

CREATIVE ASPECTS OF
NATURAL LAW

DURING the current half century, and a little longer, several writers of distinction have attempted to develop and expound philosophies, or coherent general notions, concerning the process of organic evolution. The historical *fact* of organic evolution had been established by biologists, working in their characteristic comparative manner, by the ascertainment of very numerous individual observations, combined with a limited amount of reflexion upon them. They are on the whole distrustful of speculative generalisation, and easily confused by abstractions, in their short-lived controversies. The writers to whom I shall particularly refer are Bergson and Smuts. Each, in his own way, is a brilliant expositor; each, viewing the contemporary scene of biological thought, has been strongly moved by the idea that the biologists were missing something, something of central significance to their science, and to all mankind. Each gives particular importance to

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the word creative: 'creative evolution' in Bergson and Smuts, to whom organic evolution is a central theme; 'creative process' in Whitehead, whose centres of interest are physical and subjective respectively.

Now, here, and in 1950, is there anything for us in these writers? That is what I want to discuss in this lecture. Is there anything for us as men of Science, and again anything for us as what I may call, without narrow limitations, religious men: men who earnestly wish to live their lives to good purpose? I believe that there may be, but that it will need a good deal of disentangling.

Perhaps I should begin by saying what I apprehend the word 'creative' to mean. First, taking the word coldly and dryly, divesting it of emotional significance and moral associations, I take it to qualify effective causation; to imply that had the nature or intensity of the causal system been different, the effects which flow from it would also be different; merely different, not necessarily worse or better. This requires that the causal system itself might really have been different, and so have entailed different real consequences. Creative causation in this sense is thinkable in an indeterministic world, in which the causative system might indeed have been different. It is quite unthinkable in a strictly deterministic world, such as

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until recently it was thought proper to assume in all the sciences. The possibility of regarding causation in the real world as indeterministic was open to thinkers before our own time; it was clearly expressed, for example, by Lucretius; but until recently it was dismissed as an unnecessarily complicated hypothesis. The two advances which have changed the scene are: (i) The positive evidence for determinism provided by scientific experimentation on a molar scale is seen to be inconclusive as soon as it is recognised that the predictability of the behaviour of large masses is a necessary statistical consequence of the large number of independent particles of which they are composed, and would be manifested whatever were the nature of the ultimate reality. (ii) The study of atoms, and sub-atomic particles and processes, can, it now appears, only be carried on by recognising indeterminism as inherent in their nature. It is particularly important, in this respect, that there is not a vague or uncertain degree of indeterminism, but a specific amount, calculable from one of the fundamental constants of physics. No appeal to subjectivity, or to human limitations, can explain it away. It is, for the present generation, one of its most important tasks to recognise what this change in our outlook requires, and to adjust our minds to its implications.

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The first implication, therefore, that I put before you, is that in the world as we must now conceive it, natural causation has a creative aspect, at least in the very simple and prosaic sense in which I am now using the word creative. It has a creative aspect, because it has a casual aspect. These are the back and the front of the same quality. Looking back at the cause we can recognise it as creative; it has brought about something which could not have been predicted—something which cannot be referred back to antecedent events. Looking forward to it as a future event, there is in it something which we can recognise as casual. It is viewed thus like the result of a game of chance; we can imagine ourselves able to foresee all its possible forms, and to state in advance the probability that each will occur. We can no longer imagine ourselves capable of foreseeing just which of them will occur.

There is in the word creative, as I conceive it, another strand of meaning, to which my first approach deliberately does no justice. It is charged with emotion, and I have no wish to discharge it, only to make a necessary distinction. The word seems appropriate to us only when applied to matters of importance; especially to something new; not merely new in time like a new penny, but new in its nature and potentialities. This is

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intended when we apply the word to the work of a scientist, or an artist; that his work matters in itself, and to the future of his art or science. Work to be creative in this sense must have value, intellectual or aesthetic, moral or social value; consequences which excite wonder, or admiration.

