NATURAL THEOLOGY

J. MACLAREN

EX BIBLIOTHECA

CAR. I. TABORIS.

NATURAL THEOLOGY

IN THE

NINETEENTH CENTURY.

NATURAL THEOLOGY

IN THE

Nineteenth Century.

BY

JAMES MACLAREN, M.A.,

BARRISTER-AT-LAW.

LONDON: EDWARD BUMPUS,

5 & 6, HOLBORN BARS, E.C.

1878.

Bungay:
CLAY AND TAYLOR, PRINTERS.

PREFACE.

Paley thought it necessary to apologize for his 'Natural Theology.' He says it will be urged that his readers leave off where they began; that they never doubted the existence of a God; and that it does not appear what is gained by researches upon a subject of which no proofs were wanted. But, he says, occurrences will arise to try the firmness of our most habitual opinions; and upon these occasions it is matter of incalculable use to feel our foundation; to find a support in argument for what we had taken up upon authority.

Perhaps no apology is now required for

any attempt to support the argument from design. The University to which I have the honour of belonging, has lately conferred an honorary degree on Mr. Darwin, whose claim to be so distinguished must rest upon the part which he has taken in advocating the doctrine of evolution; a doctrine which, in his hands, and still more in those of other evolutionists, whose views owe their position in public estimation in a great degree to his labours, is inconsistent with the argument from design.

Mr. Darwin, to take the view of evolution which is most favourable to the argument from design, supposes the existence of a few original forms. These forms are constantly varying in all directions; some of the variations being to the advantage, others to the disadvantage, of the creatures in which they occur, and some being neutral. All the existing forms of life are due to the action of natural selection, in picking out and preserving the variations which are advantageous.

There is a degree of hap-hazard about this theory which does not harmonize with the notion of design; and the argument from design totally vanishes when we come to the views of the more advanced evolutionists; for how is it possible to see design in automatic evolution from a bleb of jelly, itself the necessary result of accidental chemical combinations of self-existent matter?

As these doctrines seem to be quite inconsistent with the established religion of the country,—and indeed, if followed to what are supposed to be their necessary results, with any form of Christianity, or even with any form whatever of religious belief,—it certainly is a most remarkable fact that the University of Cambridge should have taken a step which must seem, to some extent at least, to give them its sanction. It may be said that the honour has been conferred upon

Mr. Darwin, not on account of his views as to evolution, but because of the valuable additions which, in the course of his labours on that subject, he has made to our knowledge of Natural History, and in deference to the position which he holds in the scientific world. But any one acquainted with the University of Cambridge forty years ago, will be aware that, at that time, a far greater claim than that which Mr. Darwin now has for the distinction, would have utterly failed to obtain it for him, if coupled with the views which he holds as to evolution.

It is no doubt highly gratifying to find that the pursuit of knowledge is encouraged without regard to collateral inferences, and no one will say that Mr. Darwin does not deserve the honour which he has received. Here I have noticed the fact only as conclusive evidence of the extent to which these new doctrines have taken hold of men's minds. It is impossible to ignore their importance, and therefore an attempt to show that Mr. Darwin's theory does not take from us what Paley calls "our foundation," cannot be a useless task.

Naturalists are indignant that a lawyer should presume to meddle with their science. They say that I have never determined a single species, and that possibly I might not know whether the evidence offered by some facts in Natural History made for, or against, Mr. Darwin's theory. I do not allow the force of this latter objection, though I acknowledge that I am placed at a disadvantage by my want of a practical acquaintance with Natural History. But are naturalists themselves quite free from similar difficulties? Chemists may say that the naturalists who have laid down these new laws, are not aware of the nature of the substances with which they deal; the blebs of jelly which they consider to be the simplest beginnings of all life, are in reality, chemically, most complex bodies, very easily decomposed, and not at all likely to be the result of the tremendous phenomena which are supposed to have heralded the dawn of life in the world, on the cooling down of our planet. In short, chemists may say that mere naturalists are not competent by themselves to deal with the question of evolution. What then is to be done? Are we, as one of my critics has remarked, to wait until some omniscient person makes his appearance before we consider the subject?

In another work I have examined the arguments for and against the general theory of Mr. Darwin, both as to the origin of species, and as to the descent of man from an ape-like ancestor; and I have pointed out reasons for believing that it is in the main untenable. My son has shown the very great difficulties which, on chemical grounds, lie in the way of those theories of evolution which attribute the origin of living beings to the fortuitous combinations of inorganic matter. In the following pages, I propose merely to call attention to a few cases of organic structure, for which I think we shall utterly fail to account, except on the supposition of the action of an intelligent will.

Constable Burton,
Bedale.

CONTENTS.

CHAPTER I.

CHAPTER II.

CHAPTER III.

CHAPTER IV.

CHAPTER VII.

CHAPTER VIII.

ERRATUM.

Page 62, line 20, *for* naturally *read* actually

NATURAL THEOLOGY

IN THE NINETEENTH CENTURY.

CHAPTER I.

Amount of life in the world—Increased by the presence of beasts of prey—Number of species of animals—Adaptations of structures and instincts—No real scale of inferiority amongst living beings—Instincts of the lower animals—Universal power of sexual reproduction—The continuance of the race the great end of life—Instances of maternal care—Arguments against design: (1) the impossibility of conceiving creation; (2) notion of beauty and design formed by what we see; (3) the imperfection of adaptation and prodigality of waste—How did imperfect adaptation and the prodigality of waste result from the survival of the fittest?

THE whole economy of nature seems directed to the maintenance of the greatest possible amount of life. Wherever a fit abode for a living being exists, it is occupied. It is even very probable that the existence of carnivorous animals, though they are directly destructive to life, may in the long run be in fact an addition to the amount of animal life. Probably the amount of animal life that can exist in the world at any given time, depends upon the quantity of vegetable food produced. But the existence of carnivorous animals renders the whole of this food available for the sustenance of life. Young animals consume vegetable food during the season of its abundance, and becoming themselves by degrees food for other creatures, the result is the same as if the surplus vegetable food of the season of abundance was stored up for future use, instead of rotting on the ground. The reader may perhaps have noticed when travelling through the country in winter, how the herbage is economised,—dealt out by the farmers bit by bit for the sustenance of the oxen and sheep who are to furnish food for man, in one sense the most carnivorous of animals.

In the pampas of South America there are vast herds of half-wild horses and cattle, and travellers are astonished at the number of the bisons on the prairies of North America. A spectator viewing those assemblages of animals is apt to think these countries peculiarly abundant in animal life, yet space for space they are not nearly so thickly peopled with cattle as England, where no beast is allowed to live to the term of its natural life.'

A very slight peculiarity of structure fits a living being to fill a place in the polity of nature, which can be occupied by itself alone. Thus we find that if we sow a field with different kinds of grass, the produce in hay will be greater than if we sow it with one kind alone; similar as all grasses are to each other, no single species can so occupy the field but some portion of its fertility is left vacant.

A natural result of this state of things would be, that in order that all the places in the polity of nature should be occupied, there must exist a vast number of living beings, differing only very slightly from each other; and this we find is the case. There are, according to some naturalists, 2411, according to others, 2636 species of mammalia. There are in round numbers 10,000 species of birds, 100,000 known species of insects, and a vast number of species of the lower animals.*

* Wallace's 'Geographical Distribution of Animals,' vol. ii., p. 170.

There are always some intermediate forms which partake of the peculiarities of their neighbours, and no doubt only by this combination are enabled to find their subsistence.

It is hardly necessary to mention that the structure of all these beings is not only well adapted to their wants, but is also of a most elaborate and complex nature. The structure of the eye, the mechanism of the human body, the eggs and feathers of birds, are familiar examples of adaptation; and numerous similar instances are to be found in every department of nature, from the highest to the lowest forms. The wings of insects are as wonderful as those of birds,—witness the butterfly covered with millions of microscopic feathers, —nor are curious mechanical contrivances wanting. The foot of the house-fly is furnished with some mechanism, probably a kind of air-pump, which enables it to walk up a smooth pane of glass. The common earwig has small wing-cases and large wings. When it alights from its flight, it has to fold up these wings in such a manner that the wing-cases may cover them. It effects this object by first shutting up its wings as a lady shuts her fan, and then folding this closed fan back upon itself until it forms a square packet of a size capable of being covered by the wing-case.*

The whole world of microscopic animals and vegetables abounds in instances of wonderful and beautiful form.

Though we speak of creatures as being lower than others in the scale of nature, it would seem that if there is any truth in the remark, we must limit it to their bodily structure as it differs from that of ourselves and the mammalia, not to their actions. Thus the tailor-bird pierces holes with its bill in the edges of two dead leaves, and then sews them together for its nest with vegetable fibres as thread, and with a neatness which would do no discredit to the artist after whom it is named. The chætodon, an Indian fish, shoots the flies upon which it preys with a drop of water projected with unerring aim from its pointed snout.

Even insects are in this respect at least on a par with any animal not rational. We may take the web of the garden-spider as an

* Kirby and Spence, Letter xxiii.

example of ingenuity; and there are spiders which enclose air in a bag made of fine web, which serves them as a kind of diving-bell when they seek to retire under water to consume their prey at leisure.*

The ant-lion, a creature which preys upon insects, and is the larva of an insect allied to the dragon-flies, is so sluggish in its motions that it has no power of capturing its prey by speed; it therefore digs a hole in some sandy place, which serves it as a kind of pitfall, in which it entraps any insect which incautiously approaches too near the edge. The creature lies almost concealed at the bottom of its den, and throws a shower of sand over any insect which may attempt to escape by climbing the sides of the pit, and speedily brings it again to the bottom.

It is hardly necessary to mention ants and bees, which labour for the common good.

It is told of a dog, as a wonderful instance of sagacity, that having been worried by a dog much larger than himself, he brought a still larger dog of his acquaintance to avenge his ill-treatment on his adversary, yet the

* Kirby and Spence, Letter xiv.

same degree of intelligence has been observed in an ant and a beetle. Mr. Belt having almost covered an ant with a piece of clay, one of its companions attempted to relieve its imprisoned friend, but failing in the endeavour it went to the nest and shortly returned with a troop of ants, who removed the clay bit by bit and so released the prisoner.* A dung-beetle while preparing the pellet in which she was about to lay her eggs, let it fall by accident into a small depression in the ground. After trying for some time without success to recover the pellet, she went to the neighbouring dunghill and soon returned with two or three similar beetles whose united exertions extricated the pellet.†

All living beings have the power of reproducing themselves by germs, and in at least the great majority of cases, if not in all, the reproduction is sexual, — the sexes, as Paley says, being exactly fitted for each other.

Indeed the provision apparently made for the continuance of life is one of the most

* 'Naturalist in Nicaragua,' p. 26.
† Kirby and Spence, Letter xxvii.

remarkable phenomena of nature. It is connected with the most violent and the most agreeable feelings of which animals are capable, and in many cases appears to be the great aim of their lives.

Works on Natural History are full of the most touching anecdotes of the devotion of animals to their offspring. We see that the most timid animals become fearless in defence of their young, and display a most wonderful degree of intelligence. Every one is familiar with the cunning tricks by which the hen partridge and the wild duck try to draw an enemy away from their nest or young. They flutter along the ground as if wounded, and invite pursuit until they have drawn the dangerous intruder to a safe distance, when they resume their usual mode of flight and speedily leave him; and all this is done instinctively, for we cannot suppose the individual birds, who are the actors in the performance, to have seen it practised by others, or noticed the actions of a wounded bird; nor if they had done so, could we suppose them capable of so perfect an imitation.*

* Duke of Argyle, 'Contemporary Review,' July 1875.

Even plants seem affected by the influence of the law of the continuance of life. Plants when weak from being placed under conditions of life which are not congenial to luxuriant growth, are known to flower and seed profusely, as if endeavouring to prevent by increased productiveness the impending extinction of their race.

Insects show the most extraordinary instincts when preparing for the continuance of their species. The butterfly, though she herself lives upon the nectar of flowers, seems to know that her children require the grosser food afforded by a cabbage leaf, and she deposits her eggs upon plants of that kind only. The young of the gad-fly are nourished in the intestines of the horse. "How," says Mr. Kirby, "is the mother to introduce them to such a situation? She lays her eggs upon the hairs of the horse, and in such parts of his body only as he can reach with his tongue; chiefly on the shoulder and the back of the knee. The horse licks these parts, probably in consequence of the irritation caused by the small grubs, which are speedily hatched from the eggs, and thus they are transferred to his intestines." * There are innumerable similar instances amongst insects, and in these cases the parent is destined never to see the young for whom she so sedulously provides, for she perishes before they are born; and when in their turn they have to provide for a family, they can owe no part of their skill to the instructions of their parents.

Looking at these instances of sagacity, we must feel disposed to modify our notion of a scale of inferiority existing amongst organic beings, and to consider each of them as equally perfect with regard to its place in nature. Indeed, the adaptation of each organic being to the conditions of life which surround it, the provision which is made for the well-doing of all creatures, and the manner in which they seem to keep each other within bounds, have always commanded admiration.

In addition to these adaptations and provisions, the organic world affords numerous instances of beauty and variety,—birds, insects, and flowers glow with most brilliant colours, and display most graceful forms.

As such a world as this,—so full of variety,

* Kirby and Spence, Letter xi.

adaptation, provision, and beauty,—evidently could not have been formed by chance, men have thought themselves irresistibly led to the conclusion that it must be the result of the action of an intelligent will,—that it must be created.

The justness of this conclusion, however, has been denied, principally on three grounds: (1) the conception of a Creator is beyond the powers of human beings; (2) our notions of adaptation and beauty are formed from the contemplation of our world, and we are therefore not capable of knowing whether such adaptations are the best, or whether there is such a thing as beauty; (3) that the so-called provision is very incomplete, and the world in fact a scene of misery.

A writer in the 'Westminster Review' for July, 1875, tells us that "the fundamental ordinance of the Creator is an ordinance of death. The condition of existence for the lower animals is mutual destruction. As regards the human race, the volcanic eruption which destroys cities; the earthquake which tramples them to ashes; the famine which starves a population; the war that destroys its millions of men, that flings babes into the flames as it did in the Crusades; the pestilence that depeoples an Athens, a Florence, or a London; the mortality which allows but one-half of the human race to attain the age of twelve years; and many similar evils,—show how entirely the presumed efforts of benevolent omnipotence have failed to attain their supposed object. Still more flagrant appears the failure if we examine the question from the historical point of view. The blessings mankind now enjoy have been purchased by the sufferings and wasted lives of whole geological periods; man has advanced only, in many thousands of generations, to such a position of comfort and dignity, that for the *élite* of the human race life is perhaps preferable to non-existence."

