SCIENCE AND THE REAL

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SCIENCE AND THE REAL

This is an age of science. Everyone agrees about that: but reactions to the achievements of science range from enthusiastic approval, through baffled indifference, to violent disapproval, and this for a variety of reasons. It has even been suggested that a moratorium on scientific research should be proclaimed to prevent scientists inventing any more horrors. Since this is a Blavatsky Lecture, let us ask ourselves 'what would H. P. Blavatsky have said about modern science?' We may be sure she would not have been indifferent, so would she have been for or against? It is often supposed that she was bitterly and sweepingly critical of the science of her day, condemning its materialistic outlook and its short-sightedness. But this is not altogether a true picture; she was selective. From her lofty viewpoint, many scientific ideas of the nineteenth century appeared false or hopelessly limited, despite the arrogance of their assertion; yet she singled out some scientists of vision for high praise. It would be the same today; she would still find much to condemn, but surely far more to praise than at the time she wrote. For truly science has taken vast strides forward, not just technologically but also in ideas and outlook.

The time is opportune for a reappraisal of the relationships between Theosophy and modern science. Some of the broad principles enunciated by H. P. Blavatsky, which appeared scientifically absurd eighty years ago, are today part of the common coin of scientific thinking. However, they are now expressed in terms quite different from hers, and before we boldly claim vindication for H. P. Blavatsky, we have to make quite sure that her poetic language really did mean the same thing as the more precise terminology of today.

THE PHYSICAL SCIENCES

By way of illustration, it is worth taking a brief glance at the present state of physics, probably the most advanced of the sciences. The solid material world of the nineteenth century physicists, which provoked H. P. Blavatsky's scorn, has been dematerialized as it were, by their grandsons. Matter is now regarded as a kind of airy-

fairy froth of inconceivably minute ultimate particles rushing about in all directions. Moreover the very term 'ultimate' now has a temporary ring—it would be no great surprise to learn that some of these particles have been further subdivided. Nor are they regarded as solid balls by any means; in some respects they behave, we are told, like waves or bundles of energy. It is hard to find cast-iron correlations, but in general all this is much more like the language that H. P. Blavatsky used than were the earlier descriptions. Then again, matter and energy are now in principle interconvertible, and in practice, under special conditions and to a limited degree, these conversions can be controlled by man. Again, H. P. Blavatsky is vindicated in general terms, since she lumped together matter and energy as essentially similar.

Moreover, it is these advanced physical sciences in the main that have inspired modern philosophers, some of whom have written in terms not too dissimilar from those of the philosophers of old whom we have been taught to revere.

THE LIFE SCIENCES

Paradoxically, it is the biological sciences, the sciences of life, that are lagging today. Here materialism, though of a subtle and insidious kind, lingers and needs to be exposed. But this is already being done, here and there, by the scientists themselves. These men are driven towards truth by the logic of their own work, and without listening to theosophical lectures. There is no occasion for impatience; the way of science may be a little slow, but it is sure, and its gains rest upon secure foundations. In a few more decades we may look forward to biologists proclaiming the Unity of Life as a scientific fact. At present they certainly do not concede the universal Life Principle in which we believe, able to function in or out of physical vehicles. However, they do already find a considerable degree of unity throughout the kingdoms of Nature, at the biological and biochemical levels.

In this lecture it may seem that I find more to criticize than to praise in present-day science and its works, and that I must therefore be a disillusioned scientist. This would be an entirely wrong conclusion; I am indeed full of admiration for the great achievements of science. But while many are able and ready to extol its accomplishments, there are few who will point a kindly finger at its present weaknesses and shortcomings, especially from the theosophical

angle. Moreover if I do this, it is in no spirit of despair or despondency. The scientific principle has a built-in corrective for such faults. In time, inherent honesty and regard for truth will inexorably compel acceptance of ideas that we hold dear, assuming that they *are* true, as we believe. The history of science is full of examples of old ideas being overthrown when they were shown to be false or inadequate—not indeed without resistance, for scientists are imperfect emotional humans like the rest of us; but reason has always prevailed in the end.

TECHNOLOGY AND MEDICINE

I shall say little in praise of technological achievements, for these are plain for all to see and admire. There are indeed those who cavil at the speed of advance; they emphasize the horrors of science harnessed to the art of warfare, and ignore the overwhelming advantages of modern civilized living that we also owe to science. Let those who hanker after the good old days recognize that on the whole they were nasty, mean, smelly, unhealthy and brutish; they could be enjoyed only by those of lusty constitution—the rest died young. Civilization has its faults and excesses, but life today is vastly more convenient and agreeable in most ways. One would like to claim also that we are healthier, and in some respects this is true, but the situation is complex and controversial. Some of us are critical of certain aspects of medical research and practice, and (until we are seriously ill) we may favour various unorthodox systems of medicine. But it cannot be denied that we live longer, statistically speaking, than our grandparents or even our parents. The following comparisons illustrate not only this fact, but also the increasing pace of the advance in medical science. At the turn of the century, the expectation of life at birth in this country was 48 years; 62 years earlier it was very little less, namely 45 years; but today, 62 years later, it has risen to 70 years. Moreover, more than half of these extra 25 years have been gained for us only in the last quarter-century.