If I have correctly apprehended the two aspects of the word, there are two modes in which it may be correctly used. In the scientific mode, without emotional excitement, we recognise creative causation at work at all times and places. For any particular event, it is a purely scientific problem to ascertain the causative action, limited in time and space, which effectively brought it about; we shall have to avoid the error of imagining that the effective causation can be traced back to antecedent events, or through them back to the beginning of things. Just when and where an event was caused to occur is an intrinsic part of our understanding of our working of the world. When, however, we apply the word to cases appropriate to its emotional repercussions, that is to the creation of things of great importance to ourselves, the scientific task is of the same kind, but our interest and motivation are animated by the importance of our enquiry, and by the latent consequences of its possible success. The task is felt to

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be worthy of the effort; we cannot scrutinise our inferences, or test them, too carefully.

Approaching the matter on this level, it is, therefore, almost axiomatic that the process by which living things, as we know them, have come gradually into existence, is, in the fullest sense, a creative process. It has created new things, pregnant with potentiality; it has produced among other things growth, voluntary movement, and appetite; striving and effort, joy and pain; consciousness, and, in Man at least, conscious self-criticism. It would be strange if the word did not fit, seeing that for ages it has been used precisely for the coming into existence of these things, however variously the process was conceived. It is almost like saying that Creation is creative; the only new implication, and it is an important one, that the phrase now has is that for us creation is still going on, whereas in the childhood of our race it was thought to have been all finished a long while ago.

Bergson's title *L'Evolution creatrice* was therefore well justified, and well in advance of his time. The biological thought of his age was impeded and constricted by the assumption of completely deterministic causation; the so-called 'Mutation theory', as a contribution to evolutionary thought, seems to me to be typical of the relative sterility of the epoch. Bergson, with striking originality,

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broke away from this assumption. He was indeed an indeterminist, but he scarcely recognised in determinism the constraint from which he was breaking free. He confuses the issue by speaking instead of mechanism; but whereas the difference between deterministic and indeterministic causation is simple, and easy to define with rigour, no one has been able to suggest a way of distinguishing a mechanistic from a vitalistic organism. Moreover, later, he dismisses vitalism also, though here finer distinctions are necessary. Let me first quote him when he comes nearest to explicit indeterminism, using Mitchell's translation of 1911 (pp. 39-41).

The mechanistic explanations, we said, hold good for systems that our thought artificially detached from the whole. But of the whole itself and of the systems which, within this whole, seem to take after it, we cannot admit *a priori* that they are mechanically explicable, for then time would be useless, and even unreal. The essence of mechanical explanation, in fact, is to regard the future and the past as calculable functions of the present, and thus to claim that *all is given*. On this hypothesis, past, present and future would be open at a glance to a superhuman intellect capable of making the calculation. Indeed, the scientists who have believed in the universality and perfect objectivity of mechanical explanations have, consciously or unconsciously, acted on a hypothesis of this kind. Laplace formulated it with the greatest precision: 'An

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intellect which at a given instant knew all the forces with which nature is animated, and the respective situations of the beings that compose nature—supposing the said intellect were vast enough to subject these data to analysis—would embrace in the same formula the motions of the greatest bodies in the universe and those of the slightest atom: nothing would be uncertain for it, and the future, like the past, would be present to its eyes.¹ And Du Bois-Reymond: 'We can imagine the knowledge of nature arrived at a point where the universal process of the world might be represented by a single mathematical formula, by one immense system of simultaneous differential equations, from which could be deduced, for each moment, the position, direction, and velocity of every atom of the world.'² Huxley has expressed the same idea in a more concrete form: 'If the fundamental proposition of evolution is true, that the entire world, living and not living, is the result of the mutual interaction, according to definite laws, of the forces possessed by the molecules of which the primitive nebulosity of the universe was composed, it is no less certain that the existing world lay, potentially, in the cosmic vapour, and that a sufficient intellect could, from a knowledge of the properties of the molecules of that vapour, have predicted, say the state of the Fauna of Great Britain in 1869, with as much certainty as one can say what will happen to the vapour of the breath on a cold winter's day.'

