JOURNAL OF

THE TRANSACTIONS

OF

The Victoria Institute

OR

Philosophical Society of Great Britain

VOL. LXX

1938

LONDON:

PUBLISHED BY
THE INSTITUTE, 1, CENTRAL BUILDINGS, WESTMINSTER, W.C.1

813TH ORDINARY GENERAL MEETING,

HELD IN COMMITTEE ROOM B, THE CENTRAL HALL, WESTMINSTER, S.W.1, ON MONDAY, JANUARY 10TH, 1938, AT 4.30 P.M.

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

The Minutes of the Meeting of May 24th, 1937, were read, confirmed and signed and the HON. SECRETARY announced the following elections :— As a Member : Lt.-Col. R. L. D. Whitfield ; as a Life Associate : the Rev. W. H. Fullerton ; and as Associates : A. C. Custance, Esq. ; the Rev. P. Wiseman, B.D., St.M., D.D. ; Lt.-Col. P. W. O'Gorman, C.M.G., M.D., M.R.C.P. ; the Rev. W. J. Downes, M.A., B.D. ; E. L. Ward Petley, Esq., L.R.A.M. ; and Constructor Lieut. W. F. Spanner, R.N., as a Student Associate.

The CHAIRMAN then called on Mr. E. L. Grant Watson, B.A., to read his paper entitled " Facts at Variance with the Theory of Organic Evolution."

The Meeting was then thrown open to discussion, in which the following took part : Mr. H. S. Shelton, Mr. R. Duncan and Mr. W. McAdam Eccles.

Written communications were received from Sir Ambrose Fleming and Dr. R. E. D. Clark.

FACTS AT VARIANCE WITH THE THEORY OF ORGANIC EVOLUTION.

By E. L. GRANT WATSON, Esq., B.A. (Cantab.).

(*Being the Dr. A. T. Schofield Memorial Paper.*)

WHEN, in 1859, Darwin's *Origin of Species* was published the new conception of the world of living things which it introduced, and which was soon to become the accepted view of orthodox biology, was welcomed by a large number of educated people as a step forward towards what they considered a wider and more realistic valuation of phenomena than that offered by orthodox religion. To an age which was so largely interested with material things, and whose energies were so much devoted to the controlling of natural forces and their subjugation to human convenience, the theory of evolution which Darwin postulated was a natural expression of its own dominating activities. It characterised a necessary and inevitable phase

of human development, and the imposing array of facts which Darwin so meticulously set forth presented an argument which the contemporary critics were not able easily to put aside. These facts Darwin classified under seven different heads, namely, facts concerning the morphological resemblance of organs, concerning the geographical distribution of species, concerning the geological record, concerning embryological development, concerning variations under domestication, concerning mutations and the presence of vestigial or rudimentary organs. This marshalling of facts, in support of the theory of organic evolution gave to contemporary biology a unifying impulse, and the materialism of the newly orientated science of biology was, for some of its disciples, so inspiring as to partake of the nature of a dogmatic religion. For many years this almost religious, and I consider narrowly religious, attitude adopted by many orthodox biologists has received very little criticism; it has until comparatively recently hardly been challenged, and indeed the Darwinian theory of evolution has received comparatively little progressive criticism of its fundamental assumptions in the years which lie between 1889 and the present day. True, there have always been critics. As contemporaries of Darwin's, Nageli, Romanes and Fabre should not be forgotten. There have been, of course, many others, but the astonishing fact remains that this theory, which has never been proved, should at the present day exist so near to its original form, when so many facts have since come to light which cannot be made to fit into the essential framework.

When I talk to modern biologists and draw their attention to life-histories of animals and the behaviour-patterns which refuse to be accounted for by any possible stretching of the theory of evolution, they either remain silent or laugh and say: "That unfortunately is one of the cases which do not fit in," or else they say: "Well, it doesn't matter anyway about the theory of evolution. No one bothers about *that* in these days but the old stagers who don't count; the interest has shifted to bio-chemistry. The theory is good enough as a working hypothesis, and there is no other to be had without making unjustifiable assumptions."

In the course of this paper I shall hope to hint at some possible assumptions which may not appear too unjustified; but first it is with facts which refuse to fit in with the claims made by the classical theories of evolution that I want to deal.

Before coming to these facts, I will state in the briefest way possible the essential postulates of the theory of evolution. They are as follows. *The species, as they are found living upon the earth to-day, have assumed their present forms as the result of variations through many generations. These variations, either small or large, have occurred by chance in all directions. Through the action of the natural selection by the survival of the fittest, those individuals best fitted to their environment have survived, and in the process of time the existing forms have been derived from common ancestral forms, many of which are now extinct.* As a variant to the above, the neo-Lamarckians say that the variations, which constitute the material by which evolution proceeds, are not entirely determined by chance, but, to a certain extent, are the result of the influence of environment on either the soma or the germ plasm of the parents, this influence being recorded in resulting variations, which adapt the creature to the changing conditions of the environment. With all evolutionists, the essential theory is the same: that ancestral forms have given rise, through countless variations, through countless generations, to the existing species as we know them to-day.