Many killing and crippling diseases have become nearly extinct in developed countries, for example, rickets, malaria and smallpox, while others such as diabetes, pernicious anaemia and pneumonia, have been brought under control. These, it may be noted, are ailments of totally different origins, due to vitamin deficiency, trypanosomes carried by an insect vector, a virus, gland atrophies and

bacteria. Improved hygiene is rightly given some credit, but it is a small part of the story. It is unfair to discount these magnificent achievements of medical and biochemical sciences, as some do, by complaining that the incidence of other diseases is increasing. Part of this is due to the very fact that we are living longer, and so giving time for the slowly progressive ailments to take hold. Would you really rather have died before you became arthritic? Some illnesses that are on the increase seem to be caused by the excesses of civilized life, and can be avoided when we learn wisdom and live by it; there are, for instance, the nervous and mental illnesses due to the stress of the 'rat-race'. Millions of Chinese peasants may die of under-nutrition, but almost as many Americans kill themselves prematurely by over-nutrition and under-exercise. 'The television set and the motor-car may well replace pathogenic bacteria as the major agents responsible for disease and early death.'*

The dark obverse of this coin is the use of scientific technology, including nuclear energy, to devise increasingly devastating weapons of war. It is grossly unfair to blame the scientists for the present state of world affairs, as some do in their search for a scapegoat. Nor indeed should we seek to put all the responsibility on the shoulders of our statesmen; the scientist must accept his share, but then so must we all, in but little smaller measure. We are all against nuclear warfare; but emotional rejection is not enough. It is not helpful to advocate abolition of these arms without having the courage and tenacity to think right through to the likely consequences, as for example Sir Stephen King-Hall has done in his books *Defence in the Nuclear Age* and *Power Politics in the Nuclear Age*. Once again we might remind ourselves: 'The world problem is the individual problem'.

One might also suggest that young people who feel strongly on this matter could do something more constructive than just protest. What form could this service usefully take? The basic problem that is bound to cause serious unrest if it is not tackled soon is quite simply—hunger. Half the present world population of around 3,000 millions is under-nourished; every day there are 100,000 extra mouths to feed, and by the close of the century our numbers are expected to double to some 6,000 millions. Incidentally, on the basis of the reincarnation theory, this must be accompanied by appreciable

* J. G. Davis, *Chemistry and Industry*, Aug. 19th 1962, 1485.

shortening of the interval between incarnations.* The cause of this crisis is emphatically not a rise in birth-rate (except here and there), but the fall in the death-rate already mentioned. Food production is also increasing, but is barely keeping pace. However, present and future populations could be well fed; no further research is needed, but only the universal application of present agricultural knowledge. Unfortunately it is the impoverished developing countries, where the need is greatest, that are the most backward in farming methods. So—what lacks? In one word—education. Western food surpluses would make but a pitiful contribution, and are best reserved for emergencies. Also, it is not primarily money that is needed as aid, but human service. The only lasting solution is to help these people to help themselves, to teach the peasants in every village how to grow more food locally. Since the villagers will most readily accept advice from their own people, the vital Western contribution must be to set up training centres where these leaders can be taught. This then, would be a splendidly constructive job of work for dedicated young theosophists; for in this way effort is multiplied, and a single individual could make a highly significant contribution to the welfare of humanity.

THE NATURE AND METHOD OF SCIENCE

I set out to discuss the state of pure science, so this is something of a digression. But before we go further, we should perhaps stop to remind ourselves what science is all about. This may seem fairly obvious, but the scope and the limitations of science are not always fully recognized, even by scientists. Science is played according to its own rules, and it is unfair to criticize it for not doing what it does not profess to do, though one might legitimately complain that it neglects some fields that are within its proper province. But again, many people do not understand the rules, while scientists sometimes forget them.

Let us start from the bold statement that scientists are not really concerned to discover Truth! This is calculated to raise immediate protests, yet the statement can be justified in the sense in which it is intended. Obviously a scientist accumulates facts that are true in a relative sense, yet absolute Reality, in the sense in which a mystic might use the term, is no concern of his because it is outside the scope of the scientific method. It comes into the realm of metaphysics,

* See *The Theosophist*, 1953, **74**, 25; 125.

and though the scientist may be inspired to enter this domain, he must take up new and unfamiliar tools to work effectively therein; so he ought not then to trade upon his scientific reputation to claim authority for his pronouncements. In other words, a good scientist is not necessarily a good philosopher.

But this too, is not generally realized. Too many men have lost faith in the priests and the prophets, and have set up Science as a false God in their place. What is more, when propitiated by their offerings—a percentage of taxes and profits—scientific technology can give them what they want, so long as their wants are material. It can do more; it can flatter them by creating wants they did not know they had, and promise fulfilment, to the delight of the prosperous and the envy of the rest.