This passage reminds us of Lyell's description of the geology of the country around Naples: "It records a constant succession of volcanic eruptions and earthquakes, and would," says Lyell, "suggest the idea of a country quite unfit for the abode of man." Yet what was the real condition of Campania during these years of dire convulsion? "A climate where heaven's breath smells sweet and wooingly; a vigorous and luxuriant nature unparalleled in its productions; a coast which was at once the fairy-land of poets, and the favourite retreat of great men. Even the tyrants of creation loved this alluring region, spared it, adorned it, lived in it, died in it. The inhabitants, indeed, have enjoyed no immunity from the calamities which are the lot of mankind; but the principal evils which they have suffered must be attributed to moral, not to physical, causes."*

So the Reviewer would have but to cast a glance upon the everyday life of the world to see that it is more than endurable to the mass of mankind, and, indeed, is perhaps quite as burthensome to those whom he has described as the *élite* of the human race; so true it is that there can be no permanent happiness without some degree of self-denial.

Another writer, Mr. G. H. Lewis, says: "Beside the few contrivances and skilful adaptations of nature, we have to admit numerous and glaring failures to attain the very end said to be designed. If we are

* Forsyth's 'Italy,' quoted by Lyell, vol. i. p. 605.

allowed to speak of the exquisite contrivances with which ends are reached, we cannot disregard the bungling failures by which those ends are missed; yet naturalists bent on theological illustration, eloquently discourse on the skill displayed by nature in her manifold methods of securing the fertilization of ova in the animal and vegetable kingdoms, and leave unnoticed the equally patent fact that for every seed or egg fertilized, thousands are produced which never fulfil the end for which they were designed. The prodigality of waste is far more conspicuous than the economy of which so much is said. No one would applaud the wisdom and skill of a man who wasted a pipe of wine every time he desired to fill a glass." *

Arguments of this kind against the evidence of design in nature are not novel, and they have hitherto been rejected by the majority of thinking men. They are too metaphysical for us to enter upon; we can only note that though man cannot conceive creation, some idea of it has occurred to him, either naturally or from Revelation. Again, in the case of

* 'Fortnightly Review,' July, 1867, p. 100.

beauty, it is clear that some things produce an impression on man by means of something which he calls beauty, while other objects appear to him to be ugly. Somehow or other we do distinguish between the two cases.

These arguments, however, are supposed to have received great support from Mr. Darwin's theory, as that theory seems to point out a mode in which the world may have been formed without the direct action of an intelligent will. The theories of evolution are indeed the great novelty in Natural Theology, and their advocates think them fatal to all notion of creation. We trust the reader will find that the consideration of them only leads us to new evidence of adaptation, and of the existence of some influence other than the automatic action of matter.

And now, before we proceed any further in our inquiries, we must ask the supporters of these theories of evolution to explain how it happens that in the world in which we live there should be, as they assert, such a predominance of misery, such prodigality of waste, when that world has been formed, according to their views, by the survival of the fittest, by a strict regard to the greatest good of each individual only. If we could conceive creation at all, we might imagine that what appeared waste might be a provision for some other creature, though not of use, or even detrimental, to the individual with respect to which it occurred. For each and for all may be the principle in creation, but this principle can have no place in a system founded upon the intensely selfish survival of the fittest.

Does it not seem to follow, if we allow that the organic world has been formed by the survival of the fittest, and yet find in it misery and waste, that these evils are inevitable in the nature of things, and therefore no reproach to creative power, no evidence whatever against the existence of such a power.

CHAPTER II.

Mr. Darwin's theory—He supposes the occurrence of variations injurious to the creature itself—Such variations almost fatal to his theory—Immediate advantage from the variation and economy of vital expenditure two essential points in Mr. Darwin's theory—Cases in which the theory fails as to the first of these points—Mr. Mivart's views as to incipient forms—The Coryanthes Macrantha—Mr. Darwin's answers to Mr. Mivart—The tendons of the hand and foot—The siphuncle of the ammonites — The same points with reference to instincts—The young cuckoo ejecting its foster brothers—Unsatisfactory explanation by Mr. Darwin—How did the pied wagtail acquire by natural selection the habit of enduring the young cuckoo in its nest—Why did the butterfly lay her eggs on the cabbage—The plunge of the osprey into the water — These cases incompatible with Mr. Darwin's theory, not merely inexplicable by it.

Mr. Darwin assumes the creation of a few original forms; the descendants of these forms are continually varying in all possible ways, differing though very slightly from their parents; such of the variations as are best adapted to the surrounding conditions of life are preserved, the others perish in the struggle for existence which, owing to the rapid rate of increase of all living beings, is continually going on in the world; and by the repetition, long-continued, of this process of natural selection, or the survival of the fittest, all the animals and plants which we see around us have been formed.

Mr. Darwin claims for his theory a true scientific basis, as being founded upon observation. The variations, therefore, which are to be naturally selected are very small, for such only are observed to occur in nature, and they are of all kinds,—some to the advantage of the creature in which they occur, and some to its disadvantage. Most of the so-called improved breeds obtained by man are the result of accumulated variations, injurious to the animals themselves. Our best shorthorn cattle could not exist in a wild state, and in fact are so tender and infertile, that they are with difficulty preserved with the greatest care.

Mr. Darwin indeed allows that variations disadvantageous to the creatures themselves do occur. In considering Dr. Asa Gray's view that variation has been specially directed, Mr. Darwin says: "Can it be reasonably maintained that the Creator specially ordained, for the sake of the breeder, each of the innumerable varieties in our domestic animals and plants, these variations being of no service to man, and not beneficial,—far more often injurious to the creatures themselves. Did He cause the frame and mental qualities of the dog to vary, in order that a breed might be formed of indomitable ferocity, with jaws fitted to pin down the bull for man's brutal sport."

As the variations are so small, the difference between the improved individuals and the original stock,—or indeed between the improved and the degraded individuals,—is not so great as to prevent all the individuals of a species from interbreeding; and this, if it does not practically entirely obliterate the supposed improvement, must at least enormously prolong the period required to produce a new species by natural selection—the only step towards that result being that the improved individuals would be slightly stronger and longer-lived than their fellows, and on this account be, after allowing for all impediments, in a slight degree more likely to leave descendants, though these descendants would not necessarily be equal to their parents, in those cases at least in which they are the result of a cross with a degraded individual.

But leaving this point for the present, we see that these theories require two principal points to be granted: (1) That each step towards the new form must be of immediate advantage to the individual in which it occurs, for otherwise its value would not be felt and known; a variation which was merely not injurious to the individual, could not be preserved by natural selection: (2) which is indeed a corollary to the first position—There must be at least a strong tendency to simplicity of structure, inasmuch as the most simple means of obtaining the end will require the least expenditure of vital force, and on that account be most advantageous in the battle of life.

The first of these propositions is admitted by Mr. Darwin, and indeed is self-evident; but as there are in Nature parts of living structures which are apparently not useful to the beings in which they are found, Mr. Darwin endeavours to account for them as the results of correlated variation; that is, they may be consequences of variations which are useful to the creature. Breeders have found that long limbs are accompanied by a long head; pigeons with short beaks have small feet, and those with long beaks, large feet. Apparently useless forms may be spontaneous variations, as when a peach-tree produces a nectarine. But these are evidently trifling cases; the great point in a system founded on the survival of the fittest must be, that each variation will be preserved only when its value is immediately felt.

As to the principle of the economy of nutriment, though Mr. Darwin accepts it, he is inclined to limit it in a way which seems quite inadmissible. He argues that its action will almost necessarily be confined to the earlier stages in the process of reduction; for he says, we cannot suppose that a minute papilla, for instance, representing in a male flower the pistil of the female flower, and formed merely of cellular tissue, could be further reduced for the sake of economizing nutriment. Now here we cannot think that

Mr. Darwin is justified in making this supposition. There is no reason why a general law, like that of the economy of nutriment, should stop short in this manner; it must continue to act so long as any superfluous structure exists. It was the inutility of the structure that set the principle to work, and while that cause continues, there is no reason why the effect should cease.

We will now proceed to examine some cases in which Mr. Darwin's theory fails with respect to the first of these two points.

Mr. Mivart was the first writer who pointed out, that the incipient stages of certain forms could not have been useful to the creatures in which they occurred, and that therefore they could not have been preserved and accumulated by natural selection. We must refer the reader to Mr. Mivart's 'Genesis of Species and Lessons from Nature,' for a full account of his views.

Mr. Mivart observes that the first steps towards the increase of the giraffe's neck, if very small, could have been of no decided use to it in its competition with the other inhabitants of the South African plains; that in the case of the eyes of flat fish, the habit which the young have acquired of twisting one eye from the lower to the upper side (both eyes being *at birth* on the opposite sides, but on the same side at maturity), could not have been attained by slow and gradual stages by natural selection, because the first steps of the process, before the habit became so perfect as to bring both eyes on one side, would have been useless. Another case is that of an orchid called Coryanthes Macrantha, which has very elaborate organs of fructification, requiring peculiar insect agency to insure its fertilization, and which organs would be wholly useless until perfect.

Mr. Darwin, in answering these objections to his theory, evidently misses the point of Mr. Mivart's observations. He describes the competition which takes place at the present time between the giraffe and the other ungulata, not that which occurred when the giraffe's neck was supposed to begin to lengthen. So as to the eyes of the flat fish, Mr. Darwin shows us how that movement takes place now, which the reader will see has nothing to do with the steps by which the habit was acquired. And as to the Coryanthes, Mr. Darwin describes a number of orchids having flowers of increasing complexity, but does not show that these forms are incipient stages of the Coryanthes.

These answers are such obvious cases of mistaking the arguments brought against him, that the reader may perhaps doubt whether Mr. Darwin's views have been fairly stated. We must refer him to the sixth edition of the 'Origin of Species,' where he will find the answers at length.

Paley tells us that there is a slit in one tendon of the hand and foot to admit of the passage of another tendon through it. This structure, he says, is found in the tendons which move the toes and the fingers. The long tendon, as it is called, in the foot, which bends the first joint of the toe, passes through the short tendon which bends the second joint, a course which allows to the sinew more liberty, and a more commodious action than it would have otherwise been capable of exerting.

Here then is another case of mechanism which could not have been formed by natural selection, for it is evident that the slit would be useless until it was so perfect as to let the tendon pass through it. No mere approximation could be felt as an advantage, and therefore would not be preserved; such a contrivance must apparently have been made at once.

Dr. Buckland, in his 'Bridgewater Treatise,' calls attention to a somewhat similar case amongst fossil forms. The shells of the ammonites, which are shaped externally like the horn of a ram, consist of a series of chambers joined together, and forming a uniform shell externally. The divisions between the chambers are pierced, and a pipe or siphuncle passes through them, which the animal,—the greater part of whose body is contained in the outermost chamber,—had the means of filling with a dense fluid which surrounded its heart. When this fluid was in its place near the heart the animal floated; when it wished to sink, it sent this fluid into the siphuncle. The body collapsed to some degree, and as the whole mass—the animal and its shell—were then smaller in bulk than before, while their joint weight remained the same, the animal sank under water; when it wished to rise again, it withdrew the fluid from the siphuncle.

There may be some doubt whether this is a correct explanation of the manner in which the ammonites rose and sank; but there seems no reason to doubt that they had the power to do so in some way from the peculiar conformation of their shells. This curious form of shell is supposed to have been a source of safety to the fish, by enabling it, when floating on the surface of the sea, to sink suddenly when danger approached. Le Vaillant, in the charming account of his travels in Africa, tells us how much his Hottentots were annoyed at being unable to catch a single specimen of the paper nautilus, a kindred recent form, of which he found many individuals floating in a quiet bay near the Cape of Good Hope. The animals instantly sank at the approach of their would-be captors. The ammonites were destitute of the ink-bag, which in allied species contained a fluid, with which they insured their safety by discolouring the water around them.

Here, again, the machinery by which the ammonites and the nautilus were enabled to rise to the top, or sink to the bottom, of the sea, could not be of any use until perfected; no incipient form could have been felt to be useful.

Can we suppose that an incipient form of the ant-lion's pit, or of the diving-bell of the water-spider, could have been selected, when the complete form of these devices is necessary to secure the end in view. Insects would escape from an imperfect pit-fall, and unless the air-bell of the spider was air-tight, it would be useless.

Other similar cases may probably occur to the reader, and we may state the point generally as follows:—Peculiar structures which are essential to the performance of a function, could not have been useful in an imperfect state, and therefore variations approaching them could not have been preserved by natural selection.

If we turn our attention to the acquisition of instincts, by natural selection, we meet with the same difficulty. To take the case mentioned by Mr. Darwin,—that of the young cuckoo ejecting its foster-brothers from the nest. It is well known that the cuckoo lays a single egg in the nest of some other bird; frequently in that of the hedge-sparrow or pied wagtail. As soon as the young cuckoo is hatched, while it is still blind, and unable to hold up its own head, it ejects its foster-brothers from the nest. It has a peculiarly-formed back, very broad from the scapula downwards, with a considerable depression in the middle. It contrives to mount the other young birds on this back, crawls to the edge of the nest, and then ejects them by a kind of jerk. "I can," says Mr. Darwin, "see no special difficulty in the young cuckoo having gradually acquired, during successive generations, the blind desire, the strength and structure, necessary for the work of ejection; those young cuckoos which had such habits and structure best developed would be most securely reared. The first step towards the acquisition of the proper instinct might have been mere unintentional restlessness on the part of the young bird when somewhat advanced in age and strength, the habit being afterwards improved and transmitted to an earlier age. There is no more difficulty in this than in the unhatched young of other birds acquiring the instinct to break through their own shells, or than in young snakes acquiring in their upper jaws a transitory sharp tooth for cutting through the tough egg-shell in which they are enclosed."*

How could unintentional restlessness, which did not at once go the length of turning out the foster-brothers, be of advantage to the young bird, and therefore be capable of being preserved by the survival of the fittest, and transmitted by descent? Again—in the case of the birds chipping their shells, and the young snakes cutting the tough covering of their eggs — how could this instinct and structure be of any use until perfect? Clearly an incipient state which did not serve to break the egg would be impossible; the young creatures would perish.

And now let us take the other side of the question. How did the pied wagtail and the hedge-sparrow acquire, by the process of natural selection, such a degree of stupidity as to nurse and feed a creature so different

* 'Origin of Species,' 6th edition, p. 214.

from their own offspring as the young cuckoo? It must be a disadvantage to those species in the battle of life to have to maintain the young of other birds. No doubt the egg of the cuckoo is very small for so large a bird, and perhaps not unlike in its markings to those of the foster-parents, but so soon as it was hatched, the cheat, one would think, must have been apparent. The young cuckoo is many times larger than its foster-brothers. The attention of the author of these pages was attracted to what appeared to be a hawk attacking the nest of a small bird; upon closer inspection, however, the disturbance in the hedge was found to be occasioned by the flutterings of a young cuckoo which was being fed by its foster-parents, and too large to keep itself in the nest without fluttering when excited by the prospect of food. The case is very different from those instances in which even animals of prey have been known to nurse the young of other creatures, when deprived of their own offspring at an early age. There are well-authenticated instances of cats nursing young rabbits and squirrels under those circumstances. Here possibly the mother found relief from getting rid of her milk.