¹ Laplace, 'Introduction à la théorie analytique des probabilités' *Oeuvres Complètes*, vol. VII. Paris, 1886, p. vi.

² Du Bois-Reymond, *Über die Grenzen des Naturerkennens*, Leipzig, 1892.

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To these opinions Bergson answers:

In such a doctrine, time is still spoken of: one pronounces the word, but one does not think of the thing. For time is here deprived of efficacy, and if it *does* nothing, it *is* nothing. Radical mechanism implies a metaphysic in which the totality of the real is postulated complete in eternity, and in which the apparent duration of things expresses merely the infirmity of a mind that cannot know everything at once. But duration is something very different from this for our consciousness, that is to say, for that which is most indisputable in our experience. We perceive duration as a stream against which we cannot go. It is the foundation of our being, and, as we feel, the very substance of the world in which we live. It is of no use to hold up before our eyes the dazzling prospect of a universal mathematic; we cannot sacrifice experience to the requirements of a system. That is why we reject radical mechanism.

The truth seems to be that Bergson paid a great price for his freedom, and I suggest that no such sacrifice is required of us. We are *born* free. Because he felt that much biological thought was mistaken he is willing to infer radical defects in the reasoning powers of the human race, an idea that has been influential on later writers, and should therefore be answered. More, and worse, he is willing to sacrifice the whole scientific procedure of tracing effects to demonstrable causes, in favour of invoking as their explanation an

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imaginary (I suppose spiritual) being, endowed with will and intelligence, whose *modus operandi* is as simply magical as that of any wish-granting fairy in a children's story. Thus, in criticising the Lamarckians he says (p. 92):

But if this cause is nothing but the conscious effort of the individual, it cannot operate in more than a restricted number of cases—at most in the animal world, and not at all in the vegetable kingdom. Even in animals, it will act only on points which are under the direct or indirect control of the will. And even where it does act, it is not clear how it could compass a change so profound as an increase of complexity: at most this would be conceivable if the acquired characters were regularly transmitted so as to be added together; but this transmission seems to be the exception rather than the rule. A hereditary change in a definite direction, which continues to accumulate and add to itself so as to build up a more and more complex machine, must certainly be related to some sort of effort, but to an effort of far greater depth than the individual effort, far more independent of circumstances, an effort common to most representatives of the same species, inherent in the germs they bear rather than in their substance alone, an effort thereby assured of being passed on to their descendants.

So we come back, by a somewhat roundabout way, to the idea we started from, that of an *original impetus* of life, passing from one generation of germs to the following generation of germs through the

developed organisms which bridge the interval between the generations.

Now, I submit that the mythological being to whom Bergson has introduced us serves no useful purpose in the understanding of the evolutionary phenomena; that it merely supplies one more example of those hypothetical causes of mutations, which are now set aside, not merely on the ground that they do not exist, but on the ground, at a deeper level, that they would not explain or compass the evolutionary process, if they did exist. Bergson's is the extreme term of a series of proposals, differing indeed in the repugnance that they arouse, yet all to be rejected on the same factual evidence. Nearest, in this spectrum, to Bergson's 'elan vital' I should place Lamarck's proposal that the *desires* of individual animals possess the power of so altering the germinal inheritance that these desires in their descendants shall be more readily gratified. Like Bergson's this operation is strictly magical; it springs from the old belief that mere willing, if sufficiently prolonged or intense, has, through unseen channels, power to arrive at wish-fulfilment. It is, however, more rational than Bergson's, for the appetites of animals do really exist, they are not a sheer construct of human imagination, as is a being capable of willing and learning, working collectively through