In themselves most of these luxuries are harmless. The tragedy rather is the false trust that men place in science. They are bemused by its achievements and blind to its limitations. Bigger and better television sets, for example, and programmes from all Europe and America, are no substitute for a philosophy of life and soundly-based ethics.

Returning to the charge that the scientist is not concerned with ultimate Reality, it can readily be conceded that facts derived from observation and experiment are not the whole of his stock in trade. He goes beyond them by collating groups of facts into laws of nature. Now and then he goes farther still towards truth by devising hypotheses that seek to explain these laws. More rarely, men of genius become possessed by the Buddhic principle, though they do not understand its nature, and become instantly and blindingly aware of some guiding principle they had not suspected previously. This may suffer some mutilation when it is expressed in thoughts and then in words, but in such a manner there emerges from oblivion a new scientific theory. It may link, co-ordinate and give new meaning to a great many observations, and may unite a group of hypotheses into an illuminating over-riding theory. So then, is this not Truth—with a capital T? If you wish the answer to this question, present your scientist with a copy of *The Secret Doctrine* and ask for his comments. If he can be persuaded to take it seriously at all he will say in effect: all this may be true, or it may not: but speaking as a scientist I simply do no know or care; these statements are quite useless to me because I cannot put them to the test. That then is his criterion. He is

interested only in those matters that can be examined by the kind of experiments with which he is familiar. Famous scientists have said quite seriously that they have no use for any theory that cannot be disproved. This must not be taken literally as meaning that they actually want their theories to be proved false; on the contrary, they accord high validity to those theories that are capable of being thoroughly tested in all their aspects and that still stand up when this is done. A theory that can only be tested by one or two dubious experiments is temporarily put aside into a 'not proven' category; while if no test at all can be devised, the theory is usually discarded as scientifically useless. Please note that such a theory is not rejected because it is necessarily wrong, though scientists as well as journalists sometimes write as if this were so; it may just as likely be right as wrong. But because there is no way to find out, the whole idea is regarded as scientifically unhelpful. The true scientist is quite unimpressed by any number of people who 'feel in their bones' that it is right, or who claim intuitions to this effect. The scientist would much rather be presented with a false theory that he could demonstrate to be false, because at least that would be one less possibility needing consideration.

This attitude can be utterly frustrating to people with pet theories they 'know' must be right, as well as for the theosophist seeking scientific acceptance for *The Secret Doctrine*. The scientist 'knows' things in a rather special, precise way, and he is impatient of claims to knowledge that do not measure up to his criteria when they are put forward as if they merited equal credence with established scientific ideas. One may be thoroughly convinced about other ways to understanding; so even may the scientist himself, especially if he is a religious man. But these are not in themselves scientific ways; the distinction is right and proper, and should not be condemned. This rigid attitude of science has been utterly invaluable, not only pragmatically but as a step in the development of the human race. We may believe the time has come to proclaim that the logical mind is not the ultimate in human powers, but we should also remember that it is an esential foundation for what is to come.

Intuition and creative imagination are indeed valuable if not indispensable to a great scientist. They may lift him to realms that plodding reason cannot reach unaided. Yet the vision must not be contrary to reason, else it must be firmly rejected. By no means every

flight of imagination may be accepted as the word of God, for as yet we are unskilled in these new techniques. We cannot always distinguish a plausible guess from an inspiration, so the bright new idea must remain suspect until it is tested at the bar of reason, or of experiment where this is feasible.

There is another convention in science that may lead to rejection of hypotheses that happen to be true. In a passion for unification, the principle of 'economy of hypotheses' finds ready acceptance. If two sets of observations can, as it were, be squeezed under the umbrella of one hypothesis, then why use two? A second plausible hypothesis may be formulated to explain one set of facts, and it may stand up to experimental tests, but it is nevertheless rejected so long as the earlier one can reasonably be held to serve. Only if observations come to light that really cannot be explained by the first, will the second hypothesis be recognized. This convention has merit, but is sometimes abused, especially in fields where excessive conservatism and prejudice are rife—and scientists are not immune from these human failings.

PSYCHICAL RESEARCH

We can, for example, observe this happening in the field of psychical research, where scientists are rather unhappily groping in deep waters. Numerous records of spontaneous events, and vast numbers of controlled 'card-guessing' experiments forced the conclusion that some 'psi factor' was operative, some faculty possessed by certain people beyond the usual five senses. Incidentally it would be wrong to claim that this is universally accepted even now. Probably the majority of scientists still cannot bring themselves to believe anything so unpalatable, and they are either not interested, or have not the time, to study the evidence. However, most of those who have done so are convinced that some hypothesis is required to explain the observations. One that seems to fit most of the facts best is conveyed by the word 'telepathy', the idea that thought can sometimes travel directly and instantaneously (or very nearly so) from one mind to another. The mechanism is still under discussion; the most obvious suggestion of radiation, at perhaps some ultra-high frequency, does not accord well with certain observations that efficiency is independent of distance. Some sort of limited merging of minds seems rather to be involved. This would be in line with the