Even if the pied wagtail had been taken by surprise by this practice of the cuckoo, we should expect to see affairs speedily put into their former state by the action of natural selection. Some wagtail might occur with a tendency to throw the young cuckoo out of the nest, which she would have the power to do at once, being much superior in strength to the young cuckoo at an early period of its life. Such a wagtail would have more descendants than one which did not throw out the young cuckoo; and so it would go on, until at last all wagtails would throw out the young cuckoos they found in their nests.

Let us compare the amount of variation and natural selection required in these two cases. The cuckoo has to acquire the instinct of laying its eggs in the nest of another bird,—a case almost peculiar to itself among birds; then it has to get the instinct of turning out its foster-brethren, and then to acquire a peculiarly-formed back. The wagtail, on the other hand, has only to acquire or retain common sense enough to know that the young cuckoo is not her own offspring. Contemplating these two cases, can we believe that they are the results of pure variation and survival of the fittest from the beginning, without any external influence?

How did a cabbage-butterfly acquire the instinct with which she selects the cabbage tribe as a nidus for her eggs? Suppose some ancestor of this butterfly to have laid her eggs, we may say, by chance upon a plant of this tribe, and that the resulting caterpillars and butterflies were unusually vigorous, what is to induce these butterflies to repeat the action of their ancestor? There is no connexion between increased strength in the individuals, and a desire to resort to a particular species of plant as a nidus for eggs.

The osprey or bald-buzzard lives exclusively on fish, which he catches by dropping upon them from a great height in the air. He falls like a stone, dashing the water up in foam, his feet are not webbed; he cannot swim or run on the top of the water, as many birds do when they have to rise from its surface; indeed his feet are occupied with his prey, and his wings are too long for action in the water. He must therefore take advantage of his first automatic rise to the surface, from being specifically lighter than water, to start at once into flight. Were he to neglect this opportunity he would be drowned. Here are an action and an instinct which could not be the result of the natural selection of small variations; they must be perfect or they would be impossible.

In all these cases the reader will note that the point is, not that Mr. Darwin's theory cannot explain these peculiarities from a want of proper knowledge of them, but that they are incapable of explanation by it; they are inconsistent with the idea of production by it. This is a very different thing from the mere fact that the theory does not account for every phenomenon of life.

Attention to this point is very important; for there is no doubt that if we could admit that creatures were constantly varying, as Mr. Darwin supposes,—at least with this reservation, that no variations occurred which were for the time being injurious to the organism,—natural selection might effect much that is attributed to it. Many forms might be due to it; and it is probably this fact which has given it such a hold upon many persons who, perhaps naturally, think that a theory which may account for many facts is not to be refuted by a few cases which it cannot explain; neglecting the distinction, that the cases are not merely inexplicable by the theory, but incompatible with it, and therefore fatal to it. The case is entirely different from those in which we fail to explain natural phenomena, merely from want of sufficient knowledge of them. And we must also remember, that if we are driven beyond Mr. Darwin's theory to seek for an explanation of those cases, we are naturally led to abandon it altogether; for the power, whatever it may be, which was capable of producing these peculiar forms, could of course give rise to the more simple forms which possibly might have been due to natural selection. We do not require two laws of origination for the organic world.

CHAPTER III.

Cases in which Mr. Darwin's theory fails as to the economy of nutriment—The deciduous horns of deer may be accounted for as specially created, because the surrounding conditions of life may be made to suit them—Case of artificial breeds of cattle—Deer's horns an impossibility on the hypothesis of the survival of the fittest—Difference between the horns of deer and of the rest of the Bovidæ—Difficulty of accounting, on the principle of utilitarian development, for diversity of structure for the same purposes — Pollen of fir-trees — Reference to plate of Coryanthes Feildingii, a kindred form of Macrantha—Comparison of this form with that of a wild rose as to facilities for fecundation—Cross-fertilization has no influence when plants are similarly situated — Is not secured by the form of Coryanthes, a point fatal to the theory of utilitarian development — Reference to plate of Nepenthes Rafflesiana—Hung round with large stomachs —Inconsistent with both points of Mr. Darwin's theory—Cypripedium Caudatum—Bizarre forms of orchids.

To go now to the second point, the economy of nutriment, we will take an instance from Sir C. Bell's 'Appendix to Paley's Theology.'* "The horn of the deer is bone, and is formed

* P. 225.

as an internal part; that is to say, is covered during its growth. It grows from the outer table of the skull; but there extends at the same time, from the integuments of the head, a soft vascular covering like velvet, so that during the whole period of its growth, the horn has around it a tender soft covering full of vessels which are necessary to its life and support. But when the horn has acquired its full form and strength, this velvet covering is destroyed by a very curious process. At the root of the horn, near the skull, a circle of tubercles, called the burr or pearl, is found; the principal vessels run between these tubercles, and, as the tubercles grow, they close in upon the ascending blood-vessels, compress them, and prevent their conveying blood to the horn; then the membrane, which was vascular, becomes insensible and dead, and in time is rubbed off. The carotid artery, which nourishes the head, increases rapidly in size during the growth of the horns.

These horns seem formed only for the purpose of fighting a rival male. The stags rush against each other with great fury. In the museum of the College of Surgeons there are two superb sets of antlers entangled and wedged together; they belonged to two males, which had struck so fiercely against each other that they could not withdraw their horns, and being thus strangely locked together they starved, and were found dead.

"When the breeding season is over, a process of absorption takes place at the root of the horns, and they are shed through the absorption at the root of the horn; a slight shock will now detach that which bore the united force of the two combatants before."

It is no doubt very difficult to account, on the principle of special creation, for the shedding and reproduction of the horns of deer; and it may perhaps be said that if this mode of providing deer with horns is the best,—as we must suppose it to be if due to special creation,—why may not natural selection have produced these horns? We can only repeat that the great difference between creation and the survival of the fittest is, that in the action of the former principle the special advantage of the individual may not be the only object. It may be sufficient that the deciduous horns are not a disadvantage to the creature under the conditions in which it is placed. It is not necessary, as in the case of natural selection, that they should be a positive advantage to it. Creative power, when forming the creature, may adapt the external conditions of life to it. Natural selection can act only within, and with regard to the creature itself. The case may be illustrated by a reference to our shorthorn cattle. When man produced this breed by selection, he provided at the same time such conditions of food and shelter as the creatures required to enable them to exist; and these conditions could not have been made by, and are entirely independent of, the variations and the selection of them.

The general principle is—creation may contemplate other objects besides the welfare of the special individual created. The survival of the fittest must be concerned with that of the varying creature alone.

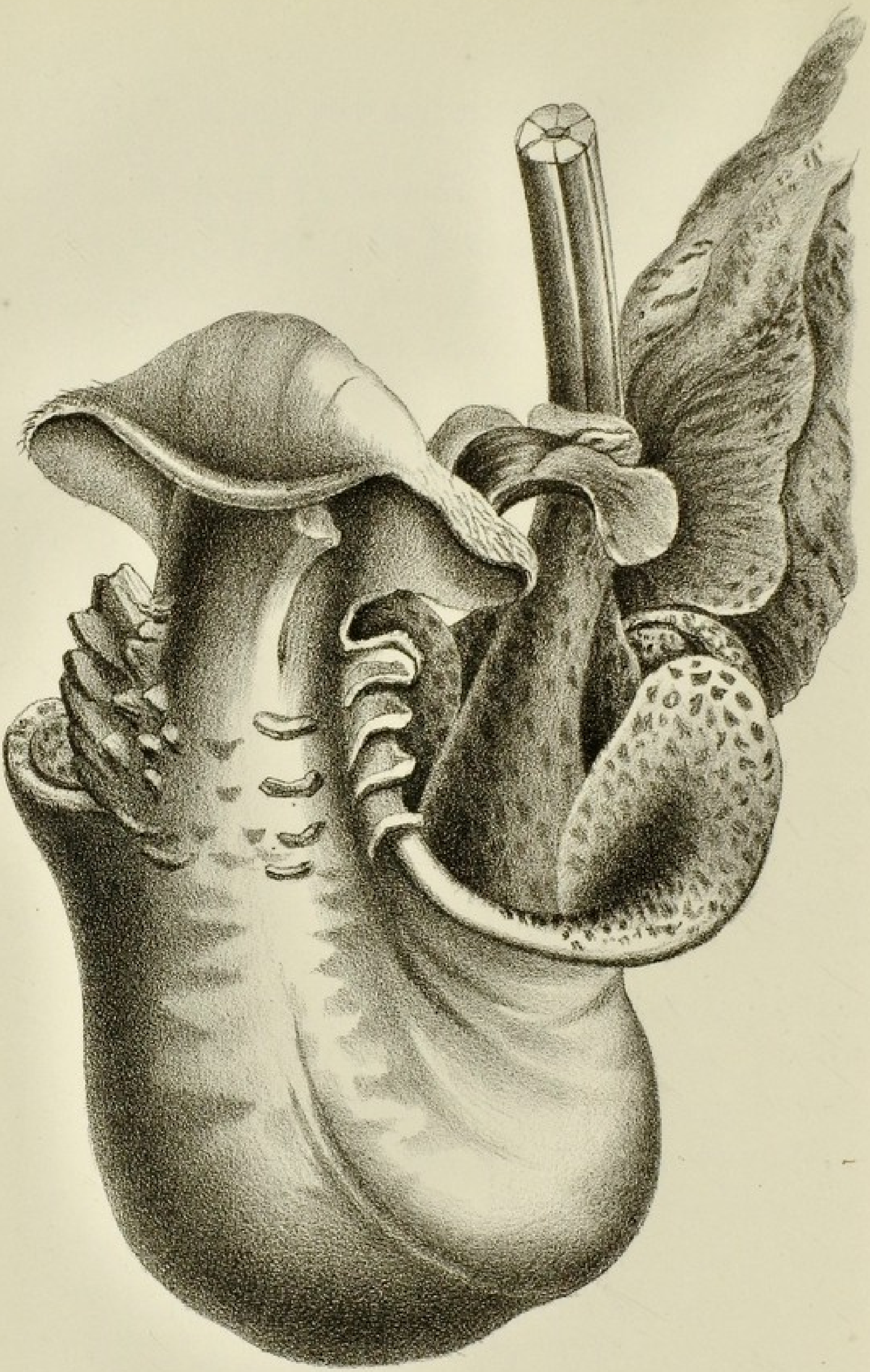
The horns of deer afford indeed examples of stately grace; and though Mr. Darwin scouts as incredible the idea that organic beings have been formed in many ways for the sake of mere variety, almost like toys in a shop,* we must remember that they are not necessarily toys; that somehow or other the human mind, and—we shall see, perhaps, according to Mr. Darwin — the feelings of the inferior animals, are influenced by what we call beauty, and that without this influence the world would not have been what it now is; and though we cannot understand creation, if we believe it possible, we may accept some phenomena without explanation.

Difficult as it is to account for these horns on the principle of special creation, they seem impossible on that of simple utilitarian evolution. We must remember that they are in reality bone; that bone contains much phosphorus; and the production of it is always considered to be a great strain upon the constitution. The disease called the rickets in children, which is very prevalent in poor and ill-ventilated neighbourhoods, is caused by their inability to make healthy and sufficient bone. The weight of a stag's horns must bear a very considerable proportion to

* P. 154.

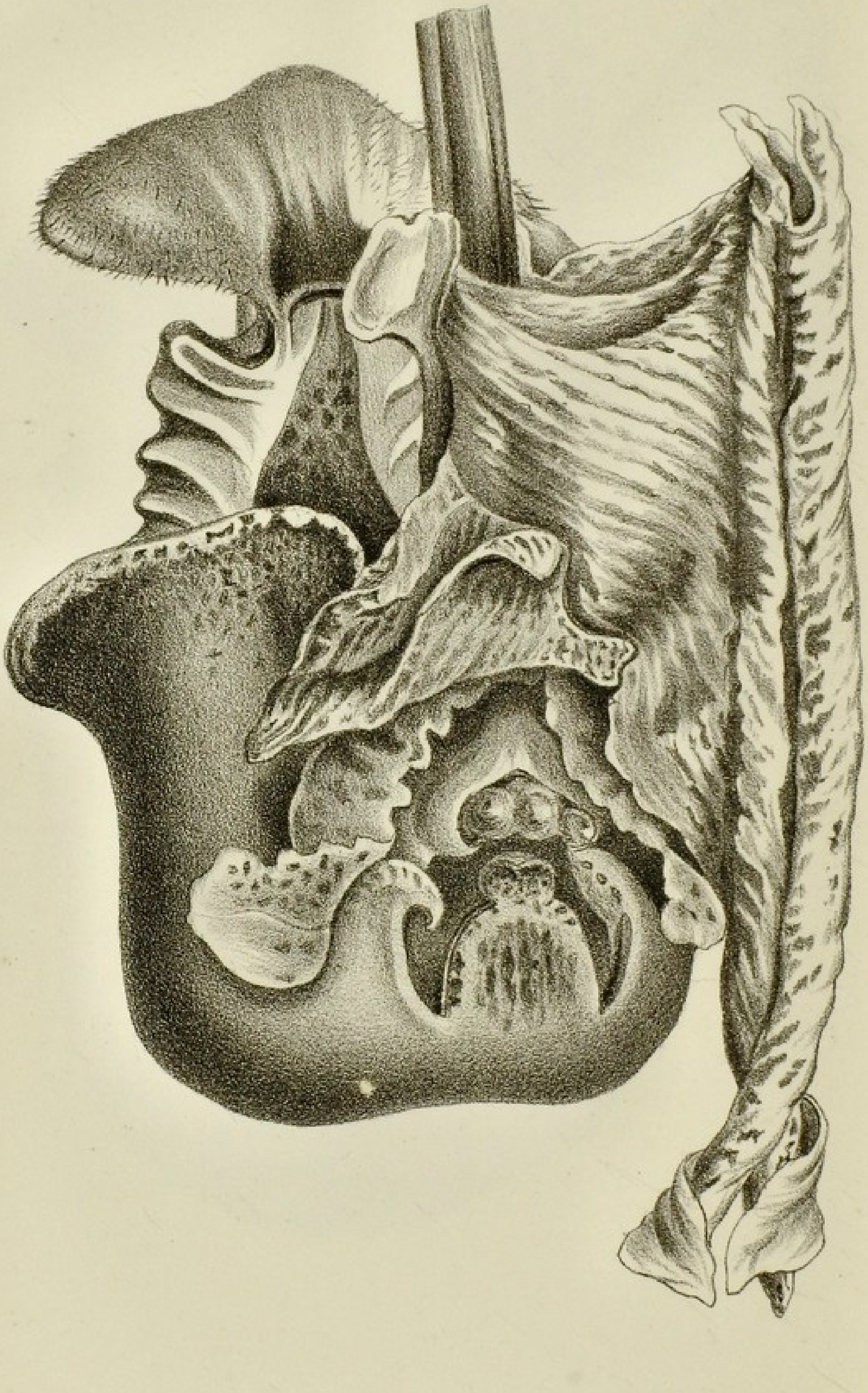
that of all the bones in its body. What a mass of bone to be produced for a temporary purpose only,—that of deciding who by right of strength should be the sire of the herd,—a purpose which in other animals is equally well provided for by far simpler means; and the shedding of the horns leaves the stag defenceless for a considerable period of the year. Can we then suppose these horns to be the result of the survival of the fittest variations? Would not persistent horns, similar to those of the rest of the Bovidæ, which are not bone, but of a much simpler structure and which do not require renewal, be a far more probable result of utilitarian evolution?