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a whole species, or through all living creation. We reject Lamarckism not because we doubt the reality of desire, but *inter alia* because we doubt its power to devise and bring into existence the supposed changes in inheritance. Third in the series, should be placed Darwin's theory of the effects of habit, through use and disuse of parts. Habit really has effects upon the body and mind of the progenitor, and, on the theory of inheritance accepted by Darwin, should induce changes in the same direction in its descendants. Darwin thus accepted the inheritance of acquired characters in theory, but made it abundantly clear that he thought the *evolutionary* effects of this factor to have been extremely slight, and gives many examples, such as the special organs and instincts of neuter insects, in which it cannot even have aided the process of progressive adaptation. Those who, like Weismann, rejected the inheritance of acquired characters as a real phenomenon, as is done now universally on the genetic evidence, have, therefore, never thought of themselves as opposed to Darwin.

The *modus operandi* of Smuts's concept of holism falls, if I understand it correctly, into a place in this series between those of Lamarck and Darwin. For he too rested the creative causation of the evolutionary process on the occurrence of minor

mutations, occurring specifically in the germ cell, or fertilised ovum, as a result of its constant tendency to completeness or integration. He did not, any more than Darwin, make calls on the magical efficacy of will power.

To this aspect of his teaching Smuts gave a good deal of space, not, I think, because it plays any part in his system of intrinsic importance, but because, being biologically heterodox, it was felt to require a rather elaborate justification. Re-reading Smuts with this point in mind, one is all the more struck by the wisdom and width of his more essential views, and by the religious feeling, if I may use the term, with which he concentrates the majestic spectacle of the evolutionary process to a meaningful focus.

Now, to those who accept a particulate theory of inheritance all these hypothetical agencies for causing mutation, or any others, fail by reason of the smallness of the mutation rates allowable. As soon as the blending theory of inheritance was replaced by one on a particulate basis all mutation rates were cut down at least ten-thousandfold. It is demonstrable, that either the mutation rates which can be measured experimentally, or indeed any, compatible with particulate inheritance, are incompetent to govern, control or even appreciably to modify the course of evolutionary

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change. An instructive example of what I mean is afforded by polydactyly, producing an extra hallux, with an extra joint, found as a result of mutation in a good many species of birds and mammals. It has probably been occurring in the ancestry of these species from the remote time of the separation of the mammalian and avian classes. Throughout this immense period innumerable and often drastic modifications of the structure of the feet have taken place in different lineages of these classes, yet *never* has this mutation of polydactyly, constantly offering itself, though constantly rejected, been allowed to incorporate itself in any evolving line. The only evolutionary effect which can reasonably be ascribed to its unrelenting efforts is the negative one, that in mice and probably other quick-breeding forms, the germ plasm has been modified so as to suppress all traces of polydactyly in the heterozygote.

If we imagine, then, some extra-natural agency endeavouring to influence the organic evolution of mammals and birds by the production, on millions of different occasions, of this single mutation, we can recognise that its efforts were futile and inoperative. Further, we can see why. In *particular*, that the polydactyl foot could not incorporate itself in the inheritance of any species,

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until it had been tried out in the separate life-history of individuals; and unless it succeeded there, there was no future for it. In *general*, that the process of mutation, whatever the scientific interest of its particular causes, is not an effective agency in that creative process which we call organic evolution. Bergson and his followers have here loaded themselves with an unnecessary difficulty. Their great point, that in the life of living things in the world a creative process is active, can at the present time be easily granted. It is in the particular location, in time and space, of the creative action, that their choice has been injudicious; injudicious scientifically, but injudicious also, I shall suggest, in relation to the moral and emotional aspects of their philosophy.