One Mind hypothesis of our theosophical works, but beyond this general idea we may note with some chagrin that they appear to have no precise and scientifically useful hypothesis to offer. Anyhow, we may say that telepathy is widely accepted among workers in this area of research. Some of them prefer the more general term 'psi factor', but few are prepared to accept clairvoyance as an additional discrete psychic power. The principle of economy of hypotheses is invoked, and everything is dragged under the telepathy umbrella, even though much seems to be left out in the rain. Thus telepathy is stretched and twisted in the most unlikely way to 'explain' every observation. This is done even where clairvoyance would provide a much more plausible explanation to minds not closed to the concept.

The strangest example of this kind of restricted thinking is the extension of telepathy to 'pre-cognitive telepathy'. This term expresses the idea that someone can read the thought that another person is going to have in a few seconds' time, but cannot possibly have at the moment of 'guessing' by the percipient. Anyone might be excused for doubting whether such a remarkable faculty could be exercised spontaneously and unintentionally by untrained observers. The concept arose in a curious way, and even the validity of the experimental data has been challenged. Shuffled packs of special cards are placed face-down and turned up singly by the 'transmitter'. The 'recipient' then states which of five pictures he believes is on the card turned up. Clearly he should get one in five right just by chance, but successful subjects do somewhat better than this, perhaps two or even three right out of five. A long run of correct answers is rare, and usually statistical analysis of many trials is required to assess whether the correct answers significantly exceed chance. Many subjects have no 'psi factor' and literally guess, scoring only a trifle above or below chance expectation. Others do have the faculty, but usually to an erratic degree; they often score badly at first, then warm up to a run of successes, and fall off again as they get tired or bored. During these off periods, it was noticed that sometimes the answers tallied better with the next or next-but-one card that the transmitter would turn up, though at the time of guessing no one could know what symbol that card in the shuffled pack bore. So pre-cognitive telepathy was invoked; alternative explanations would be clairvoyance—or just errors in the experiment. It is indeed disturbing to note how much reliance has to be placed on statistics and

the 'laws' of chance in this work; and fellow statisticians have suggested that this reliance was sometimes stretched beyond proper limits. As was remarked in another connection: 'Statistics is used as an inebriated gentleman uses a lamp post, not for the light it casts on the subject, but for the support it gives his position.'

The argument runs that if you arrange five symbols in two completely random lists, then if these are extensive enough, there are bound to be short sections where agreement is better than chance (and of course others where it is below chance expectation); this follows from statistical theory itself. Similarly there are bound to be sections that agree to some extent if the lists are displaced by one or two positions. The truth of this was in fact demonstrated with published lists of random numbers used by statisticians in planning experiments; they did just about as well as some of the 'psychics'.

Thus 'pre-cognitive telepathy' is believed by some to be disproved; nevertheless the idea persists, and it is still invoked to discredit claims to have demonstrated clairvoyance. So in all future work the most elaborate precautions will have to be taken to exclude the operation of this possibly mythical faculty.

The reality of straight telepathy is surely demonstrated far more convincingly by the rare runs of ten or so correct answers than by innumerable runs only slightly above chance. The whole approach, however, illustrates another trait of modern science, namely the passion for controlled experiments in preference to patient observations of spontaneous events. In uncharted fields like psychical research, it is not always appreciated that the artificial conditions of an experiment may distort or even inhibit the phenomenon under study. By way of illustration, one would hardly expect to observe the breeding habits of a shy species of bird by bringing a pair into the laboratory. Even the love life of *Homo sapiens* would be difficult to study under experimental conditions.

It is probably quite unconscious, but one might be forgiven for supposing that some psychical researchers design their studies in such a way as to avoid the unpalatable necessity of admitting the reality of psychic faculties. The subjects are often brought into unfamiliar surroundings and required to perform large numbers of repetitive tests in order to provide enough material for statistical analysis. Under these uncongenial conditions they are apt to put up a poor performance inadequate to satisfy the investigator, who for his

part may demand proofs of a degree of certainty that are proper only in well-cultivated fields such as engineering. The fate of many a man, at the hands of either the medical or legal professions, has rested for a life or death decision on one tenth the weight of evidence that is expected in some of this work.

LIMITATIONS OF SCIENCE

It may well be asked, what then *are* scientists interested in, and why? Random perusal of titles in scientific journals might suggest the flippant reply: the strangest of things, for the strangest of reasons. The academic worker will claim with complete honesty that sheer curiosity is an adequate motive—curiosity about anything, however remote from daily life or likely utility. So the greater part of all this research merely adds its tittle to our vast sum total of knowledge. But it is official policy to encourage and support such basic research, on two grounds: first, for rather vague cultural reasons; and secondly, by the pragmatic criterion of eventual utility. There are innumerable examples of researches that were originally entirely academic, but which led to valuable inventions, now in everyday use. One need only recall Michael Faraday's early experiments with electricity and magnetism, and Rutherford's on the constitution of the atom, that jointly led to atomic power stations. More recently, Baekland's chemical experiments that went wrong founded the plastics industry, while some abstruse work on solid state physics led to transistors.