After this preliminary statement, which I think is necessary, I come to some of the facts which in my opinion cannot be made, by any stretching of coincidence, to fit into these comparatively simple concepts.

Sea slugs are brighter coloured and more fantastic in form than those which live upon land. They are to be found in shallow pools when the tide is low. Many of them have brilliantly coloured papillæ or appendages growing from their backs, and in these are found groups of curiously formed stinging-cells, which are believed to function as defensive weapons against attacks from fishes.

The stinging-cells, or nematocysts, are explosive cells which, in their discharged condition, are usually of a long whip-like shape. In its undischarged condition the nematocyst is folded within itself, and, at the least touch, the turgor produced by the tension of the cell-wall will cause the enfolded nettle-lash to fly out and sting any foreign body which is in the near neighbourhood. Many sea-anemones and jellyfish are provided with these protective cells, and when nematocysts were first discovered to be present in the papillæ of sea slugs they suggested a close affinity between the *Mollusca* and the *Cœlenterata*. It was only later discovered that the nematocysts which lie, in

an unexploded condition, in the papillæ of the sea slugs, and which are used by them as a defensive mechanism, have their origin in the cœlenterates on which the sea slugs feed.

The facts of the relation between the cœlenterates and the sea slugs, and the part that the stinging-cells play in these happenings have been carefully worked out by marine biologists. It has been found that only certain species of the sea slugs have the power of overcoming and using for their own purposes the defensive mechanism of the polyps. In these cases, several questions present themselves. How is it that the nematocysts, which explode at the least touch, are not exploded by the sea slug in the process of being devoured ? How is it that the harsh, saw-like radula of the slug, with which it tears its food, does not break the thin capsule of the nettle-cell ? It has been suggested that the slug, in eating, exudes mucus, which prevents the discharge of the nematocysts, but is this sufficient explanation ? Why are not the defensive cells discharged on the approach of the slug ? They are discharged in some cases but not in all. Why not ? And how is it that the slug is immune from the poison ? Mr. O. C. Glaser writes : " It is truly remarkable that these apparently helpless creatures should have selected such a dangerous prey, but since they have, it must be because the danger does not apply to them. Why it does not, I do not know, but it may well be for the same reason the nematocyst does not discharge while being eaten."

Those reasons, whatever they are, remain obscure, and there are other questions we must ask. How is it that the unexploded, and only the unexploded, nematocysts are gathered together from out of the stomach of the slug into narrow ciliated channels, and are swept by the working of the cilia up into pouches which lie near the periphery of the brightly coloured appendages, and how is it that they are there neatly arranged the right way up, and in such a manner that they can be discharged against any creature which threatens the sea slug ? How is such a complicated and highly specialised sequence of events to be accounted for ?

Is it possible to imagine that this elaborate and complicated pattern of improbable events has come into existence through chance variations or mutations ? Let us try. We must suppose that the kinds of sea slugs which can swallow the nematocysts with impunity are derived from some ancestral form, which resembles the majority of sea slugs, which have not this power,

and which are warned off those cœlenterates which are armed with nematocysts. In the first place a number of co-ordinated variations must have taken place which enabled the slugs to approach the polyps without exploding the stinging cells. Other variations must have been necessary to allow the slugs to swallow the nematocysts, and yet others, of subtle and complicated nature, which govern the mechanism, which sweeps the nematocysts into the ciliated channels and up into the pouches which lie near the periphery of the brightly coloured appendages; other variations there must be, all composed of unit characters, which govern the arranging of the nematocysts the right way up. All these combinations of variations, must, according to the theory, be the outcome of chance. If these suppositions seem reasonable, then we can still remain upholders of the belief that these sea slugs have been evolved from ancestral types through the process of natural selection.

Is it not simpler and also more reasonable to suppose that this complicated pattern of events is the result of some guiding principle or *entelechy* ? The pattern exists as a whole, and as a whole it must have come into existence, for separate parts of the pattern would not function without all parts being present. These complicated, interlocked arrangements must, I submit, exist in their entirety, and in this connection I should like to tell of an incident from my student days at Cambridge, when Adam Sedgwick was Professor of Zoology. On one occasion, when I was turning over the pages of a zoological text-book, he passed and stood behind me when I chanced to have turned up a picture of Archæopteryx, the winged and feathered reptile of the Triassic period. " Precipitated ! " he said with a characteristic sniff. I was then in my second year, and a convinced Evolutionist. I turned to him with what might well have been an inquiring look. " Precipitated," he repeated. " We don't say created in our days, it's not the the fashion."

It would need as wise a man to make the same comment after investigating the case of the sea slug.