And here we come to a most important point. How does it happen that in the course of utilitarian evolution from a very simple form, we see so many modes of attaining the same object? How, for instance, did natural selection give rise to two forms so distinct in structure as the horns of a deer and of a buffalo? Mr. Darwin enters at some length upon the consideration of this point, which he seems to think is in favour



Coryanthes Feildingii (front view)

PLATE I.



Coryanthes Feildingii (back view.)

PLATE II.

of his views. He says: "All this diversity of structure can be satisfactorily accounted for as follows: When two forms vary, which already differ from each other in some slight degree, the variability will not be of the same nature, and consequently the result obtained through natural selection will not be the same."

Now what is meant by the expression, "their variability will not be of the same nature"? We must ask, why not, if the forms have originated from one simple form, and with the same end in view? To us, all these various modes of attaining the same end seem to be quite inconsistent with the action of simple utilitarian evolution from one form; for some of these modes of effecting the proposed object must in themselves be better than others—more effective, or requiring a smaller expenditure of vital force—and would, we should suppose, taking all forms as the result of utilitarian evolution confined to the welfare of the varying being, be naturally selected. At least, we should expect a very great degree of simplicity, and a considerable amount of uniformity of structure. We should not expect such very different structures as the horns of a deer, and of an antelope or buffalo, or the flower of a wild rose and the Coryanthes Macrantha.

And there is another difficulty connected with the production of deer's horns by natural selection. When the ancestor of the family of Bovidæ began to branch out into the groups which we now see, the incipient steps by which the bone horns of the deer —an internal structure—were formed, must from the first have been very different from those by which the horns of the rest of the family were produced, these horns being of a totally different structure.

In fact, the existence, despite the battle for life, of creatures which appear in some respects unfit to maintain, when unaided, their position in the world, is strong positive evidence of the existence of an intelligent governing will.

A nearly similar case to that of the shedding of the deer's horns, is the apparently enormous waste of the pollen of fir-trees. This pollen is so abundant, that it flies off in clouds at every gust of wind.

We will observe here, that on the principle of special creation, this great supply of pollen may not be really wasted, for if of no use to the trees, it may afford food for insects.

The orchid, Coryanthes Macrantha, to which we have already alluded, is another instance of a great expenditure of vital energy to secure an end, which is attained in other flowers by much simpler means.* In the large flower of this orchid, the labellum, or lip, forms a large bucket, which is half-filled with a liquid almost pure water, which falls into it from two little secreting horns. There are certain ridges at the top of this labellum, of which humble bees are very fond. In their struggle to get possession of these ridges, the bees sometimes push each other into the bucket, and their wings being wetted they cannot fly away, but must crawl out by a spout in the side of the labellum through which the superfluous liquid runs. In doing this, they attach to their heads the viscid pollen masses, without at the time fertilizing the flower. But when

* 'Origin of Species,' 6th Edition, p. 154.

they fly back again to the same, or to another flower, they, while going through the same performance, bring the viscid pollen masses still adhering to their heads into contact with the pistil, and the flower is fertilized.

If the reader will cast his eye on the opposite page, he will see in Plate I. a representation of a flower of Coryanthes Feildingii, a kindred form to Macrantha, taken from a figure in the third volume of the 'Journal of the Horticultural Society,' given with an article on the plant by the late Dr. Lindley. "As usual," says Dr. Lindley, "in this genus the flowers are pendulous and inverted, so that the apparatus of the column hangs downwards instead of being erect; when closed, the flower is about five inches long and three wide. As it unfolds, the sepals and petals, which are membraneous, and bear no small resemblance to bats' wings, turn back, seem to fold up, and finally hang drooping at the back of the lip and column."

Plate II. contains a back view of the same flower, showing the passage out of which the bees crawl, and near to which is the anther whose pollinia are to stick to their backs.

Let the reader compare the massive, elaborate—we had almost said clumsy—flower of the Coryanthes, capable of being fertilized only by a particular agency, with the simplicity of the flower of a common wild rose, whose pistil is surrounded with anthers, and can be fertilized by the slightest shake, and the question will naturally arise how could the Coryanthes have acquired its structure by the constant action of variation and the survival of the fittest, when the rose has attained its structure by the same means? What advantage can the plant derive from this extraordinary form of flower, to compensate it for so large an expenditure of vital force?

Mr. Darwin would answer: The certainty that its flowers would be set by the pollen of those of another plant; that they must be cross-fertilized, and therefore produce more and better seed than if fertilized by their own pollen.

We will now consider, (1) what is the value to a plant in the battle of life of cross-fertilization; and (2) how far the Coryanthes supplies us with evidence of that benefit.

Mr. Darwin has treated the subject of cross-fertilization in great detail,* and he seems to have come to the conclusion that plants were originally diœcious; that is, having flowers of different sexes upon different plants; and that by degrees they attained by natural selection the hermaphrodite form, like that of the rose or the lily, as they were thus more certain of some kind of fertilization than when the sexes were limited to different plants; and that this sort of inferior fertilization was better than none at all. At a later period he supposes that some plants found that they were certain of cross-fertilization, and became again diœcious; or if they retained the hermaphrodite form, that natural selection in time made some of their anthers barren, or caused the stigma to ripen before or after the anthers, so as to be incapable of being fertilized by them.

Here is another very curious series of changes brought about for the sake of cross-fertilization, and our expectations as to the

* 'Cross and Self-Fertilization of Plants.'

benefit to be derived from it are raised still higher. But here again we have a difficulty in tracing the process by which the unripe anthers were obtained. Let us suppose a plant in which the anthers began to have the peculiarity of not ripening with the pistil, to be set with the pollen of another flower. The result would be, according to Mr. Darwin, increased vigour in the seedlings. Would not this increased vigour show itself in a general improvement of the flower, rather than in an increased debility or lateness cf ripening of the anther? What connexion can there be between increasing vigour and decreasing strength, or greater delay in the time of ripening of the anther?

There is no doubt that amongst cultivated plants, cross-fertilization has been found to occasion abundant and good seed, but it is doubtful if the same rule holds good in nature. The orchids are all, more or less, according to Mr. Darwin, prepared by their structure for cross-fertilization, and they produce an immense quantity of very small seeds, yet their numbers are not in proportion; they are comparatively scarce plants all over the world.

We must remember that, as a general principle, it is a disadvantage to a plant to be capable of fertilization by particular insects only; and we must deduct this disadvantage from the supposed advantage of cross-fertilization, before we can estimate its true value in any case to the species in the general battle of life.

Indeed, we think Mr. Darwin has himself shown the practical worthlessness of cross-fertilization at least as to wild plants. He comes to the conclusion that cross-fertilization is not of much use, unless the plants which are crossed have been subjected to different conditions of life. Now if this be so, the supposed advantage to the fir-tree of its great abundance of pollen will vanish, for fir-trees, as is well known, grow together in great forests, and of course under very similar conditions of life, for very long periods.

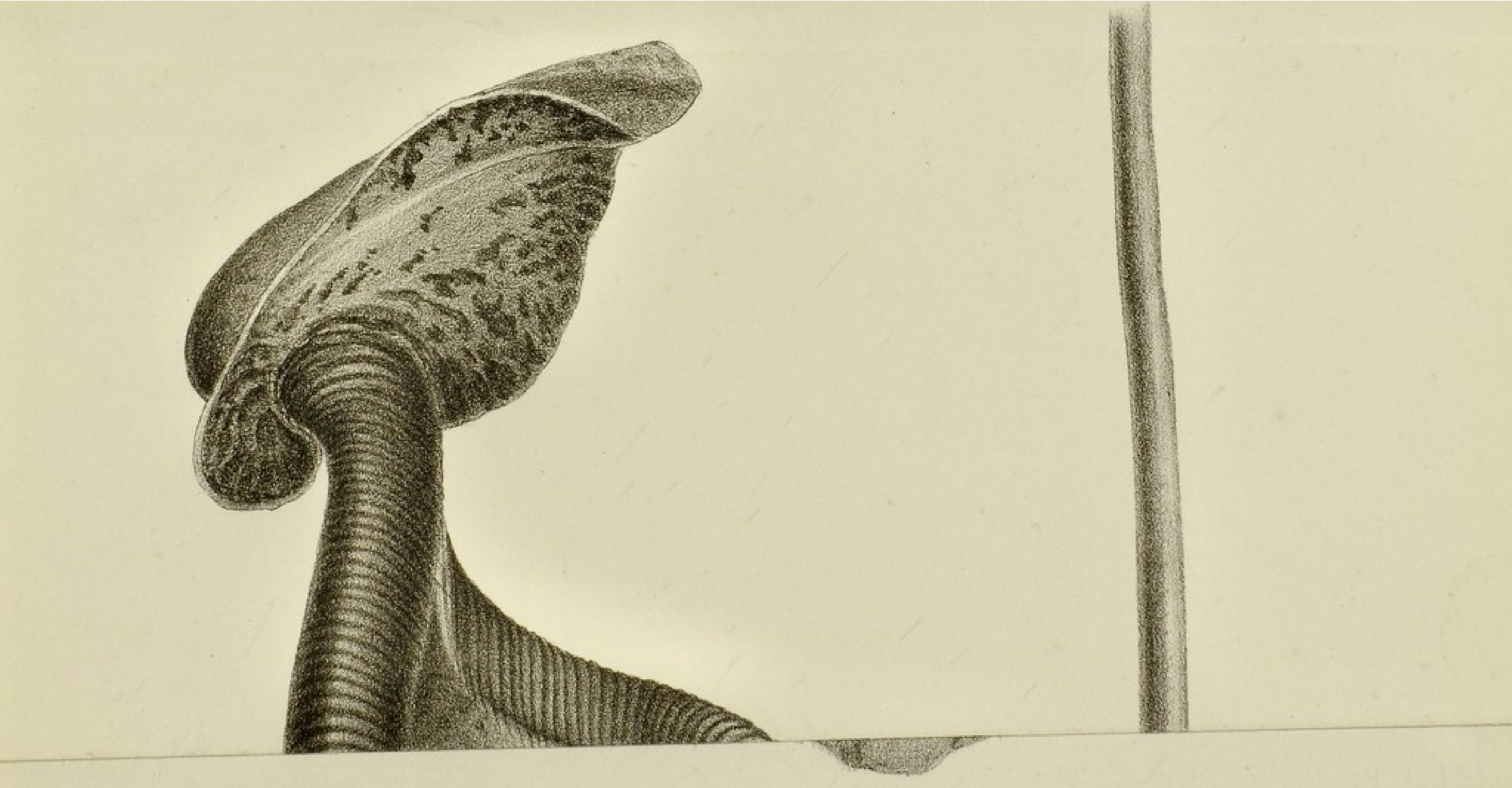
Again, all the social plants, such as heather, buttercups, wild hyacinths, and many other flowers which clothe our heaths and fields with sheets of colour, are, according to Mr. Darwin's last theory, standing arguments against the general value of cross-fertilization. These plants are perennials; many of them, such as the heather and the wild hyacinths, probably nearly as lasting as trees, and therefore must have long been subjected to the same conditions of life.

Many plants are always self-fertilized, as, for instance, the common garden-pea, which no insect can open; yet we find no deficiency of vigour in the seed of the pea.

Looking to these results, we can hardly believe that such advantage as cross-fertilization may give, and such chances as are provided for it in nature, can account for the complicated and extraordinary structures which we have been considering. And if cross-fertilization fails to account for them, all these extraordinary structures are evidently in themselves disadvantageous to the plants in which they occur, as they limit the means of fecundation, and require a great expenditure of nutriment. They, therefore, could not have been acquired by natural selection.

To return to the question how far the Coryanthes Macrantha affords an instance of the benefits of cross-fertilization, we shall find it utterly fails in that respect, and indeed affords in itself most conclusive evidence against the theory of utilitarian evolution. Elaborate as is the flower of this plant, there is scarcely any probability of its being cross-fertilized. The bee, which is pushed into the bucket by its companions, and which leaves the flower by the spout in the side, would most likely return to the same flower, as that one would be the nearest to it, and would still contain the food which it required, namely, the ridges on which it was feeding when pushed into the bucket; and in this case the bee would set the flower with its own pollen, which had stuck to his head while crawling through the spout, on making his escape from the bucket into which he had been pushed. The case is quite different from that of a bee leaving a flower after having exhausted its nectar.

In this case the fertilization of a very peculiar form of flower is secured by a special agency, but no advantage is gained by the flower over other flowers set in the usual way. How can we suppose this peculiar form of the flower, elaborate as it is, to have been produced by simple utilitarian evolu-



A Pitcher of Nepenthes Rafflesiana,

the natural size as grown by Mess.rs Lucombe & Pince.

PLATE III.

tion? How could the preliminary variations which were to produce it, be felt to be advantageous, when the ultimate form itself is no better off than other flowers? We need hardly add that this case of special structure and special provision, harmonizes well with the notion of the action of an intelligent will. Here we have a most complicated structure. Mr. Darwin himself says, that the most ingenious man, if he had not witnessed what takes place (amongst the bees), could never have comprehended what purpose all these parts (of the flower) could serve. And all these parts are more or less opposed to the free setting of the flower in the ordinary course of fertilization, yet such fertilization is secured by this special provision; and by it the extraordinary form of the flower, whatever may be its purpose in the polity of nature, is not allowed to interfere with the law of reproduction.

Plate III. contains a figure of a plant of Nepenthes Rafflesiana. The pitcher hangs down twenty inches or two feet from the end of the leaf, on a kind of foot-stalk formed by a prolongation of the midrib of the leaf.