So it is pleasing to think of the questing minds of scientists being free to follow wherever their imagination leads, just as a musician may compose what he likes. Unfortunately, it seldom works out that way in practice. few scientists are free to this degree; they need to eat, and 'who pays the piper calls the tune'. The work of the younger men is broadly directed. When they want to work out their own ideas, they must find financial support for their projects from the committees of senior scientists who administer research grants or decide appointments; even the most eminent are expected to work in the fields in which they hold chairs. All this may be inevitable, but it does mean that research effort is heavily channelled along established lines; it is difficult to break really new ground in unpopular directions. Science is admired—almost worshipped—for its successes, and is generously supported by public funds. Sometimes it is indeed castigated for real or imaginary failures, like its inability

to find a universal cure for cancer. But few criticize it for what it does not even try to do, though it could, for there is little realization of the lack of balance in the overall effort, and of the feed-back effect inherent in the support system that tends to maintain the imbalance.

We are enamoured of the physical sciences, the crowning triumph of our Fifth Race mental processes. We love the precise quantitative mathematical forms in which we can express our understanding in these fields. It is true that modern physics is fast leading us out of our depth into waters perilous for the lower mind; but these ideas have yet to make their full impact. The biological sciences do not flatter us in the same way, because life will not conform to the precise patterns our minds enjoy. The trouble is that we are not content to accept this uniqueness of behaviour as characteristic of living beings. We think they ought to conform, and believe we shall find eventually that the life sciences too will become explicable in mathematical equations. The result is that we give undue weight just to those aspects that can most easily be systematized. We are good at chemistry and physics, so we eagerly study the chemistry and physics of living matter. This in itself is right and proper; the investigations are fascinating and educative, and should inculcate a hearty respect for Nature and her works. The error comes in when—to invert a popular saying—we cannot see the tree for the wood. We become so absorbed in our study of its constituents at structural, cellular and molecular levels that we come to believe we know it all. We are apt to forget that the whole is more than the sum of the parts; in seeking to integrate them we omit a vital component—vitality itself. The biochemists are inclined to suppose that the enormously complicated chemistry of cellular processes completely describes and determines the cell. They thereby deny exactly what it is that makes the cell a living unit, namely the ability to control and co-ordinate all these multitudinous activities.

Another rung up the ladder, the biologists who study the cell as an entity fall into the analogous error: they see the whole living organism as an assemblage of cells and suppose it to be controlled by the sum total of their varied activities. Again, as we believe, the converse is true, the lesser lives of the cells being purposively co-ordinated by the greater life of the animal, for example.

It may seem tragic and scarcely believable that such thinking is indeed common in the life sciences; it arises in part from the intense

specialization that is now a necessary price to be paid for proficiency. Intense preoccupation with details tends to exclude the vision of the whole. However, there is no occasion for dismay, because this attitude does not pass without challenge from some of our more far-seeing scientists. For example, the theme of a hard-hitting paper in the *Lancet*, by Dr. D. W. Smithers,* is that the study of cells alone cannot give an understanding of the whole animal, because it is much more than just an aggregate of its component cells. As he says: 'The organization of cells into organs and of organs into organisms is something more than individual cell performance; it exists in its own right and performs the most important and fundamental functions of life. The behaviour of individual cells is, in fact, the result and not the origin of organized living. . . . Organisms contain vastly more information than any one of their cells. . . . It does not therefore follow that, because organisms are the product of interacting cells, they must be governed by organismal laws which are ultimately reducible to the laws of cytology.' 'Cells are a product of life, not the creators of it. . . . What we need most at present is to develop an autonomous science of organismal organization, the social science of the human body: a science not so naïve as to suppose that its units, when isolated, will behave exactly as they do in the context of the wholes of which they form a part, and willing to recognize that whole functioning organisms are its proper concern.' In conclusion, Dr. Smithers cites with approval the following quotation from Loren Eiseley: 'Men talk much of matter and energy, of the struggle for existence that moulds the shapes of life. These things exist, it is true; but more delicate, elusive, quicker than the fins in water, is that mysterious principle known as "organization", which leaves all other mysteries concerned with life stale and insignificant by comparison. For that without organization life does not exist is obvious. Yet this organization itself is not strictly the product of life, nor of selection. Like some dark and passing shadow within matter, it cups out the eyes' small windows or spaces the notes of a meadow lark's song in the interior of a mottled egg. That principle—I am beginning to suspect—was there before the livings in the deeps of water.'

Other authorities could be cited who write in the same vein, and indeed this theme has been developed in the Theosophical Research

* *Lancet*, March 10th 1962, 1. 493.