There is a prejudice, easily aroused by the mere mention of moral and emotional considerations, from which I must now endeavour to disentangle myself. We attempt, so far as our powers allow, to understand the world, by reasoning, by experimentation, and again by reasoning. In this process moral or emotional grounds for preferring one conclusion to another are completely out of place. Scientific findings must be based entirely on the scientific evidence. Nevertheless, to review these findings, in their bearing perhaps on our own future actions, may be to experience

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perhaps reassurance, perhaps repugnance. The scientific purist fears that such feelings may bias the interpretation of the evidence, and surely he should guard himself against this, or any other form of falsification. Let our loyalty to the facts be absolute. I suggest that we should also guard ourselves against the assumption, which seems to me a perverse one, that the facts when ascertained will necessarily be antagonistic to our aims, hopes or aspirations. If we are prepared to learn from the facts, it may sometimes be that they will teach us terrible things. It appears to me, however, an absurd degree of pessimism to assume that they will always tend to confound and disillusion us rather than to strengthen our hearts as much as our hands. The right answer to such pessimism, I suggest, is to examine candidly the moral and emotional effects of scientific knowledge, and not to conceal with shame our awareness that such effects exist.

The writers with whom I am chiefly concerned are both strongly influenced by feelings of repugnance for the theory of evolution by natural selection. They both conceive it as embedded in a deterministic theory of the world, and it is through it in particular that determinism hurts their moral feelings. But, in such a framework, any naturalistic theory of evolution must be equally

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devastating; for in such a world all seeming choice is an illusion; we shall get what is coming to us, and can do nothing about it, Bergson is content that the inorganic world should be deterministic, so long as the *elan vital* can work its will with living matter. He thus introduces another schism in creation, as Descartes had done before him by dividing the human race from the other animals. Smuts is more thorough; holism, like Planck's constant, is at work in the atoms and molecules; it is thought to be intrinsic to all created things. But, if there be an intrinsic creative activity, as indeterminism teaches there surely is, must we assume that natural selection is so bleak and arid as it would seem to have appeared, rather than an implement of creative activity as fruitful as it is effectual?

Just where does the theory of natural selection place the creative causes which shape evolutionary change? In the actual life of living things; in their contacts and conflicts with their environments, with the outer world as it is to them; in their unconscious efforts to grow, or their more conscious efforts to move. Especially, in the vital drama of the success or failure of each of their enterprises. To Smuts, in particular, I should have liked to submit that it is a view even more in harmony with his own concept of holism, that

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creative causation should be a function of every organ through the entire life history, of the brain in devising, and of the hands in execution, than that it should be confined to the fertilised ovum. To the selectionist it acts, not in the dark by potentiality only, but by real effects in the real world.

The surface or limit separating the inner from the outer life of each living thing is also, in our experience, the true seat of our consciousness, the boundary of the objective and the subjective, where we experience, through our imperfect sense-organs, what comes to us from outside, and, with at least equal obscurity, that which rises into consciousness from within. If consciousness is, as it would seem, the symbol, or even the means, of unification in our being, this is the region to which creative activity could most fitly be traced.

The theory of Selection seems to me also holistic, though here only Smuts could say if I am using his word correctly, in the mutual reaction of each organism with the whole ecological situation in which it lives—the creative action of one species on another. The timid antelope has played its part in the creation of the lion, and species long extinct must have left indelible memorials in their effects on species still surviving.

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Who knows if the mammals would ever have evolved, but for the creative activity of the dinosaurs!

It is not to be assumed, then, that though we resolutely and obstinately refuse to favour a scientific theory on account of moral edification or aesthetic fitness, that these qualities will necessarily be sacrificed. So far as we feel the matter to be one that concerns us at all, we really must disregard the labels on the bottles, and taste the contents for ourselves. The labels 'pessimism', 'materialism', etc., have been affixed by not very meticulous, and not very philosophical people—both care and penetration seem to have been often lacking. Only by obtaining our personal reactions to these theories, as possible ingredients in our general outlook, can we judge whether their taste is, so to speak, astringent or cordial. For my own part I confess to feeling heartily relieved that it is not necessary to regard the life and death drama of the myriads of individual existences as a play, a make-believe, a shadow-show, having, for all the intensity and effort squandered in them, no real effects or consequences. There is indeed a strand of moral philosophy, which appeals to me as pure gain, which arises in comparing Natural Selection with the Lamarckian group of evolutionary theories. In both of these contrasting

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hypotheses living things themselves are the chief instruments of the Creative activity. On the Lamarckian view, however, they work their effect by willing and striving only; but, on the Darwinian view, it is by doing or dying. It is not the mere will, but its actual sequel in the real world, its success or failure, that is alone effective.