There are a multitude of cases as remarkable and challenging to facile explanations, which time and space do not allow me to mention ; but while dealing with this type of association between either friendly or hostile species I should like to draw attention to the various kinds of small fishes which derive protection from large jelly-fish. The jelly-fish are armed with long, streaming tentacles, and these swaying filaments are richly provided with

nematocysts. They will explode at the least touch, as any bather in a tropical sea will have learnt to his cost. Certain species of fish make a habit of living in, or close to, these jelly-fish. When they are threatened by larger enemies, they retreat inside the bell of the medusa. They are not digested, as other creatures are, by the juices within the pouch, neither are they stung, although they move to and fro and in and out.

Other associations which it is equally difficult to imagine as having arisen as the result of gradual evolution, in the usually accepted sense of the word, are provided by hermit crabs which detach sea-anemones from their rocks, and place them upon their own shells. If such a hermit crab is confined in the same aquarium as an anemone, the anemone will often abandon its position on a rock and, gliding towards the crab, will fasten on its shell. Sometimes the crab is not merely passive, for if the anemone is detached from his shell, the crab will pick it up with his claws, and, pressing it against his shell, will hold it there till such time as the anemone has made itself fast once more. Evolutionists must find it hard to account for such reciprocal actions by chance arrangement of genes, bearing unit characters. Another such instance, perhaps more remarkable, is that of a small crab which frequents coral reefs. This crab is provided with claws or chelipeds of very small size, which are of little use for attack or defence. The fingers of these claws are armed with recurved teeth, enabling them to take firm hold on the slippery bodies of small anemones. With their claws, carefully and without injury, the crabs detach the anemones from their hold on the rocks. They then clasp the anemones, one in each claw, and hold them in close proximity to their mouths. The anemones do not appear to suffer from this rough treatment, and continue to spread their tentacles, and to capture any small creatures that are wafted to them in the water. The crab with his first pair of walking legs removes any tit-bit that he fancies from the tentacles of the anemone, and eats it himself. In this way, life is made easy for him through the functioning of a completely different species. He is seldom met without one or more anemones in his claws, and this association is developed in the species, and not only in individual crabs. Such a behaviour pattern as the above embraces a great number of tendencies. Are we to assume that these have come together through chance mutations, which conveniently correspond with other chance physical modifications? Or are we to assume that the chance

modification of the chelipeds prompted some ancestral crab to detach, for the mere fun of the thing, an anemone, and by chance hold it near his mouth ? Again, we must assume that by chance some creature was caught in the tentacles, and the crab was not slow to take advantage of such good luck, and so retained its hold on the anemone ; and, if we follow such line of reasoning, we must assume that the crab passed on to its offspring a tendency to use their chelipeds in a like manner, and so, through the action of natural selection, we have the present-day crabs with their close association with sea-anemones. Such assumptions can hardly, I think, recommend themselves to our reason.

Cases as the above are by no means exceptional. Amongst the lower animals, the insects and crustacea, they are typical, and, in the opinion of any unprejudiced observer, will not find a satisfactory explanation in such simple concepts as those put forward by the upholders of the classical theories of evolution.

Much as I would like to give further examples of these fascinating behaviour-patterns and life-histories, time will not allow me to do so, and I will turn to a different aspect of my subject. I will ask you to consider the behaviour of the caterpillar at the time when it changes into a pupa, and the events which then occur. The metamorphosis which takes place in the life cycle of insects, and especially that complete series of transformations within the life history of the lepidoptera, has been taken as a significant expression of the transformative processes of life, and it is here that we may find most clearly marked indications, which may lead us to a better understanding of the formative forces which govern the development of living things. The essential differences in form, size and habit which separate the early phases of the larva from the perfect insect cannot fail to capture the attention of any observer, and to evoke the question : How can the transformations from larva to pupa, to imago, be reconciled with the concept of continuous modification by innumerable, slow variations, or with the concept of uninterrupted evolution by gradual functional changes ; and further, how can the phenomenon of histolysis in the chrysalis, by which most of the organs are reduced to an amorphous emulsion, preparatory to the coming metamorphosis, be brought about by purely mechanistic, physico-chemical reactions ? Is there not here revealed a testimony, which declares that neither the changes in the larva nor the mysterious solution of the tissues in the chrysalis lead up to, or in any obvious way anticipate, the future

morphology of the perfect insect; and is not the conclusion unavoidable that this testimony reveals the existence of an ideal, proper to and working within (and perhaps without) the organism in question? This ideal or final cause being the determining factor which governs the transformations.

The process of such transformations can be observed in any butterfly or moth. I should like, if time allowed, to give a full description of the life history of *Papilio Machaon*, the English swallow-tail butterfly, with which I have good opportunity of making myself familiar, but as time is limited I will confine my description to the most significant period of that history. I will ask you to consider whether this behaviour-pattern is more likely to have come about as the result of chance mutations or variations, or as the result of an innate and directive tendency governing the life of the species. That you may judge the better, I will describe the process in some detail.