Centre Transaction *Man's Expanding Horizon.** However, one must admit that at present these are only minority views.

THE GENETIC CODE

I mentioned earlier the intense current interest in the chemistry and physics of life processes. The culminating point was reached in 1961 and 1962 with the breaking of the genetic code. This exciting achievement has been explained, with some comments from the theosophical angle, in the *Science Group Journal* for April and May 1962, and only the briefest outline can be given here. Painstaking genetic studies with plants and insects have shown that the inheritance of physical characteristics is controlled by the chromosomes in the nuclei of the male and female germ cells; the units of heredity, called genes, can now be precisely located along these microscopic chromosomes. Yet even the delicacy of this probing into Nature's ways has been surpassed, because most of this can now be expressed in still finer detail, namely in terms of the architecture of molecules. Chemically speaking, we know that the genes are composed mainly of one kind of nucleic acid, in very long chain-like molecules. Physically speaking, we also know that pairs of these molecules are arranged, caduceus fashion, in intertwined spirals. These delicate sub-microscopic structures have two very remarkable properties, both of which we can now express in rather exact chemical language. First, these nucleic acid molecules can replicate themselves precisely, but only while they are within a living cell. Secondly, they carry hereditary information within their chemical structures, and this can be expressed even when the cells are broken. The basic chemistry can be explained fairly simply. The nucleic acid concerned is built up from just four rather similar substances. They differ only in the organic bases present, which we can call A, G, C, and T, from the first letters of their names. The key discovery was that these form two complementary pairs; A forms a loose association with T and G links similarly with C; and *vice versa* of course. Indeed it is just this association that holds the double helix together, as if with a zip-fastener; for opposite every A in one strand there is a T in the other, opposite every C a G, and so on. Thus each strand is the exact complement of the other all along its length. The order of the components is in-

* Sub-title, *This Purposeful Universe*, Edited by C. R. Groves and Corona Trew.

variable in any particular gene, and vitally important, as will be seen. We can now begin to understand in chemical terms what happens when the chromosomes replicate themselves at cell division. Each double spiral unwinds into its two single strands, and each of these builds onto itself a new complementary strand; that is, it builds not its own likeness but that of its former partner. It can do this just because of the association between pairs of bases, because each T can attract to itself an A, each C a G and so on. In this manner, exact continuity is assured, and the characteristics of the species are maintained without change.

That is one miracle; the second is the chemical nature of the code, the information carried by these genes, and the manner in which it is expressed. Biochemical studies have revealed that each gene operates by guiding the synthesis of one special protein called an enzyme. This in turn catalyses just one particlar chemical reaction among all the metabolic processes of the organism. And this one reaction, or sometimes two or three working together (believe it or not) brings about the special physical characteristic attributed to that gene. These relationships have not, of course, been worked out in full detail, but the theory has been fully vindicated in certain instances, for example the flower pigments of antirrhinum and some primula species. The special protein is a long chain-like molecule composed of amino-acids, of which there are twenty or so kinds. So the gene somehow carries information which instructs the cell to put together these amino-acids in the correct, precise, invariable sequence—because we know that every molecule of the enzyme is exactly like every other. The 'genetic code' is our general term for this kind of information; we may recall that the gene molecule is a long spiral containing the four things we have called A, T, C, and G, arranged in a specific order. It is precisely the sequences of these four 'letters' that spells out the genetic information. Each amino-acid has its own code, which is lately known to be a group of three of these bases (the same or different) in a particular order. There are more than enough permutations available, so that one amino-acid may be specified by any of two or three of these 'three-letter words'. Anyhow, the amazing thing is that one of them is now known for almost every amino-acid. If there are, say, 100 of these in an enzyme molecule (and that would be a rather small one) then 300 code letters are needed to spell it out. Truly, Nature's ways are effective for her

purposes, but they are nothing like as simple as we used to believe.

Many examples could be given of the unity of biochemistry throughout the plant, animal and human kingdoms—a unity with local variations. The most striking illustration would be the universality of this genetic code; only a few tests have yet been made, but already they suggest that it will indeed prove to be universal.

There is a long way still to go, before the whole of genetics can be translated into exact chemical language. But already one can here discern a truly magnificent achievement, of Nobel Prize calibre. The Nobel Prize for Medicine in 1962 was indeed awarded for the earlier stages of this work. Nevertheless the scientists, or those who popularize their work, should not over reach themselves in their claims. For example, even all these accomplishments cannot justify the statement that prefaces a recent popular book on biology, namely: 'Modern science has all but wiped out the border-line between life and non-life.' There is a tendency to believe that the whole secret of life is wrapped up in this genetic code, so that when it has been completely unravelled it will be possible to create life. But theosophists surely cannot subscribe to such a notion. For here is the materialism that H. P. Blavatsky fought so strenuously, rearing its ugly head again, though in more subtle guise and the harder to detect. So if we applaud these scientific achievements, as well we may, we should be wary not to endorse such implications in addition. We should proclaim firmly that the biochemists are not studying Life itself, but its mechanisms, the almost unbelievably intricate and delicate tools it uses for its purposes.