The lid of the pitcher always stands open after the leaf has arrived at maturity. The edge of the pitcher is not smeared with any sweet secretion, nor is the fluid which it contains in the least degree viscid. Here we have a very great expenditure of vital force, and the advantage to the plant ought to be proportionally great. Mr. Darwin and Sir William Hooker say, that this advantage is to be found in the insects which are caught in the pitchers, and which the plant feeds on and digests. Now this fact is startling, as we cannot well see how the digestion is effected, and the case, if proved, would be singular amongst plants, being confined to a few species only, which produce pitchers of some kind or other.

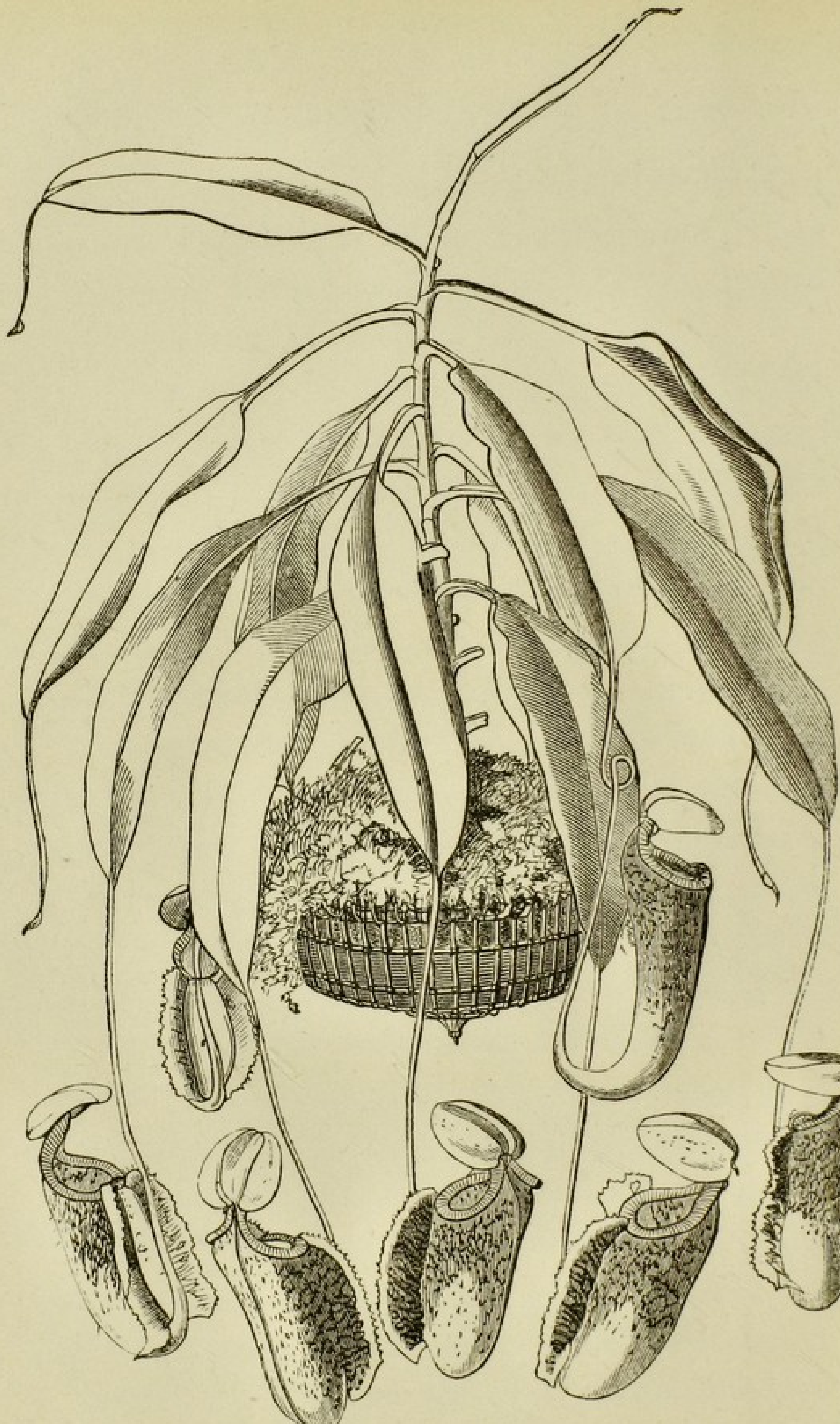
Insects are no doubt found drowned in the pitchers, but not in great numbers; certainly there is not any crowd of insects hovering round these pitchers as we see round ripe fruit. The pitchers indeed do not seem at all necessary to the welfare of the plants; it is often difficult to get them to make pitchers in our hothouses, and the same thing happens in their wild state. Mr. Low says, the

Nepenthes Ampullacea is a climbing plant, found in thick jungles. The old stems falling from the trees become covered in a short time with leaves and vegetable matter; they then throw out shoots which become in time new plants; but apparently the first attempts to form the leaf are futile, and become only pitchers, which as the petioles are closely imbricated, form a dense mass, and frequently cover the ground as with a carpet of these curious formations. As it continues growing, the laminæ of the leaves gradually appear—small at first, but every new one increasing in size—until the blades of the leaves are perfect, and the pitchers, which as the leaves have developed themselves have become smaller and smaller, finally disappear altogether when the plant climbs into the trees. This formation of the pitcher, says Mr. Low, is perceptible in all this curious tribe, though not to the same extent in all the kinds; the leaves of seedlings and weak plants always produce the largest pitchers.

The fact that weak plants have the largest pitchers, may seem to be an argument in favour of the view that they provide nutriment, as they are present in the greatest perfection where that seems to be most wanted. But there are some considerations which will prevent us from entertaining this view.

How came it to be of advantage to the plants to lose their pitchers as they advance in age, if the pitcher afford a supply of food? We must note that the increasing laminæ of the leaves cannot supply the place of the failing pitchers, for, according to the above views, their offices are different; the pitchers are supposed to supply nitrogenous food; the laminæ afford carbon only. And it is another important fact, that according to the above views, the nutriment of the plant begins to fail at the very time when a large supply of it is most required,—that is, when the plant flowers and produces seed, which it does not do until it has climbed up into the trees.

Imperfectly-formed leaves are not unusual in the early stages of plant development. Young palms make many leaves before the leaves assume the normal form, and when a plant is cut down and pushes very strong shoots, the first leaves of these shoots are often imperfect. It is possible that the pro-



NEPENTHES RAFFLESIANA. (Borneo, &c.)

PLATE III.

[*Reprinted, by permission, from* WILLIAMS'S "*Choice Stove and Greenhouse Plants.*"]

duction of these pitchers instead of leaves, as described by Mr. Low, may be a similar case.

The size of these pitchers is a strong argument against their being organs of digestion. As grown by Messrs. Lucombe and Pince, of the Exeter Nurseries, they average from four and a half to five inches in length, with a diameter of between two and three inches. There is nothing very gross in the habit of the plant indicating a great demand for nourishment. Can we then believe that it requires to be hung round by seven or eight of these great stomachs, each equal in size to that of a pretty large quadruped; and in its native jungles the pitchers are probably much larger; Mr. Williams speaks of them as being from six inches to a foot in length.*

The pitchers in this variety are highly coloured, which may seem to mark their nutritive office as being attractive to flies, but the pitchers of other varieties, and notably of the common Nepenthes Distillatoria, are green, of exactly the same tint as the leaves.

The theory, then, that these pitchers supply

* Williams' 'Stove and Greenhouse Plants,' p. 255.

food to the plants, seems too doubtful to account for the great expenditure of vital force required to produce them. But waving this point, it seems clear that an incipient form of the pitcher, when it was not yet so complete as to detain and digest insects, could not be an advantage to the plant, and therefore could not be naturally selected as a step towards the perfect form.

The reader must carefully distinguish between the small pitchers of the young leaves, mentioned by Mr. Low, and incipient forms of pitchers. The small pitchers are quite complete in form, though small. The incipient pitchers would probably be mere fleshy lumps at the end of the leaves; the pitchers being supposed to be unusual developments of the gland commonly found at the tips of leaves.

In the Nepenthes then we have an instance of a structure quite opposed to both principles of utilitarian evolution. There is a great expenditure of vital force in the formation of the pitchers, without any adequate benefit to the plant, and there is a form, the incipient stages of which must have been wholly useless; and it seems impossible to come to any other conclusion than that, difficult as it is to account for these very curious forms on the principle of special creation, they are quite incompatible with utilitarian evolution.

In the orchid, Cypripedium caudatum, the flower-scapes rise from the centre of the plant to a height of from twelve to eighteen inches. The petals, when the flower expands, are only about an inch in length; but in the space of four days, during which we may watch them grow, they extend to the length of thirty inches. It is difficult to conceive how these long tails can benefit the plant; they look indeed like ladders let down to invite the approach of insects. But we are told* that creeping insects, though they may set flowers, are really injurious to them, as forestalling the advent of flying insects, which would insure cross-fertilization. All the varieties of Cypripedium have large cup-shaped lips; but in no case, we believe, have these cups any liquor secreted in them.

Though many orchids have very beautiful

* Sir John Lubbock. 'Fortnightly Review,' April 1877.

flowers, the majority of the tribe are inconspicuous weeds. Their flowers, however, though small are often strangely formed; in many cases resembling insects and even lizards in form.

Of course our argument must be, that as these pitchers and strange forms of flower cannot have been formed by simple utilitarian evolution, they must be the results of an intelligent will; useful perhaps upon the principle of for each and for all, though we may not be able to point out their exact utility. In some cases, possibly, the liquor contained in the pitchers of the Nepenthes may be useful in affording food for insects, or perhaps a drink to some creatures. The flowers of the orchids can apparently have no end in view but beauty and variety.

CHAPTER IV.

Structures unsuited or injurious to the organism—Upland geese, coot, and landrail—Are these forms really in a transition state?—The blubber of the sperm whale—The sting of the bee—The rattlesnake—The rattle no increase to the terror of the snake, but a warning—The roaring of lions—The white tail of a rabbit injurious to it—The black tail of the white ermine—The limitation of animals to particular kinds of food only—Existence of hooks in the seeds of plants before furry animals were in existence, and of honey without bees.

There are, says Mr. Darwin, upland geese in the Falkland Islands which never go near the water; grebes and coots have not webbed feet, but merely membranes bordering their toes, yet they are eminently aquatic; the water-hen and the landrail have long toes, apparently formed for walking over aquatic weeds; yet the water-hen is nearly as aquatic as the coot, and the landrail as terrestrial as the partridge. In these cases, says Mr. Darwin, which cannot be reconciled to the idea of special creation, habits have changed before forms: in time the structure would conform to the habits. Now, in the first place, why does not the change of structure keep pace with the change of habits? But there is another point. Why if these creatures flourish, formed as they are now, should their structure change? Have we any reason to suppose that the grebe or the coot would be benefited by webbed feet, or the landrail by having shorter toes? Is it not possible that these creatures are not in a state of transition of any kind, and that their structure is really of advantage to them in the particular position which they fill in nature?

Mr. Darwin is naturally inclined to consider creatures to be in a state of transition. He speaks of that curious animal, the lepidosiren, which inhabits the marshes of the Amazons, and breathes in water by means of gills during the rainy season, and in air by means of a modified swim-bladder when the marshes are dried up, as being a "recent fossil;" as a rare survivor of species formerly abundant; and he accounts for its persistence because it is an inhabitant of fresh-water, and so exposed to slighter competition in the battle of life than other creatures its contemporaries, inasmuch as the area of the fresh-water lakes and rivers is much smaller than that of the land and sea. It is obvious, however, that the lepidosiren may exist without any reference to past times, simply because it is well fitted for the conditions of life in which it is at present placed.

There is another case in which some of the structure of a creature does not seem to be suited to the situation in which it is placed, and yet we can hardly suppose it to be about to change. The spermaceti whale, though it inhabits the hottest seas on the globe, is covered with a coat of blubber as thick as that of many of those whales which live in the polar seas. Of course we don't know exactly why the polar whales have a coating of blubber, but it is generally supposed to be a defence against cold. The spermaceti whale is eminently a native of warm seas, for Mr. Beal tells us that they go with the sun, always keeping in those parts of the ocean which are calmest and warmest;

nor can they want their blubber to protect them against the cold of the deep water, for they are surface creatures by habit, and the water in those regions which they inhabit is still at a temperature of 45° five hundred fathoms below the surface.

The sting of the bee cannot be withdrawn, and so when used causes the death of the insect; and this is a case in which we cannot see that the imperfection can be reconciled with the action of natural selection. Mr. Darwin tells us that the sting is a modified form of an ovipositor, or a boring instrument. On both these suppositions the original of the sting must have been capable of being withdrawn, or it would have been wholly useless. Here, then, is a case in which natural selection has imparted a quality to an organ which it had not before, and which is naturally injurious to it.

Mr. Darwin says, if it could be proved that any part of the structure of any one species had been formed for the exclusive good of another species, it would annihilate his theory; for it could not have been produced through natural selection. He adds, although many statements may be found in works on Natural History to this effect, there is not even one which has any weight. It is admitted, he says, that the rattlesnake has a poison-fang for its own defence, and for the destruction of its prey; but some authors suppose that at the same time it is furnished with a rattle for its own injury; namely, to warn its prey. Mr. Darwin says, he would as soon believe that the cat curls its tail when preparing to spring in order to warn the doomed mouse. It is much more likely that the snake uses its rattle to frighten the many birds and beasts which are known to attack even the most venomous species. Snakes act on the principle which makes a hen ruffle her feathers and expand her wings when a dog approaches her chickens. Upon this point we must note, that the noise made by the rattle of the rattlesnake is not loud; in one deadly species, the crotalus miliaris, it is scarcely audible. This slight noise in itself has no terrors. Though dreaded as announcing the presence of the snake, it does not in the slightest degree increase, even apparently, the powers of the creature; and in this respect differs from the ruffled feathers and expanded wing of the hen. Whatever may be the intention of the creature, it is certain that the rattle does give warning of the animal's presence, and is a protection to man, and probably to other animals. Another point is, that young snakes which have the greatest need of protection have no rattle; the rattle increasing with the age and strength of the snake; in other words, with its power to injure.

There is not much reliable information to be found as to the habits of the rattlesnake in using his rattle. On one occasion, Mr. Bates, returning home through a narrow alley, heard a pattering noise close to him. Hard by was a tall palm tree, whose head was heavily weighted with parasitic plants. Mr. Bates supposed that the noise was a warning that it would suddenly come down, but the wind lulling for a few moments there was no doubt that the noise proceeded from the ground. "On turning my head in that direction," says Mr. Bates, "a sudden plunge startled me, and a heavy gliding motion betrayed a large serpent making off almost from beneath my feet." * Here there seems no appearance of the rattle being used in conjunction with any threatening attitude on the part of the snake.