After thirty days from the emergence from the egg, the caterpillar is fully fed, and is ready for the change into the pupa stage. This readiness for change is announced by a restlessness and a desire to walk, which fulfils the purpose of distributing the individual larvæ over wide areas, far from the place where the parent insect deposited the eggs.

The first act is to spin on a reed-stem a firm mat, on which to fix the hind claspers. In an upright position, with the hind claspers fixed on the mat, the larva spins the semi-circular band which is to hold the pupa in an upright position. From side to side the head moves, while the fore-feet guide and fasten the thread as far down the supporting stem as they can reach. When this task is completed, the caterpillar is circled round the back by a strong silk cord. It now rests, and during this period the body becomes noticeably smaller, and towards the later part of the time all the claspers are loosed but the last pair; and the creature leans on the band of silk in a shape which is already suggestive of the pupa.

At the appointed time, usually after about fifty hours of quiescence, rhythmical movements are to be observed. These swell from the posterior to the anterior and, becoming at last sufficiently violent to break the thin larval skin, which splits down the back, while a green, tender body seems definitely to push itself through the widening gap, and at the same time the skin, as though pulled back by some invisible instrument, slips farther and farther towards the tail. It passes the silk cord,

which one would expect to entangle it, and, by the most extraordinary dexterity of wriggling, the now naked pupa works the skin down to the region of the hind claspers. As a penultimate act, it releases its hold on the silk mat, draws up the tail and lifts clear of the skin, pushing it aside, and finally fastens again on the mat, making, as a seal of its accomplishment, a few quick turns to secure its hold.

The empty skin falls, and the pupa occupies the place of the larva, but it has not yet assumed its pupal form. The posterior end is much rounder than it will soon become, and the part where the eyes and the head are to be is still snub and soft. This condition changes within twenty minutes, and the chrysalis takes its final shape, and the outer integument hardens.

I want to draw particular attention to the following fact: the shape and position of the organs of the butterfly which is to be are at this stage already stamped on the pupa. These marks are on the *outside*, and there is nothing yet formed inside to correspond with them. This is a significant fact, and one which, when its significance is grasped, will modify the accepted idea that development takes place always and only from a centre outwards. Invisible forces outside the insect have stamped upon it the shape corresponding to that final-cause which is inherent in its being. I want to stress the idea that this final-cause, which I describe as inherent in its being, is not necessarily contained within its material body. At this stage, when the larva turns into the pupa, the governing ideal declares itself. Although there is within the creature nothing but the old body of the larva, which is in process of breaking down, there is on the outside of the pupa the pattern of the perfect insect, with wings, legs, antennæ, etc., which are later to be occupied by the as yet unformed organs. This pattern is waiting to be filled by organs not yet made but already determined.

The changes which go on within are not less wonderful than those which have been visible from the outside. A breaking down of tissues is taking place. Cells which are comparable to white blood-corpuscles are generated in large numbers at this time, and these devour most of the organs which have functioned in the caterpillar, reducing these to a kind of non-cellular mush. These changes remain, even in their physical aspect, much of a mystery, but it is maintained that the tissues, which are reduced by the phagocytes, comprise the hypodermic cells of the first four segments, the breathing tubes, the muscles, the fatty bodies

and the peripheral nerves. At the time that this change is taking place, the cells of the middle intestine assemble into a central mass, and later a new generation of tissue is formed, partly from this central intestinal magma and partly from the proliferation of special corpuscles called image-bearing discs. Thus it is that the newly formed portions seem to have no direct filiation with the destroyed parts of the larval organism. The creature has in fact died, in so far as it has lost its form, its organs and its habits, and now is experiencing a new orientation towards a quite different form, which is to find expression in a different mode of life.

In this process of metamorphosis we are, I believe, in the presence of the working of a concrete, creative idea upon plastic material. What we have witnessed is the working of a centralising and directive force, which determines the chemical and physical reactions of the organic medium. This principle, which makes itself so clearly manifest in the above instance, is—and there can be no doubt about this—the principle which determines the development of all life. Similar, though less patent metamorphoses occur in all embryological development. When we recognise this fact, the physical forms and the outward behaviour of animals can no longer be considered as constituting their whole being; we become aware of the presence of invisible forces, as yet ungauged and unknown, which lie behind the visible phenomena of life, and we realise that Nature expresses invisible values in visible forms; then it follows that many biological and psychological theories, in so far as they try to explain the phenomena of their sciences entirely in terms of physical matter, are trying to do what is impossible; and are in the same position a mathematician would be in if he attempted to make an equation which involved three arbitrary constants passing through five arbitrary points. More terms have got to be put into the ideas before they can fit the facts. This simile has been used by another writer, but it is such a good one that I do not hesitate to repeat it.

The facts which refuse to be fitted into the old theories are numerous. I have been able to give only a few; this is not because they are rare or not so interesting as those which I have selected. There are many other cases which I might equally well have described, and which would have fitted my arguments just as well.