PURPOSE OR CHANCE?

One might well go on to ask: 'Who then wrote this fine script in the first instance?' That of course is quite another question—an 'unscientific' question, because science restricts inquiry to problems it is competent to solve. But some scientists seem to have forgotten this restriction, and have unwisely essayed an answer in this instance. Or rather, they have assumed that there is really no question to answer—because it all happened by chance! This sounds an incredible proposition when it is stated thus, without preparation. Indeed, I still consider it incredible after mature consideration, but the biologist is not entirely without foundations for his assumption. It is known that the genetic code can occasionally change spon-

taneously at one or more points, and this gives rise to a mutant organism. It is also known that such changes can be caused by random events like cosmic rays, that is, by chance—or so it seems. We can ourselves bring about such events by deliberate use of radiation or chemical mutagens. As yet we cannot do this in an exactly predetermined fashion, but we shall soon learn; this indeed is a frightening new power that man has wrested from the Guardians—something even more sinister in its possibilities than atomic energy. However, my immediate point is that scientists can do these things, but they do not seem to think that God (working through Nature) is so clever; He must rely on chance events, and the slow travail of natural selection to sort out the good results from the bad. Evolution is a slow process, but the biological structures that have arisen are so incredibly complex, and moreover so closely co-ordinated, one part with another, that surely many more millions of years would have been needed to achieve this integration from merely random changes. An infinity of time indeed, for I do not believe it ever could have come about by sheer chance. This also has been argued in *Man's Expanding Horizons*. So I will pass on to a related topic—the origin of life on our planet.

Even if we were to concede to our biologist the chance nature of mutations, that would still not excuse the wild extropolation he makes next. This is the notion that because (as he believes) alterations in the script can occur by chance, therefore the whole thing arose initially in the same random manner. Once upon a time, in the primeval mud, a molecule with a propensity for self-duplication just happened to get put together, and then chanced to evolve itself in due course into the first primitive living organism. This really is too fantastic, yet the idea is being seriously discussed in scientific journals, especially by Russian authors. Perhaps they do it, tongue in cheek, to please the Authorities—but I fear not. Once again, the basic work is good and interesting. After all, the first living organisms, however they arose, had to be created out of some organic substance. So these investigators have been trying to envisage conditions on the prebiotic earth. They have good reasons to believe they were very different from now, and that the atmosphere contained little oxygen, but instead gases like hydrogen and methane. Simulating such conditions in the laboratory, they have shown that an astonishing range of substances found in living organisms can be made from inorganic

compounds likely to be present at that time, through such agencies as heat, light and electrical discharges (lightning). So the materials of life could have been available, but it is a long leap from there to spontaneous generation, even of the most primitive living forms. We may note in passing the curious history of this idea of spontaneous generation. Until about 120 years ago no one had any doubts about it; it was a matter of common observation that meat turned into maggots and piles of rubbish into mice. It was Pasteur who challenged this notion and, against fierce opposition, finally proved his point that life never appeared spontaneously; his flasks of nutrient broth remained sterile indefinitely so long as microbes in the air were kept out. But now it is as if Pasteur had never lived; spontaneous generation is respectable again, provided one postulates the event far enough back in time. Scientists speak vaguely but seriously of primitive life arising in the 'soup' of organic molecules in the primeval oceans. None of them seems to recall the thousands of millions of cans of far more nutritious soup lying in our warehouses, and (fortunately) refusing to become infected through spontaneous generation.

But our scorn must be tempered; for, after all, what has the Occult Tradition to offer as a more satisfying alternative explanation for the origin of life in physical forms? We are told that life existed for long aeons prior to this event, clothed in bodies of more subtle matter. By long gradual steps it learned to manipulate denser material, till it descended to the etheric levels of the physical plane. Then gradually again, these etheric bodies 'densified' until—hey presto—we had life in dense physical bodies. To the scientific theosophist this is all very unsatisfactory, for a concatenation of miracles is slurred over in that word 'densification'. It is not too difficult to imagine life in subtle matter that can be moulded instantly by any passing thought; we all have some dim experience of this kind of thing in our dreams. But dense physical matter is not like this at all. It is hard and unresponsive, in our own experience, to anything but other physical agencies. In earlier days, the transition from some etheric being to a thing like an amoeba would not have seemed too difficult; for the amoeba was envisaged as a 'bag of protoplasm'. But the further science probes into molecular biology, the more difficult it looks; for now we realize that the 'simple' amoeba is nothing of the sort; it has a highly complex structure, containing the requisite enzymes to

carry out hundreds of chemical reactions, all at rates under control in accordance with its circumstances, and integrated to achieve its humble purposes of growth and propagation.