At another time, Mr. Bates nearly trod on a rattlesnake which lay stretched out on the bare sandy pathway. He tried to excite the sluggish reptile by throwing handfuls of sand and sticks at it, but the only notice it took was to raise its ugly horny tail and shake its rattle. This certainly is very like saying—You see what I am; you had better let me alone.

The habit of lions to roar at night is another case of a character which must be injurious to its possessor.

Familiar examples are the most trustworthy and useful. We will therefore call the attention of the reader to the case of the white upturned tail of the common wild rabbit, which is always displayed when the creature runs, and makes it very conspicuous to its enemies. In all other respects the colour of the rabbit is well fitted for concealment. It has been suggested that the tail, conspicuous

* 'The Naturalist on the Amazons,' p. 150.

when the rabbit is running, may be useful as a guide to its young ones to follow it in a straight line to the family burrow. But very young rabbits, when surprised at a distance from their holes, squat, and endeavour to escape observation by remaining still, as if instinctively conscious that their strength is not sufficient to enable them to escape by flight. When older they certainly do run for their holes, but by this time they need no guide, and moreover they invite pursuit by displaying their own white tails. The case would be different if the tails of old rabbits only were white.

The winter dress of the ermine is a similar case. Though the greater part of its body is white, the tail remains quite black, as if to modify the concealment afforded by the general white colour, and so to give the creature only such an amount of advantage as would not be inconsistent with its keeping its former relations to its prey and enemies. Why, on any purely utilitarian principles, should the tail have been insensible to the influence which caused the change of the rest of the fur to white, when a similar change in the tail would be a manifest advantage?

In the economy of nature, the great majority of living beings are confined to the use of some particular food. Thus we see some animals are carnivorous; some herbivorous; some live entirely upon fish; some upon insects. The butterfly lays her eggs upon a particular plant, as that alone can support her young; and this principle is carried so far, that amongst dung-beetles there are species which are limited to the dung of particular animals. On the principle of natural selection, how can we account for this adaptation of each living being to its peculiar food? We can see that it may have been of advantage to some particular living organism to acquire a taste which would be nauseous to the creatures which usually preyed upon it, as those creatures would then leave it alone and be driven to some other food. But there are cases in which the limitation to a particular food must have arisen on the part of the consumer. This must have happened where the creature is limited to the consumption of dead food; as are vultures, for example. How could it be of advantage to a dung-beetle to limit itself to the dung of a particular animal?* No doubt the food existing in the world supports as much life as if it in all its forms was available to each creature. A state of affairs in which each animal is confined to a particular kind of food is conceivable enough, if we suppose that the world has been formed upon the principle of for each and for all, but difficult to realize, if we take the survival of the fittest as the only principle; as the self-limitation of the individual to a particular kind of food would, in the first instance, to some degree, at least, be injurious until his neighbours had left his peculiar food untouched, limiting themselves to some other kind of nutriment.

The strictness with which animals and plants are sometimes confined to particular localities, seems inconsistent with the elasticity in this respect which we should expect

* Darwin's 'Naturalist's Voyage,' p. 490.

to find in a world entirely formed by variation and natural selection. The gorilla exists in one small district of the western coast of Africa only; and it is said that the mistletoe, a plant which is parasitic upon trees, and therefore we should suppose was independent of the nature of soil, is found in abundance in Herefordshire, but not in the neighbouring county of Shropshire; so it infests the apple orchards of Somersetshire, but is not found in those of Devonshire, though near at hand. We should have expected to find some gorilla born of a more hardy nature, more capable of bearing different kinds of food and a new climate, and so extending his range; and in like manner, we should look for some seedling mistletoe acquiring the power of skipping over the very slight barrier which at present seems to confine it to its peculiar haunts. We must note that it is not the action of any other organism which confines the gorilla and the mistletoe to their respective habitats.

The manner in which each living creature seems to fit into its own proper place in the economy of nature, is no doubt a most remarkable phenomenon, and it is a most important point to ascertain whether it can be the result of the selfish action of the survival of the fittest.

We may mention here two other cases in which it is difficult to reconcile Mr. Darwin's theory with facts in nature. Many seeds are furnished with hooks to catch hold of the fur of passing animals. How could these plants have acquired this form of seed-pod before there were furry animals in existence? —and is it not contrary to geological evidence, that furry animals existed before the plants on which they probably lived? A still stronger case is that of the honey secreted by most flowers. This, says Mr. Darwin, is the result of gradual development and natural selection, and is a provision to insure the fertilization of the flower by means of bees. Here, of course, the question is obvious — How could the secretion of honey be useful to the plants until bees were in existence?—and how could bees have existed until there was honey for them to live upon? This seems exactly a case in which two forms have been independently adapted to each other, and can only be the work of an intelligent will.

CHAPTER V.

Beauty in nature — Beauty in plants — In animals— Mr. Darwin on sexual selection—The wing-feather of the Argus pheasant—The red admiral and peacock butterflies—Cannot be the results of sexual selection—Mr. Wallace on protective and warning colours, and on mimicry—How did insects acquire the instinct to avail themselves of protective forms when acquired ?—Mr. Wallace, colours of male birds due to their superior vitality—Objections to the views of Mr. Wallace and Mr. Darwin—No increase of fertility in brilliantly-coloured creatures though they are exposed to greater danger—Sir John Lubbock's position that birds take spotted caterpillars for snakes—Humming-birds and toucans—Beauty evidence of design.

We now come to one of the greatest difficulties in the way of Mr. Darwin's theory—how to account, on the principle of utilitarian evolution, for the beauty which we see in nature, which has no apparent connexion with the welfare of the organisms in which it occurs.

Mr. Darwin supposes that the beautiful petals of flowers have been acquired through the agency of variation and natural selection, as a means of attracting insects, and thus insuring fertilization; and he and Mr. Wallace point to the fact, that in the Galapagos Islands and in New Zealand, where insects are scarce, the plants in general have inconspicuous flowers. This is so much the case in the Galápagos, that Mr. Darwin says, he was not aware for some time that the bushes around him were in full flower. Now here we have two points to note: (1) by a scarcity of insects those naturalists may mean that there are but few species; not that the numbers of any one species are small. We might have an island with only one species of insect, namely, bees, in which the plants would be amply provided with instruments of fertilization; and (2) it does not appear that the plants of those two islands, though their flowers are inconspicuous, are not amply furnished with seed. In our own gardens we find such weeds as groundsel, shepherd's purse, chickweed, and the like, very abundant seeders, and provided with very perfect seeds, though their flowers are remarkably inconspicuous.

We may mention here a case of a plant having very showy petals, and yet almost certain not to be fertilized by insects. Let the reader examine a flower of the beautiful Lilium Auratum, common in all our gardens in the autumn, and he will find a pistil projecting far beyond the nectary of the plant, surrounded by stamens of nearly equal length; the whole so situated that a bee would not touch any of them in seeking the nectary. The flower is very large, very conspicuous, and very strongly scented, and yet to all appearance would not be set by bees, if attracted to it.

We will, however, pass over the beauty of plants and flowers, as it may be said to be useful in attracting insects, or to be merely the result of the chemical nature of the surface acting upon light; though neither of these explanations would account for mere beauty of form. On what evolutionary ground can we account for the beauty of such a plant as the Adiantum or maiden-hair fern? We will take the innumerable instances of splendid colouring and beauty of design, which are found amongst birds and insects, and which have generally been considered evidences of design in nature, because they seem formed to adorn the world, and for that end only. Can Mr. Darwin and his followers account for these beauties as necessary results of evolution from a simple unadorned form ?

Mr. Darwin endeavours to show that these beautiful colours and designs are the result of sexual selection; that is, that the most beautiful males—those who had made the nearest approach to the forms we now see—were always preferred by the females, and thus in time the present beautiful forms arose.

One example (taken by Mr. Darwin), is the wing-feather of the Argus pheasant. The vane on each side of the midrib is covered with spots, apparently at the first glance irregularly placed; but, upon closer inspection, the spots form a regular and elaborate pattern. The great peculiarity of the feather, however, is, that on the right hand side of the midrib, as the feather is placed in the bird's wing, there is a row of eye-like spots, each of these spots, grey-coloured in the centre, gradually shaded off into yellow, and surrounded by a dark margin, gives the idea of a ball in a socket. The whole feather is not brilliantly coloured, but the design is very elegant. Another more familiar instance of beauty is furnished by the red admiral and peacock butterflies, very common in gardens in the early autumn. Both sides, upper and under, of the wings of these insects, are beautiful, and they are fond, when resting upon flowers, of alternately opening and shutting their wings as if to display their various charms.

Now let the reader ask himself the question—Is it possible that a bird or a butterfly should appreciate the dawnings of these beauties?—could foresee that some slight beginning in markings or colour was capable, if encouraged, of producing the beautiful patterns which we now see; and which, or anything like which, we must remember the female Argus pheasant or butterflies could never have seen?

The answer to this question will be—It is simply incredible. So thought Mr. Wallace—Mr. Darwin's co-founder of the theory of natural selection—who says, that he believes that Mr. Darwin's theory of sexual selection has staggered many evolutionists, but has been provisionally accepted by them, because it was the only theory which attempted to explain the facts.

Mr. Wallace, in an essay which appeared in Macmillan's Magazine for September and October, 1877, discussed at length the question of the origin of colour in animals and plants; and he endeavoured to show that some colours are acquired by natural selection as a protection, as they afford safety by concealment; and that other colours, which he calls warning colours, are protective, by giving notice that the creatures coloured are poisonous, and thereby deterring animals of prey from molesting them.

There is, in South America, says Mr. Wallace, a family of butterflies, the Heliconidæ, which are very numerous and brilliantly coloured, and which have a very slow flight, and are so disagreeable to birds that they are never preyed upon by them. Along with these butterflies there is found another family, the Leptalides, which are good food for birds, but which escape them by closely imitating the form, colours, and mode of flight of the Heliconidæ. Mr. Wallace supposes that these imitating butterflies have gained their present form by natural selection; those insects which approached the Heliconidæ in colour and habits being neglected by the birds, and so surviving in the battle of life. And he meets the point that a small variation towards the form and habits of the Heliconidæ would not be sufficient to afford concealment and protection, by supposing that originally the Heliconidæ were like other butterflies in colour and manner of flight; and that it was only after they had acquired their nauseous qualities, that they began by degrees to change their form and colour, as a warning to birds to leave them alone; and that the Leptalides began to vary, and continued to vary, *pari passu*, with them. It would have been of no use to the Leptalides, says Mr. Wallace, to have begun to imitate the Heliconidæ in the acquisition of a nauseous taste, because any small movement in that direction would not have really acted as a safeguard, as the birds would have seized them, and so have killed or greatly injured them, although they might ultimately have rejected them. Here two things will strike the reader: (1) that we must have a constant succession of concurrent variations,—a most inadmissible supposition; and (2) it would seem that the reasons which Mr. Wallace gives for the non-imitation by the Leptalides of the nauseous taste of the Heliconidæ, would be fatal to the original acquisition of the nauseous taste by the Heliconidæ themselves, inasmuch as a slight degree of disagreeableness would not be sufficient to save their lives.

And there is another point to be considered here. The warning colouring which these Heliconidæ are said to have acquired through the action of natural selection, is more elaborate than would be required for their protection. The colours are very various, and the patterns on the wings often very complex, generally full of spots; while simple uniformly-coloured wings would have answered the purpose of protection, if indeed that object would not have been amply secured by the peculiar mode of flight, of these butterflies. What could have been the use of adding spot after spot? Is it possible to believe that the last spot was necessary to deter the birds? Again, the spots on the wings would, while the insects were flying—the time of their greatest danger—not be distinctly visible as spots, but would, from the motion of the wings, produce the same effect as uniform colours.

Then it seems very strange that the butterflies which mimic the Heliconidæ, should not have been content to mimic their general appearance, without, as is the case, having copied each spot and stroke on the wing.

These are cases which are fatal to the theory of natural selection, because too much is done.

Here we may ask—Are the caterpillars of these butterflies protected, or is the immunity confined to the perfect insects?

And we must note, that the existence of these Heliconidæ in such numbers, and so protected, may be urged as an argument against the existence of variation and natural selection; for why should not this principle supply a race of birds to whom the Heliconidæ would not be nauseous, and who would thrive on such an abundant supply of food as they would afford?

There are numerous cases of insects resembling dead substances. A moth very common in this country is exactly like a chip of stone; the hair-streak butterfly, when it is at rest, resembles the green leaf of a white thorn; and the kallima, an Indian butterfly, which has the upper surface of its wing brilliantly coloured, exhibits the colours and form of a dead leaf when the wings are closed. And what is the most worthy of remark in these cases is, that the instinct of the insects makes them resort to those places in which these peculiarities would protect them. Thus the moth alights upon stone walls; the hair-streak is fond of settling on thorn hedges; and the kallima has recourse to dead bushes. Were these insects not to select these special resting-places, their peculiar colours would be of no use to them. How could they acquire this instinct by natural selection? True, those insects which resorted to the proper places of rest would survive those who neglected that precaution, but does it follow that their descendants should inherit that action as a peculiarity of the species? If we could suppose the existence of any tendency to resort to these peculiar places, we could see how that tendency could be improved, though here we should have to meet the difficulty of concurrent variations. But the question is—How did that tendency arise in the first instance?

It is certainly a most extraordinary fact, that in the long course of evolution from a bleb of protoplasm, which has been conducted strictly upon the principle of the survival of the fittest, many creatures should be so much worse off than others, as to be glad to pretend to have the characteristics which their neighbours have acquired in reality.

Mr. Wallace allows that, after deducting all cases of protective colouring, there exists a large group of typically-coloured animals, which are brilliantly coloured in both sexes, and for whose particular colours we can assign no function or use. It comprises an immense number of showy birds, such as kingfishers, barbets, toucans, lories, tits, and starlings; most of the largest and handsomest butterflies; and innumerable bright-coloured beetles, locusts, and dragonflies.

Mr. Wallace's explanation of the existence of beauty in birds, is that the males have a greater amount of vitality than the females; that this vitality is at its height in the breeding season; that it leads to expansions of growth; that these again produce a change of structure, which must be accompanied with a change of colour, inasmuch as colour depends upon the action of structure upon light.*

Mr. Wallace is thus led to conclude that the most brilliantly-coloured males are the strongest; that therefore they will be naturally selected; and we have no need of the theory of sexual selection which he says has really no place in nature—the partners of the females being determined, not by their own choice, but by the combats of the males, the victors driving the vanquished away.

Here we quite agree with Mr. Wallace that the females have no choice, but we take exception to the point that the vitality of the males is greater than that of the females. Each sex has its own work to do in the

* 'Macmillan's Magazine,' Sept., 1877, p. 408.

reproduction of the species; each is fitted for its duties, and nothing more. There is no reason to suppose that the male has any spare vitality to expend in a display of colours.