If we now turn to look at some of the assumptions which have been made to support the classical theories of evolution, we will find that they are not so much in accord with those theories as

at variance. Evolutionists often use the simile of a tree to indicate the relation of the species to each other, and the extinct forms, and to the forms which are assumed to be ancestral forms. They say: Consider the existing species as the terminal twigs of such a tree of life; then the smaller branches would represent the ancestral forms connecting the adjacent twigs; the larger branches would represent earlier ancestral forms of a more general and primitive type; the stem and the root would stand for those ancestors of ours, the most primitive and first developed creatures on the earth. In their earliest use of this picture of a tree, men placed some of the existing species upon the developing branches and regarded the species and genera as leading one into another. True, they recognised that there were many links absent. These absences in the hypothetical sequence they called missing links. That was but an early conception; soon they admitted that few of the existing or extinct species could be placed *on* the connecting branches, but that most occupied the position of terminal twigs. And now, with a more careful study of morphology, it is admitted that *all* existing and extinct species must be regarded as terminal twigs, and at some little distance from the connecting branches and stems. The connecting branches and stems are in fact entirely hypothetical, and furthermore the tree, as it was first conceived, no longer exists as an adequate simile, but there has taken its place a hypothetical growth more like a tuft of rushes than a tree, and the existing species are the terminals of that outbranching growth.

Now the facts to which I wish to draw attention are these: That the existing species or the extinct fossil species do not exist anywhere on the connecting branches, but must all be regarded as terminals; the vast body of the tree of evolution is entirely imaginary, and no material creatures have been found to correspond to it. And yet—and this cannot be contested—there is little doubt that, in the process of time, more complicated animals, and animals of higher development of consciousness, have appeared on the earth than those previously upon it. There is an apparent evolution in time, and the idea of evolution is not by any means one to be lightly thrown aside. All those classes of facts which Darwin collected are to a large extent still valid, though contradicted by other facts. How are we going to get out of this dilemma?

By putting, as I have suggested, more terms into our ideas. If we postulate an invisible but definitely objective environment—

and from many different departments of science inferences are being made which strongly support this postulate—then we shall have opened out to our consciousness a new field for investigation. This invisible, objective environment may well be called, if we so please, a spiritual world. In it exist those invisible values which find physical expression on our earth. In this invisible region, of whose existence science is only just becoming aware, there may well exist, and I believe do exist, the missing portions of the tree of evolution. These portions are represented, not by existing species, or extinct fossil species, or hypothetical ancestral species, but by a more plastic material than that material that is incarnated on our earth. It is this invisible environment, which is already coming within the region of our investigations, in which are activating concrete ideas, centralising and directive forces, as witnessed in the formation of pupa and imago, and in the life histories already described. These forces determine the chemical and physical reactions of the organic medium. It is these which govern the process of evolution, not in material forms, all manifested in a chain of successive lives upon the earth, but in the spiritual universe. Science is becoming increasingly aware of this invisible background which lies behind, and which is responsible for, sensual phenomena. It is of this background that William MacDougal has written: "... a great unknown in which great discoveries await the intrepid explorer, a vast region at whose mysteries we can hardly guess, but which we may look forward to with wonder and awe, and towards which we may go on in a spirit of joyful adventure, confident in the knowledge that though superstition is old, science is still young and has hardly yet learnt to spread her wings and leave the solid ground of sense perception."

Discussion.

The Chairman (Mr. Dewar) said: Mr. Grant Watson, who is a trained zoologist, has travelled much, done a great deal of good work in the field and is an independent thinker, has given us a most valuable paper. It is of exceptional worth, because, while most of us who are sceptical about evolution have criticised it on morphological and palæontological grounds, Mr. Grant Watson has concentrated on the habits of animals. He has cited startling cases of habits and metamorphoses at variance with the doctrine of evolution.

For his assertion that there are many others, I, as an ornithologist, can vouch. It seems to me that some of the nest-building habits of birds cannot have evolved gradually. Take the case of the familiar house-martin. Most of you must have watched this little bird, looking very smart in his spotless white trousers and shirt, gathering mud from a puddle. The bird ejects from his beak each mud pellet collected to the spot on the wall to which the nest will be attached. The pellets stick to the wall, and more are added until the cup-shaped nest is completed. I submit that this habit cannot have developed gradually. This is also true of the sand-martin which excavates a nest in a sandbank.