So how then did it all begin? If we suggest that biological life came to the earth from some other planet, that only pushes the origin farther back. If we reject spontaneous generation, then it seems to me we must accept special creation by a pre-existing superior Intelligence. The majority of biologists will fight a long rearguard action—but I believe in the end they can reach no other conclusion.

THEOSOPHY AND THE WORLD OF SCIENCE

This brings me to my concluding thoughts. We theosophists believe we have something to give to humanity. What then have we to offer to the world of science? This is a question to which I have given much thought over the years. I believe the answer is that we have rather little to offer, but nevertheless it is precious and fundamental. The sincere dedicated scientist is treading his own path, and in due time it will lead him where he has to go. And when that time comes, he will be a mighty power in the land because he will speak in words the people will understand, and he will carry conviction. Meanwhile we shall do him and humanity no service by seeking to draw him from his own way to ours. I do not believe for example that it is helpful to drag our scientist friends to meetings of The Theosophical Society. As I remarked earlier, the scientist has no way to use our revelations in his work. He is unlikely to be impressed by what a Russian lady wrote some eighty years ago; but he might well be influenced by what a fellow scientist wrote last year in a similar vein.

Do I now speak like a disillusioned Theosophist? Certainly I am less enchanted than I was in my youth by the occult lore that adorns our earlier books—the clairvoyant investigations, ranging in space from the planets to inside the atom; in time from the primeval earth to centuries in the future. It may all be true: it just no longer seems vitally important. But the imperishable principles remain to inspire us, and these are the gems we have to offer. I believe it is more important for us to propound these eternal truths and live by them, than to work for the growth of The Theosophical Society as an organization. I trust I do not take H. P. Blavatsky's name in vain if I claim her blessing for these views.

So—as a first introduction to the scientist—I would put it all in a

very small nutshell and say simply: 'Intelligence was there first'. Moreover, I would direct him in the first instance not to *The Secret Doctrine*, nor even to one of our Research Centre Transactions, but to the writings of those scientist-philosophers whose own work has driven them to this conclusion. My reasons for this choice of priority should be clear from my talk. The world of science is busy racking its collective brains, wondering however intelligence, culminating in human intelligence, managed to evolve (by random steps, moreover) from primitive forms of life, or even from non-living matter. The more he learns, the more untenable this position becomes—yet the more firmly he clings to it, because there is no alternative save the utter inversion of former ways of thinking. But this is a step he must eventually take, for his own sanity and for the good of humanity.

This vision of the Intelligence of the Cosmos should be presented as a formless principle and not in any anthropomorphic guise, nor as the Deity named by any of the world religions; for this would confuse by calling up preconceived and possibly rejected ideas.

Such a reorientation can entirely change a scientist's attitude to his work, inducing humility, yet a sense of enhanced power. No longer is he on his own, striving to create from the bottom upwards. Rather, in seeking deeper understanding, his need is to bring his own limited mind a little more closely into line with the Cosmic Mind. How does this happen? Is it perhaps by those rare flashes of intuition, compelling, disturbing yet exhilarating, coming from who knows where? If so, is there any way to encourage them? This is indeed what I should try to explain to the scientist in our second conversation, even though I have myself only a glimmering of the answer. He needs to keep the way clear for his own revelations. These will command attention, and because they will be the fruit of his own thinking, he will be able to interpret, check and use them. I said earlier that he would have no use for the revelations of other people, however exalted. I will now qualify this by saying they would only be useful if they served to evoke his own intuition; it is the writings of other scientists that are most likely to do this. My present inclination would be to introduce two books to him at this stage, though doubtless there are others equally suitable. The first, provided he were not actively opposed to the Christian Church, would be H. F. Huntley's *The Faith of a Physicist*. An irritating little book in some ways, it does include a sincere attempt in simple language to show the part

that intuition has played in fundamental research. The second, a much more substantial, not to say ponderous work, is *The Meeting of East and West* by the eminent American philosopher, Professor F. S. Northrop. He uses his own unfamiliar terms, such as 'undifferentiated aesthetic continuum' to signify, perhaps, what I have called Cosmic Intelligence; but among the author's many services is his insistence that intuition and the mystic experience are ways of knowing every bit as valid as ordinary sense perceptions.

The Way of Science is not an easy one—but what path is easy? Some of its followers seem to have lost the track, or even to be stumbling along it facing the wrong way. But their innate honesty of purpose will put them right in the end. Then they will consciously invite inspiration, and will recognize and welcome truth when it comes in this manner. Moreover inspiration can play its part not only in academic or pure research, but also in applied science.

Science has its own Yoga, but so far removed is it from the popular conception that few of its practitioners would recognise it as Yoga. But the central elements of self-forgetting absorption in creative work, and aspiration towards closer union with Cosmic Intelligence, surely qualify for this description. It might help indeed if this situation were recognised, so that we might try to work out, deliberately instead of incidentally, a system of Yoga suited to the Western World. When this new way of science is established, there can arise a scientifically based philosophy that will have the impact of a new world religion.

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