Both Mr. Darwin and Mr. Wallace must be aware that in proportion as creatures become more conspicuous, they are exposed to greater dangers from their enemies. Increase of beauty would therefore be a positive evil to the creature in which it occurred; and, therefore, at least at the first glance, could not be the result of natural selection. The charms of the Argus pheasant, when in full plumage, render him almost incapable of flight.

Mr. Darwin meets the objection by supposing, that the preference which is given to such a highly-adorned male by the female, compensates him for the increased danger to which he is exposed from his enemies.

We have elsewhere shown the fallacy of this argument, and that Mr. Darwin mistakes between advantage gained by the individual and that obtained by the species. It is clear that, however much the most beautiful males may be preferred by the females, the species will not be benefited in the battle of life by such preference, unless its fecundity is increased by it to such a degree as to more than compensate it for the greater dangers to which it is exposed from its more conspicuous appearance; and there is no evidence whatever that this is the case.

This difficulty is equally fatal to the views of Mr. Wallace. The more beautiful birds could not be naturally selected, unless it could be shown that the increased beauty which made them more conspicuous, augmented at the same time the fertility of the species. We ought to find the Argus pheasants, as they increased in beauty, and became more and more conspicuous, becoming also more and more prolific. We can have no evidence as to this fact, for we do not know the extent of their original fertility; we can only suppose that it has not increased in this proportion, by observing that they are not more prolific than other birds which are more plainly clothed. We do not find that brilliantly-coloured birds are more numerous than their plainer brethren.

We may note here that Mr. Wallace's view, that the colours of the male birds are due to superior vitality, can have nothing to do with such delicate markings as those on the wing of the Argus pheasant, and of many butterflies; and there is a special difficulty in the way of Mr. Wallace's view. We might expect variety in the different forms of their partners, if those forms depended upon the taste of the females. Some might prefer a gaudy, some a more homely, mate. But if the adornment of the males is merely a consequence of their superior vital energy, it should be general in all species; and Mr. Wallace himself says this is not the case. Even in the tropics the great majority of birds and insects are dull-coloured.

No doubt the beautiful colours of male birds are found in many cases only during the nuptial season, and it is also true that male birds do display their beauties before the females; but this does not prove that these colours are due to sexual selection. They may be a kind of halo surrounding the attribute of reproduction, the continuance of the species being the chief aim of every creature's life.

Mr. Wallace's 'Essay' contains some passages which are very remarkable, as showing the impression which the sight of beautiful objects in nature has made upon a mind prepared to accept utilitarian evolution. Speaking of the old-fashioned theory, that these beautiful objects were intended at once to please and refine mankind, he says: "And even now, with all our recently acquired knowledge of the subject, who shall say that these old-world views were not intrinsically and fundamentally sound?—and that although we now know that colour has uses in nature that we little dreamt of, yet the relation of those colours to our sense and emotions may be another and perhaps more important use which they subserve in the great system of the universe." And he closes his 'Essay' with the remark, that the emotions excited by colour and music alike seem to rise above the level of a world developed upon purely utilitarian principles.*

* P. 384.

Sir John Lubbock, in his lecture on plants and insects, says,* that the evidence already brought forward, however imperfectly, is at least sufficient to justify the conclusion that there is not a hair or a line, not a spot or a colour, for which there is not a reason; which has not a purpose or a meaning in the economy of Nature; and he illustrates the point, amongst other cases, by the following anecdote:—A spotted caterpillar of large size was put into a tray in which seed was placed for birds. Soon a little flock of sparrows and other small birds assembled to feed as usual. One of them lit on the edge of the tray, and was just going to hop in, when she spied the caterpillar. Immediately she began bobbing her head up and down, but was afraid to go nearer. Another joined her, and then another, until at last there was a little company of ten or twelve birds, all looking on in astonishment, but not one ventured into the tray. When the caterpillar was removed the birds soon attacked the seeds. These caterpillars, says Sir J.

* 'Fortnightly Review,' April 1877, p. 492.

Lubbock, were probably protected by their resemblance to spotted snakes.

Here we are asked to believe that the birds were afraid of being devoured by their own food. This is indeed a failure of instinct which is incredible. A much more probable explanation is, that the birds, always on the alert to avoid traps and other dangers of that kind, were scared, not by the caterpillar itself, but by the unusual circumstance of its being placed in the tray.

As to the general proposition, that there is not a hair or a line, a spot or a colour, for which there is not a reason, the reader will perhaps be inclined to assent to it, if that purpose may be the adornment of the world; but he will, we think, find it a difficult task to account for such beauties of colour and pattern as are displayed in the wings of the red admiral and peacock butterflies, if they are to be conducive solely to the welfare of the creature, which is what Sir John intends to imply.

And there is another point to be considered in connexion with this subject, which we have already noticed more than once. The various spots and streaks by which these caterpillars are adorned, are supposed to have been acquired by them by the process of natural selection, as a concealment and protection against those creatures which prey upon them. This position seems to require that the action of natural selection should be one-sided only, and should be confined to the caterpillars. Why should not the consumers have their senses sharpened by natural selection in proportion as their prey became protected by colour, &c.? Thus the equilibrium between the two would be restored. We may infer that this is the case, if indeed natural selection be the guiding principle; for we see that no one class of creatures gets such an advantage in the battle of life as to change its place with reference to its neighbours.

If we look at a collection of humming-birds, we shall readily find two species which differ from each other only in so far as one has a crest of ruby and the other a crest of emerald; and the question will naturally occur to us—How can one of these crests be of more use to the bird than the other? It is not, however, in the crests alone of these birds that we find ornament; there are about four hundred species of them, and they exhibit every variety of beauty. "In some it is the feathers of the crown, worked into different forms of crest; in some it is the feathers of the throat, forming gorgets and beards of many shapes and hues; in some it is a special development of neck-plumes, elongated into frills and tippets of extraordinary form and beauty. In a great number of genera the feathers of the tail are the special subjects of decoration, and this on every variety of plan and principle of ornament."*

The toucans are another family of birds whose peculiarities are very difficult of explanation on purely utilitarian principles. Both sexes are highly coloured, and they have most extraordinary bills—very large, of very peculiar structure—requiring a great expenditure of vital force, and very highly coloured. The toucans in a wild state feed on fruits, and perhaps the eggs and young of birds; but there seems nothing in their mode of feeding which can require the peculiarly-

* 'Reign of Law,' p. 231.

formed bill. Mr. Bates attempts to account for the bill by supposing it is useful in gathering fruit from the extremities of long and thin branches, but he is obliged to add that the bill of the toucan can scarcely be considered a very perfectly-formed instrument for the end to which it is applied. And then there are the brilliancy and variety of the colouring of the bills to be explained on utilitarian principles.

Mr. Darwin traces the steps of the evolution of the toucans as follows:—The ancestral form of the family, at first plainly coloured, gradually acquired bright colours in the male to please his mate (the first doubtful point). These colours were transmitted to both sexes (the second doubtful point, for such transmissions are not general amongst birds, and there is no special reason why they should have occurred in this case). Then the female being in danger, through the conspicuous colours, of becoming a prey to her enemies while sitting on her nest, began to acquire the instinct of concealing herself, and finally got the habit of building her nest in the holes of trees, thus escaping the peculiar danger, and remaining as well off, but not better, than other birds which retained their plain dress. It is difficult to see how the principle of natural selection should have been the main agent in a series of changes leading to so poor a conclusion.

We can, however, form no adequate idea of the force of the evidence for design afforded by natural beauty from the contemplation of one or two species of birds or butterflies. The reader should take an opportunity of examining a large collection of humming-birds, or of toucans, or of tropical butterflies; or, in the absence of such collections, he may turn to the plates in the splendid work of Mr. Gould on the Trochilidæ and on the toucans, or of Mr. Hewitson on tropical butterflies; and if he remembers that no one of the varied forms in this "ocean of beauty and variety" which he sees, can be shown to be essential to the welfare of the creature in which it occurs, or can be accounted for by sexual selection, or by exuberant vitality, or by natural selection, or by chance, he will, we think, be inclined to admit, that though we do form our conception of beauty from what we see, it is hardly possible to reject the conclusion that these beautiful objects afford some evidence of design.

CHAPTER VI.

The more advanced evolutionists—Views of Huxley and Tyndall—Mr. Wallace's view that growth in a living being is like the increase of a drop of dew—No analogy between the cases—Dying of old age and sexual reproduction cannot be results of spontaneous generation—Professor Tyndall's view that the brain acts solely in obedience to impressions conveyed to it by the nerves—Has the brain any power to translate or analyze these impressions? —Case of the merchant receiving a telegram.

AND now we come to the opinions of the more advanced evolutionists.

Professor Huxley says, that the whole analogy of natural operations furnishes so complete and crushing an argument against the intervention of any but what are called secondary causes in the production of all the phenomena of the universe, that in view of the intimate relation between the forces exerted by the living world and all other forces, there can be no excuse for doubting that all are co-ordinated terms of nature's great progression; from the formless to the formed; from the inorganic to the organic; from blind force to conscious intellect and will.

Professor Tyndall shares Huxley's views, and expresses his belief that the structural power of matter is sufficient, under proper conditions, to produce living organisms. But neither of these philosophers ventures to assert that, in the present state of chemistry, living protoplasm can be produced; and this is but a small part of the difficulty. If living protoplasm could be so produced, how could it acquire the power of reproducing itself?—a power which we see that all living beings possess. We will take Mr. Wallace's suggestions as to this point, as his is the usual and most plausible view. Mr. Wallace says: If a mass of matter be so constituted as to have the power of attracting to itself from the surrounding medium, matter like that of which it is composed, we have the first rudiment of vegetable life. We can conceive such an organism, and that it may be so constituted that any fragments which may be accidentally broken from it, or which may fall away when its bulk has become too great for the cohesion of all its parts, may begin to increase anew, and run the same course as the parent mass. This is growth and reproduction in its simplest form. The simplest conceivable form of such life would be the dew-drop, which owes its existence to the balance between the condensation of aqueous vapours in the atmosphere and the evaporation of its substance.

Here the dew-drop increases by the accretion of particles of water or dew floating in the circumambient atmosphere. To enable a mass of protoplasm to increase in the same way, we must suppose that there are particles of protoplasm at hand to be appropriated. We must suppose that at the dawn of life on the earth, a great quantity of protoplasm was produced at once, and that separate portions of this protoplasm joined each other, and so appeared to grow. But then the question meets us—Why did they fall to pieces again?—why did not the attractive force which brought them together keep them together? The power of growth which would make a mass of protoplasm too large for cohesion, is evidently a very different thing from mere attraction; it seems, indeed, to be antagonistic to that force,—in this instance, it seems to be a special force. This indeed is the great point in all these inquiries—Is life a special power? Dew-drops never separate into parts from an increase of size; they lose the form of drops and run off in streams, but there is no separation of parts from a want of cohesion.

If we take another view, and suppose that the first masses of protoplasm which were formed, increased by assimilating the element which surrounded them, we meet the great difficulty,—that the protoplasm would have in the first place to manufacture the materials which it was to incorporate; a very different affair from the mere accretion of pre-existent similar matter, as in the case of the dew-drop; and a very elaborate process if, as we are told, protoplasm is chemically a very complex substance. This point was taken by my son, who has shown the enormous difficulties which, on chemical grounds, lie in the way of all these theories of the production of life from inorganic matter; and has pointed out that the protoplasm—the bleb of living jelly

—which is taken as the simple beginning of things, is in reality a very complex body, in which the molecules, or ultimate portions of the matter composing it, are arranged in a particular, though unknown, manner; such molecules themselves being complex structures.*

And here we meet another point. We must ask these gentlemen what they mean by life. Is the protoplasm, which they say is the result of chemical combination, merely a mass of matter showing a certain amount of irritability?—or has it the attributes of dying of old age, and reproducing itself by germs? If it has not this latter faculty it cannot vary, and therefore cannot be perfected by natural selection. No increase by fission of the original mass of protoplasm, or by budding, can lead to new kinds of creatures. This is almost self-evident, and is clearly shown by the constant practice of gardeners, who sow the seed of a plant when they want to produce new varieties, and have resort to cuttings or buds when they wish to perpetuate those kinds which they value.

* 'Some Chemical Difficulties of Evolution.'

It is not even hinted that these attributes are the necessary results of chemical action. In fact, the gap between a mass of protoplasm possessing mere irritability and a living being dying of old age and reproducing itself sexually by germs, is enormous, and this faculty of reproduction must have arisen all at once; no incomplete approach to it could have been preserved as the fittest, for it would be useless until perfectly acquired; its acquisition, then, must plainly have been in the nature of a miracle; and, as we have seen, the continuance of the race by reproduction seems to be the great principle of organic life.

We may add that, in addition to this fatal difficulty, the theories of these evolutionists are exposed to all the objections which can be urged against Mr. Darwin's views, for they differ from him merely by beginning at a lower stage of the progression.

Professor Tyndall has lately given us his views as to the existence of a soul in the human body, which we must briefly notice.

"A merchant is sitting quietly in his easy-chair; a servant enters the room with a telegram, bearing the words, 'Jonas & Co. have failed.' Up starts the merchant, descends to the counting-house, dictates letters and forwards despatches, jumps into his carriage, and is immediately at the Bank or the Bourse, and among his commercial friends. Before an hour has elapsed he is once more at home, where he throws himself again into his easy-chair with a deep-drawn sigh: 'Thank God; I am protected against the worst.'

"This complex mass of motion—emotional, intellectual, and mechanical—is evoked," says Professor Tyndall, "by the impact upon the retina of the infinitesimal waves of light coming from a few pencil-marks upon a piece of paper. What caused the merchant to spring out of his chair?—The contraction of his muscles. What caused the muscles to contract?—An impulse of the nerves, which lifted the proper latch and liberated the muscular power."

"Some," says Professor Tyndall, "may be disposed to press upon me such considerations as these:—Your motor nerves are so many speaking-tubes, through which messages are sent from the man to the world, and your sensor nerves are so many conduits through which the whispers of the world are sent back to the man. Who or what is it that sends or receives those messages through the bodily organism? Do not the phenomena point to the existence of a self within the self, which acts through the body as through a skilfully-constructed instrument? Are you not bound to supplement the mechanism by the assumption of an entity which uses it?—in other words, are you not forced by your own exposition into the hypothesis of a free human soul?"

This question is most clearly put, and it is one of which every one must feel the importance.

Professor Tyndall answers it, by stating that this reasoning is incongruous with the knowledge of our time. "You do not," he says, "in this case, explain the unknown in terms of the known, but you explain the unknown in terms of the more unknown. Try to visualize this soul as an entity distinct from a body, and the difficulty immediately appears. From the side of science all that we are warranted in saying is, that the terror, hope, sensation, and calculation of the merchant are psychical phenomena, produced by, or associated with, the molecular processes set up by waves of light on a previously prepared brain."