The only criticism I have to make of Mr. Grant Watson's paper is that it seems to me that he is inclined to overestimate the extent to which the facts, or supposed facts, on which Darwin relied are still valid. The facts known to-day are far less favourable to the concept of evolution than they were in 1859. The thousands of fossils since found, with the possible exception of Archæopteryx, have not served to bridge any of the gaps between the great groups of animals. That Archæopteryx, although a very curious bird, does not bridge the gap between reptiles and birds is shown by the fact that it gives the evolutionist no assistance in determining the group of reptiles from which birds are supposed to have evolved. Recent genetical experiments, contrary to the expectations of evolutionists, have demonstrated the great stability of animal species, and there is no getting away from the fact that they are unfavourable to evolution. Our greatly increased knowledge of comparative anatomy has not revealed the presence of a single structure in a nascent condition in any adult animal; yet, if the evolution theory be true, such structures should be numerous. On the other hand, a number of what were formerly believed to be useless vestiges of ancestral organs are now known to be useful to their possessors. Finally, new discoveries of fossils have tended to throw doubt on the idea that in the course of time animals have increased in complication. As new discoveries are made we have to put back the date of appearance of the higher types of animals in the rocks known to us. Take the case of fishes, using the term in its widest sense. At one time the earliest known fish fossils were Devonian; it is now well established that such fossils occur in the Ordovician, and last year a supposed fish fossil was found in the Cambrian. If this be con-

firmed, then all the great phyla of the animal kingdom occur in the earliest known fossiliferous rocks, so that any complication that has been effected has taken place within the phylum. It is true that the earliest fish known to us are very different from those now living and that the bony fishes (Teleosts) do not appear before the Jurassic. These are supposed to be the highest fish because their bones are ossified, but I do not see that they are more complicated than sharks which appear very early; in any case Stensio has recently shown that some Devonian fish had developed bone. Nor were these early fish puny creatures. The head of the Devonian Dinichthys measured more than a yard across, and its neck was jointed, which is more than can be said of any living fish.

In conclusion, I have much pleasure in handing to Mr. Grant Watson the Dr. Schofield Memorial award for his valuable paper. Many of you knew Dr. Schofield personally. Most of you have read his autobiography *Behind the Brass Plate* and are aware that he was a distinguished physician who for many years served on the Council of the Victoria Institute and left the Institute a sum of money, the interest on which is given every year to the author of a selected paper.

I ask you to accord a hearty vote of thanks to Mr. Grant Watson.

The meeting is now open to discussion.

Mr. H. S. SHELTON paid a tribute to the interesting facts of Natural History contained in the paper, but remarked that there seemed to be very little connection between the paper and the title. So far as he understood the main trend of the paper (and he confessed he did not find it at all easy to understand), the author contended that some spiritual principle was involved in embryonic development. It was impossible to express an opinion on a theory of this kind unless it was developed in greater detail, but, for what it was worth, it appeared to be neutral between evolution and special creation. If such a principle were involved in embryonic development, it could be applied equally well to evolution.

Mr. Shelton also remarked that the features which the author found difficult to explain by descent with modification were differences within the zoological family, and contrasted this with the idea the chairman had expressed in his well-known book that

evolution took place within the family, but not to such an extent as to join by direct descent groups more widely separated.

Mr. R. DUNCAN said that in the supremacy of death there was a further fact, universal in its scope, that seemed to him inconsistent with the theory of evolution.

In all the beings comprised in animated nature there were basic instincts directed towards the preserving of their own lives and the avoidance of death.

If an evolutionary process, continuously acting throughout untold ages, is to be assumed, then it is only reasonable to assume also that its course could not fail to be profoundly influenced by the ever-present urge of the instincts aforesaid—influenced, that is to say, in the direction of survival power being more and more developed in the units of life as the ages unfolded.

Where, however, can trace be found of the working out of any such tendency ? In the reigning conditions to-day, does not the lordship of death remain altogether unabridged ?

He (Mr. Duncan) would submit, therefore, that, apart from more potent considerations, the one thus set forth is in itself a bar to accepting evolution as the key to a true understanding of the world of life.

Mr. W. MCADAM ECCLES, M.S., F.R.C.S., said : All present are much indebted to Mr. Grant Watson for taking us back again into the realms of the fascinating facts concerning the sea-slugs, and the metamorphoses of the butterfly, but to many of those present these appear to have but little bearing upon the subject before us, as evidenced in the title of the paper read.

It is well to have a clear view as to what is the belief of sincere followers of the Bible.

Can we not affirm that all present —

(i) Believe in an intelligent creator.
(ii) Would call that Creator—GOD.
(iii) That the first chapter of Genesis gives us a concise account of the steps in the creation, including that of man himself.
(iv) These steps are chiefly the preparation of this globe for man.

(v) But this is through motion, light, life—vegetable and animal —and these in a definite order, extending over time represented by "six days," which were unknown periods of time.

(vi) That the expression used for nearly all is "Let there be," rather than creative acts for every living thing.

(vii) There are most interesting animals still existing on the earth which apparently are what some would call "missing links" actually present, *e.g.*, the ornithorhynchus in Australia.

Such a belief as outlined above does not in fact necessitate the giving up of a whole-hearted certainty of "inspiration" of the Scriptures, or that development by "evolution" of living organisms in any way detracts from God's almighty power of creation.

Sir AMBROSE FLEMING wrote: Although we have had several papers read to the Victoria Institute in the last ten years dealing with the theory of organic evolution, the present paper by a competent naturalist is a welcome addition because it sets out in detail biological facts which are inconsistent with that theory.

