deliberate suppression differ more in degree than in nature and the latter may be a cause of the former. With regard to sin dwelling within one, "confession," understood comprehensively to include recognition, realisation, abhorrence and acknowledgment, is closely parallel, I maintain, to the process used by the psychotherapist in overcoming a repression, whatever may be the detailed technique of hypnosis, dream analysis and interpretation, recall, or what you will. The real greatness of Christian deliverance from sin—and I refer primarily to indwelling sin—is that the Christian is taught to

recognise fully and with clear consciousness the presence within him of something which he abhors but which has lost its power to hold him in bondage or mental conflict. The once unconscious source of conflict is brought fully and unqualifiedly to the light of consciousness and there judged in the light of the Cross of Christ. And the Christian is as free as a bird.