We come here to a close parallelism with Christian discussions on the merits of Faith and Works. Faith, in the form of right intentions and resolution, is assuredly necessary, but there has, I believe, never been lacking through the centuries the parallel, or complementary, conviction that the service of God requires of us also effective action. If men are to see our good works, it is of course necessary that they should be good, but also and emphatically that they should work, in making the world a better place. It is not necessary that others should know by what particular agency the result has been brought about, but there must be in the result something for them to thank God for. We must face the difficult and responsible task of getting good results actually accomplished. Good intentions and pious observances are no sufficient substitute, and are noxious if accepted as substitute.

If, to this extent, it is allowable not to repudiate this sublunary world as past praying for, as is

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the oriental tendency, but to find in it a field for devoted activity, then it is hard to see that anything unedifying or disquieting should be found in a theory of organic evolution which rests essentially, not on the tendencies of living things, but on their performances. Both views emphasise responsibility for our actions, and for their natural consequences. Disquiet, however, has been undoubtedly felt, and it springs, I suggest, not from the acceptance of this or that view of the nature of Natural Causation, but from a fact the recognition of which is, I suppose, primary and axiomatic for the religious life; the fact that there is evil in the world, and evil also in ourselves. Any explanation of how the world and ourselves have come into existence is thus in some sense responsible for this fact also. Paley's special creationism felt the strain when he discussed the beautifully contrived fangs of poisonous snakes. It is scarcely fair to saddle natural philosophy with the abstract and theoretical Problem of Evil.

However, there is no *practical* problem of evil. We know perfectly well what to do about evil. We must recognise it, in ourselves and in the world, and repudiate it. To the best of our ability we must combat it, study it and extirpate it. That is exactly what we mean by the word Evil: that which we are called upon unequivocally to attack

and to eliminate. On this view evil is relative; it changes its nature with evolutionary progress and with the changing structure of human society. Attempts at codification such as the Ten Commandments, or the Seven Deadly Sins, may remain valid for a long while; manifestly we cannot expect them to be adequate for ever. We are fully conscious of evil, today, for example, when we hear of the deliberate breaking of helpless prisoners by torture and brutal interrogation; we are still not perhaps so fully conscious of the senseless agony occasioned when a forest fire sweeps through woodlands filled with the helpless young of nesting birds, though the sense of human responsibility for such catastrophes is beginning to be felt.

For the future, so far as we can foresee it, it appears to be unquestionable that the activity of the human race will provide the major factor in the environment of almost every evolving organism. Whether they act consciously or unconsciously human initiative and human choice have become the major channels of creative activity on this planet. Inadequately prepared we unquestionably are for the new responsibilities, which with the rapid extension of human control over the productive resources of the world have been, as it were, suddenly thrust upon us. Yet there

have in recent times been some signs of a responsible attitude. We have come to expect kindness in the treatment of the domestic animals. We have come to deplore the irreplaceable loss of some of the species which ignorance and greed have exterminated. The future of some wild animals has occasioned sufficient anxiety for the provision of Parks and Nature Reserves to be the normal policy of civilised peoples. These are signs that we do not feel that ruthless exploitation is good enough. Our knowledge it is true is still in the highest degree inadequate; yet a beginning has been made with ecological studies, and what has been called population genetics, at least to explore the methods by which more effective knowledge can be obtained.