The difficulty, however, is to secure attention to them, not merely by the professed evolutionists, but even by the daily papers which are the chief source of information to the general public. The assumption made is that the theory is so fully certified that any apparent contradictions can, or may be, explained away. Moreover, the evolutionists make assumptions which are contradicted by existing knowledge. All definite researches have proved that living matter only originates from previously living organisms, and not from non-living material. The evolutionists attempt to bridge this gap by the improved statement that if we could go back far enough in geological time we should find the transition automatically taking place. Then further, they assume that in connection with living matter there are no agencies or processes concerned which cannot properly be called physical or mechanical, and that there is no reason for assuming any hyper-physical causes.

Thus T. H. Huxley rebuked those who employ the terms *vitality* or *vitalism* in connection with the growth and multiplication of

living cells, saying that there is no more need to use them than to say that something called "horology" is concerned with the movements of a clock. "Both the clock and the cell," he said, "are pieces of mechanism and involve no occult incomprehensible causes." When, however, it is pointed out that there is a *directive power* of some kind concerned with the arrangement of the cells, say in development of the yolk of a hen's egg into a chicken as it is hatched, then evolutionists are content to invoke an agency called "entelechy" or "biotic energy" to account for this directivity. Against this, however, we may contend that all order or ordering involves thought and thought implies and requires a Thinker, and not simply an impersonal causation or the employment of a term which imparts no true explanation but is rather a cloak for ignorance. Then we may note that since Darwin's day some branches of biology have made progress in a direction which does not assist Darwin's fundamental assumption that the germs, ova, or seeds of living organisms vary accidentally in all possible directions. The branch of science called Cytology is concerned with the structure and processes of growth of living cells. It has been advanced since Darwin's time by improvements in the microscope and in staining living tissues. The result has been to show the extremely complicated structure and wonderful actions at work in the growth of the fertilised ovum or seed which is the starting-point for organic life. These all seem governed by exact law and regularity and afford no support to the supposition of a large variety of states occurring by accident. Then when the theory is extended to cover the origin of the human race the all-important psychical differences between the highest animal and the lowest type of man are ignored and only similarities in bodily structure given attention.

Man, from his earliest appearance, had powers of progressive constructiveness of which there is no trace in any animal. Early man used fire, made tools and weapons, had vocal speech, made drawings of animals on cave walls, and by burial customs exhibited a firm conviction that the death of the body was not the end of existence, and exhibited potential or actual religious opinions and emotions, not the slightest germ of which appears in the highest anthropoids. The theory of evolution ignores completely the psychic facts of human life and adherence to it seems to atrophy

not only æsthetic but religious faculties. There is a striking proof of this in Darwin's own confessions as given in a recent biography of him by Mr. Geoffrey West.*

It is there shown that as his ideas and convictions on organic evolution progressed, so also there was a decrease in his higher æsthetic tastes and religious convictions. Once he had pleasure in the beauties of poetry, music, and painting. Then he confesses he became dead to them all. His mind, he said, had become a *machine* for grinding out general laws from a collection of facts. As regards religion, he abandoned doctrinal faith after he was 40 years of age. He said: " The more I think, the more bewildered I become. My theology is simply a muddle. I cannot look at the Universe as the result of blind chance, yet I can see no evidence of benevolent design, or indeed of design of any kind in the details."

If these were the results in the case of the chief author of the theory of organic evolution, we may ask: Is it safe to instil into the minds of students or even those of the general public the improved principles of this theory *without giving them full opportunity to learn the arguments against it ?*

This paper of Mr. Grant Watson has, then, a field of usefulness as it furnishes some material for attack against a theory which has unquestionably a destructive influence on religious certainty and conviction.

The best antidote to it is a more extensive study of those Scriptures of truth which reveal to us the true origin, nature and destiny of Man, and a collateral study of the ever-accumulating evidence from archæological research that supports the historical truth of these Scriptures and that they are not a collection of myths and fables but record facts of history which are neither " incredible " nor untrue.

The view sometimes taken that organic evolution may be regarded as a method of Divine operation is open to the objection that if we extend this view to include the human race we are brought at once into opposition to the plainest statements of Scripture ; and, moreover, we cannot deny the miracles of creation without also denying the similar miracles of Christ, and to do this involves as a logical consequence that it becomes necessary to throw overboard the

* See *John o'London's Weekly*, Dec. 17th and 24th, 1937.

whole of the historical basis of Christianity and reduce it simply to the inculcation of morality and philanthropy but divested of all doctrinal truth and supernatural power.

Written Communications.

Dr. R. E. D. Clark wrote : Mr. Grant Watson's paper is certainly one of great interest and his suggestion that, instead of repudiating it, we should " add more terms " to the current theory of evolution is worthy of careful thought.

Nevertheless, the view offers great difficulties. Let us draw an analogy from physics. A long time ago the concept of " time " was adopted by physicists and it was supposed that this " time," which is measured by the earth's rotation, was the same as the time which we experience in our minds. But it has turned out that this is not so (*see*, for instance, M. E. Cleugh, *Time*, Methuen, 1937, chap. ii.). Moreover, Professor Dingle's recent careful examination of the subject (*Through Science to Philosophy*, C.U.P., 1937, chap. xi) makes one wonder whether physical time is time at all !

Now Mr. Grant Watson has outlined the theory of evolution and shown, as a matter of fact, that it has a history very like that of time. It would seem to follow that, if his conclusion is correct, we should also add " more terms " to the physical idea of time and hence hope to make it consistent with the facts with which it will not at present agree. But that is not what the physicists are doing. Rather, they are becoming more and more contented to use their fiction, for the simple reason that " adding more terms " is a counsel of perfection. It requires a genius at least of the calibre of Einstein to think of a new term to add which would be any use to science !

Mr. Grant Watson meets this difficulty by proposing a new " force " which he describes as " an innate and directive tendency governing the life of the species." But almost identical suggestions in almost the same words have been made repeatedly since the time of the Cambridge Platonists (*e.g.*, R. Cudworth, *Intellectual System of the Universe*, London, 1678, pp. 179, 190), but they have never been found useful to science. Surely they are no better than the old functional psychology—a man is very clever because he has a tendency for cleverness ! In fact, it is just this type of thinking which all Christians so rightly deplore among sceptics to-day—the

view, for instance, that there is really no need to believe in a God Who created the world because, no doubt, matter has a " tendency " to arrange itself into complex organisms, worlds, etc., of its own accord, providing the conditions are right !

In addition, surely some of the evidence which has been given is quite unconvincing. What ground is there for saying that there is an " amorphous emulsion " inside a chrysalis ? There is evidence that the most amorphous looking protoplasm may be quite elaborately organised (*see* J. Needham, *Order and Life*, C.U.P., 1936, p. 151, etc.). Even among pure chemical substances it is often found that liquids, though they are perfectly fluid, may yet contain a good deal of organisation (the so-called *meso-* or *liquid crystalline* states of matter). Thus a weak solution of ammonium oleate apparently contains fibrils of molecular dimensions, so far as their thickness is concerned, but they often stretch many inches through the liquid. Again, a suspension of bentonite clay which has been shaken is liquid but sets solid on standing a few seconds (*thixotropy*). The solid is not amorphous but organised, yet the behaviour can be adequately explained without postulating a " concrete, creative idea " acting upon " plastic material." Caterpillars are certainly more highly organised than bentonite, but this and other analogies are so striking (*see* Needham, *loc. cit.*, p. 156, ff., H. Przibram, *Die anorganischen Grenzgebiete d. Biologie*, Berlin, 1926) that the same principles may well be at work.

Invisible " forces " not known to science may, of course, exist, but it is no use speaking of " forces " unless they help to unify our knowledge, and until then science is certain to progress without them. So long as we realise the limitations of science this will not do any harm to religion.

Author's Reply.

In answer to Mr. Shelton, I should apologise for not having called my paper " Facts at Variance with the Classical Theories of Evolution " rather than " Facts at Variance with the Theory of Organic Evolution." The Classical Theories, which are the orthodox and most generally accepted theories, all lay stress on the mechanical nature of evolution. In my paper I think I have made it clear (though this is perhaps not clear in the title) that I believe in an

evolution which is an instrument of a divine spirit. Such a belief in evolution has been held by many philosophers, both ancient and modern, and has little to do with the mechanistic theories against which my arguments have been directed.

I differ from Mr. Duncan in my valuation of the fact of death. I regard death as equally part of existence as life itself. No basic instincts can possibly modify the balance between life and death, for the instinct towards death is the most basic instinct of all. No process of evolution taking place in a material universe could possibly bring about an avoidance of death.

To answer Dr. Clark's criticisms, I would need to write a paper as long or longer than the one I have already read. But to his objection to my plea for adding more terms to our ideas, I will merely drop this brief hint as to the lines of my rejoinder. St. Paul has written in his first Epistle to Corinthians—

> " Yea, the things which are not (hath God chosen), to put to nought the things which are."

I would suggest that scientists, when studying the things which are, should be aware of the possibility of the things which are not. This is, I know, making a fairly stiff demand upon their consciousness, but it is one which the scientists of the future will have to face up to.

With regard to his more particular criticism of my use of the word *amorphous*, I admit the justice of this objection. I should have used the word non-cellular. My point about the metamorphosis of the insect is, that one form of organism breaks down with regard to its most obvious and general structure, and from the resulting non-cellular matrix a new form of organism of a different structure is gradually built up. I believe that the precise and complicated organism of a butterfly, which as the facts tell us arises from this matrix, can best be explained by the working of a concrete creative idea upon plastic material. This belief cannot yet be proved, but it can with justice be put forward as the most probable.