"What," continues Professor Tyndall, "is the connexion between molecular motions and states of consciousness? We can present to our minds a coherent picture of the physical processes; the stirring of the brain, the thrilling of the nerve, the discharging of the muscle, and all the subsequent mechanical motions of the organism. But we can present no picture of the process whereby consciousness emerges, either as a necessary link, or as an accidental by-product of this series of actions. We are here on the boundary line of the intellect, where the ordinary canons of science fail to extricate us from our difficulties. If we are true to these canons, we must deny to subjective phenomena all influence on physical processes; we have here to deal with facts almost as difficult to be seized mentally as the idea of a soul."

What does this amount to, but simply that science cannot explain what life is? The point is, whether life is within the canons of science, not how we are to apply those canons to life.

The reader will have noted the expression, "lifts up the latch;" this seems as if there were a store of force somewhere, like water in a mill-dam, to be let loose as occasion requires. What is this store, and where is it?

And now let us suppose that another telegram comes to the merchant in the midst of his trouble, bearing the words, "Jonas & Co. have not failed;" peace would be immediately restored to his mind, and all the actions set in motion by the former telegram would cease. Through the effect of the new telegram on the nerves the latch would be put down again, the lifting of which by the former telegram caused all the disturbance.

The waves of light impinging upon the retina in those two cases are very nearly alike, the only difference being those which come from the little word *not*. How can the waves of light coming from this little word alone, totally alter the effect of the whole telegram? Is there not here a hint of some selective action on the part of the brain, distinct from the mechanical effect of the mere nervous message received from the retina?

To take another case—The telegram, instead of being written in pencil, might have been written in black, blue, red, green, or yellow ink; or partly in one colour and partly in another; again, it might have been written in ordinary writing, or printed in types of different kinds, as in German or Greek letters; and all those different modes of writing the telegram might be changed and combined in such a manner, that the number of different combinations of waves of light which might impinge upon the retina, and carry the message to the brain, through the nerves, would be enormous; yet in each case the same idea of the failure of Jonas & Co. would be instantly seized and acted on by the brain. Does not this look like some power in the brain to analyze, or perhaps we may say, to translate, the messages conveyed to it by the nerves?—and this state of the brain is very different from the "previously-prepared brain" alluded to by the Professor;

such preparation being, by the nature of his views, purely mechanical; merely fitting the brain to receive sensation through the nerves.

And now let us take yet another case—Suppose no telegram is brought to the merchant, but that he gets up from his easy-chair, after a quiet nap, and goes into his counting-house to see if anything requires his attention. What lifts up the latch and sets the muscles in motion on this occasion? There is no action upon the brain from without; something must have acted upon it to set the muscles in motion. What is this something?—and this mode of setting the muscles in motion by some action of the brain independent of external influence must evidently be of constant occurrence.

The following answer to these queries may possibly be suggested:—Memory, or the recollection of former business, sets the machinery in motion, and sends the merchant to his counting-house. But then we must ask—What is this memory, according to Professor Tyndall's views? Is it a residuum of former messages to the brain from the retina, which were not wholly used in setting the muscles in motion in the first instance? But how can we account for the whole of the influence of those messages on the brain not making itself felt in action at the time of their reception? By what means was any part of them kept in reserve?

Professor Tyndall goes on to say, that amid all our speculative uncertainty, there is one practical point as clear as the day, namely, that the brightness and the usefulness of life, as well as its darkness and disaster, depend to a great extent upon our own use or abuse of this miraculous organ. Now who are we, who are to use this organ? Do not its actions, according to what we have just been told, depend entirely upon messages conveyed to it which it is bound to obey? In what sense is the brain, according to Professor Tyndall's view, entitled to be called a miraculous organ?

CHAPTER VII.

Evolution with design—The world probably formed by some law of evolution—Analogy between similar parts in different creatures; man, beasts, birds, and fishes—Humming-birds instances of probable evolution—Evolution a form of creation—Possible change in the laws of reproduction with a change of circumstances—No hint of what the law of evolution really is—Organisms do not readily change—No change during the vicissitudes of the glacial period—Great influence of locality upon form—Extinct animals of North America—Why has not natural selection reproduced anything like them?

And now the reader will probably ask—What do you mean by the terms "design" and "special creation"? Do you maintain, what was probably Paley's view, that every spot and streak of colour upon an animal, a shell, or a plant, is the handiwork of a personal Creator whose attributes are similar, though infinitely superior, to those of man? To this question we must reply, that it is more consistent with what we see around us in other departments of nature, that the organic world is also the result of some natural law; probably some form of evolution. It is not necessary, as Dr. Asa Gray remarked, that a new species should be created out of nothing, when a slight modification of an existing form would answer the purpose.

When we look at any great class of animals we see that, independently of their habits of life, they resemble each other in the general plan of their organization. Thus, in the vertebrata, the arms and legs of man correspond with the fore and hind-legs of beasts, with the wings and legs of bats and birds, and with the pectoral and ventral fins of fishes; the arm of man is the fore-leg of the beast, the wing of the bird, and the pectoral fin of the fish.*

Similar analogies are observable in all classes of the animal world. The reader may have observed, when examining a collection of butterflies, how similar the markings of the wing are in each class; the lines radiate from the same point, and the spots occupy similar situations.

These analogies were attributed by Paley

* 'Owen on the Nature of Limbs,' p. 3.

to the "uniformity of plan" which the Creator has laid down for each class of creatures. But they can be accounted for to a very great extent by supposing, with Mr. Darwin, that they are the results of descent from a common ancestor, and this is one of Mr. Darwin's strongest points; though even here he meets with difficulties, as similar structures occasionally appear in creatures which cannot be closely related by descent; in which case he is obliged to suggest that natural selection has by chance hit upon the same device.

Mr. Darwin says that when he published his 'Origin of Species' few naturalists believed in evolution; but now things are wholly changed, and almost every naturalist believes in the great principle of evolution.

There are certainly some cases in which such an origin of species appears very probable. The humming-birds are found only in America; they are quite distinct from all other birds; there are more than four hundred species of them which closely resemble each other, though they never intermingle. Mr. Gould, during his long study of these birds, saw no case of natural hybridism. It is no great strain on the imagination to suppose that all these species of humming-birds are modifications of one type.

Evolution, in this sense, being the mode in which the Creator has chosen to form the world, is not at all inconsistent with design. It merely gives us a higher idea of the Designer, who has foreseen and provided for the results of the evolution; all we contend for is, that the world has not been formed by the accumulation of hap-hazard variations.

At present the law of reproduction seems to be that like should produce like; that the descendants should resemble their parents. But there is no difficulty in conceiving a law of reproduction which should give rise to a succession of the same species for a long period, and then under different conditions produce a different kind. We may illustrate this point by a very homely reference:—A human artificer would find no difficulty in making a barrel-organ, which, at ordinary temperatures and under usual atmospheric conditions, should play a certain set of tunes, and which, without any fresh action on the part of the original maker, should play another set of tunes when the thermometer fell to zero, or the atmosphere became as moist as it is in the dense jungles of the tropics. It is obvious that the barrel of the organ, instead of being set by hand, as is usual, when a new tune is wanted, might be moved into the required place by the contraction in cooling of a bar of metal, or by the increased weight of any absorbent substance when exposed to damp vapours.

We have no hint of what this law of evolution is or how it acts. Variations of form are very rare, even when the surrounding conditions of life change considerably. It is now generally allowed that there was a period when the earth was much colder than it is at present; the polar ice extending to the middle of England; and this period was followed by a return of warmth, which again gave place to cold, to be again followed by the milder climate which we now enjoy. Under these circumstances, animals and plants were exposed to great changes of climate, and there must have been many migrations both of plants and animals to enable them to live; yet it is found that from the commencement of this cold climate until the present time, a period, according to Sir C. Lyell, of hundreds of thousands of years, most animals and plants have remained unchanged.

Even at the present time we have instances of the same organisms living under very different conditions of life. Sir Wyvill Thompson found the same species of coral at a depth of thirty fathoms and fifteen hundred fathoms. The pressure and the darkness must have been five hundred times as great in the latter case as in the former.

Locality, however, seems to have the greatest influence upon form. In the island of Jura, one of the Hebrides, many deer are found with what are called there "crummy horns"; these horns are distorted, destitute of many of the points of the common antler, and turn back on the head like those of a goat.

The goitres and cretins of the Alps of Switzerland and the Tyrol are instances of the same kind amongst ourselves. The valleys of those countries produce the wretched victims of these maladies side by side with some of the finest specimens of the human race.

The animals of Angora afford another instance of the influence of locality. They are distinguished by a tendency to produce long and fine hair; this is the case with the dogs, rabbits, goats, and cats; the beautiful Angora cats are well-known favourites. All these animals are said to lose this peculiarity after being some time in Europe.

The humming-birds afford another instance of the possible influence of locality. Many of the species are extremely local; one or two of them are confined to the craters of extinct volcanoes. It certainly seems probable that these are local modifications of neighbouring species.

The influence of locality on form seems to reach its maximum in the island of Celebes, in the Indian Ocean. This island contains so many creatures peculiar to itself—though there are other islands in its neighbourhood—that Mr. Wallace is driven to account for them by the supposition that Celebes is the remains of a large continent formerly existing in that part of the earth, and probably connecting South America with Madagascar, —some of the productions of this latter island being similar to those of South America, though the two countries are so far apart, and part of Africa lies between them.

Then it is said that there is a tendency in creatures to become black in the southern hemisphere. The black swan of Australia is a familiar instance of this tendency.

But all this is too vague to give us any hint of the nature of the law of development, if there be such a law.

The recent discoveries of fossil remains in North America are most interesting.* There are species of the horse, ranging from the true equus of the later deposits, through a long course of species, to animals about the size of a fox, with five toes. Then there were animals, allied to the rhinoceros, with three pairs of horns; the first pair on the top of the head, large and perhaps palmated; the second above the eyes; and the third and smallest pair standing out sideways on the snout. There were also abundance

* Wallace's 'Distribution of Animals,' vol. i. p. 135.

of forms of the camel; and even in the most ancient strata are found the remains of the machairodus (or sabre-toothed tiger), and the cave lion; horses and tapirs larger than any now living; a llama as large as a camel; great mastodons and elephants; and abundance of huge megatherieid animals of almost equal size. In South America there were these same megatherieids in greater variety; numerous huge armadillos; a mastodon; large horses and tapirs; large porcupines; two forms of antelope; numerous bears and felines, including a machairodus and a large monkey: all these have become extinct since the deposition of the most recent of the fossil-bearing strata.

What great change in physical surroundings could have caused all these forms to vanish? But the question which more particularly relates to our subject is—How has it happened that none of these forms, nor anything like them, has re-appeared in America from the action of variation and natural selection, if that was the process by which they were originally produced? We must note that the soil and climate of America are now, so far at least as horses and cattle are concerned, very well adapted to large animals, as is seen by the rapid increase of them when introduced by man.

We are aware that it may be said that there has not been sufficient time for the reproduction of these large animals; and also that when they were originally produced by the action of natural selection, the area of the country in which they appeared was much larger than the present continent of North America, and therefore afforded greater scope for the action of variation and natural selection; but these reasons seem totally inadequate to account for the almost entire absence of any approach to the former state of things.

These phenomena seem to point to special creation. But all we wish to maintain is that the law of development, if such a law exists, is not a mere result of self-existent matter.

CHAPTER VIII.

SUMMARY AND CONCLUSION.

We have seen that the philosophers who decline to believe in a Creator, because the world is so full of misery and waste, are unable to explain the existence of this misery and waste on their supposition that the world has been formed by a strict regard to the greatest good of each individual.

We have also seen that it is highly probable that the variations which occur in organisms neutralize each other, and therefore cannot give rise to new forms.

Mr. Darwin's theory requires that incipient steps towards a new form must be immediately useful, and that they must be such as require the least expenditure of vital energy. And we have examined many cases in nature, both of structure and instinct, which are inconsistent with these principles.

That some forms and instincts appear in themselves to be actually injurious to the organisms in which they are found, and therefore totally incompatible with natural selection.

We have seen that these objections to Mr. Darwin's theory are fatal to it, not because from lack of knowledge certain phenomena cannot be explained by it, but because these phenomena are incapable from their nature of explanation by it.

We have seen that there are many curious and complicated forms which cannot be accounted for on any principle of utilitarian evolution; and that one of these forms,—that of the Coryanthes Macrantha, adduced by Mr. Darwin as strong evidence of the action of natural selection,—is in fact almost conclusive evidence in favour of the exercise of a guiding will.

Again, Mr. Darwin and his followers wholly fail to account, on utilitarian principles, for beauty of colour and form in animals.

We have seen that the more advanced evolutionists,—even if we allow the spontaneous generation of a bleb of protoplasm,—

entirely fail to show how difference of sex, which is so universal in nature, could have been derived from it.

It has appeared probable that the existing forms of organic life are the results of some unknown law of evolution. But it is contended that such law of evolution cannot be automatic variation of self-existent matter and the survival of the fittest, but must be directed by, or have originated from, an intelligent will.

Finally, the knowledge which man has acquired, and his very nature, are inconsistent with the notion of a bestial origin.

To begin with our own earth. Geology has told us that it has existed in a state fit for the support of life for periods so long that we cannot realize them. Natural History has proved that the world has been, and is now, full of life; from the elephant to a microscopic animalcule; from the giant oak to the smallest moss,—and all this life is of the most varied form and adaptation. Turning from the contemplation of the earth to that of the heavens, we see the sun, the centre of our planetary system, the source of all the forces existing on the earth, and at least essential to life. Man has learned that his earth and the other planets circle round the sun, or rather round the common centre of gravity of the whole system; and he has learned this, though from the position of our earth in the system, the motions of the planets appear to be almost backwards and forwards in straight lines. Man has discovered, by the most abstract reasoning, the law which regulates the motion of the planets round this centre of gravity, and the complex results upon this motion of the forces exerted by the planets upon each other. So accurately are these results calculated, that an unexpected apparent error led to the belief that there might be another planet not yet known to us to which it was due. The supposed place of this planet was suggested, and there it was seen by means of an instrument—the achromatic telescope—made by man, and the result of most elaborate and abstract calculations in another branch of science; a marvellous instance of the power of the human mind. Beyond our planetary system the telescope shows us more than twenty millions of stars which are suns, possibly or perhaps probably surrounded by planets. We know that many of these stars are much larger than our sun, and so distant from us that the light of many of them may take thousands of years to reach us. The spectroscope—an instrument which tells us the nature of bodies by their action in an incandescent state upon light—has shown us to some extent the materials of which those suns are made; and we find that like our own they contain many elements, such as iron, hydrogen, chlorine, and the like, which exist in our earth. Astronomy also tells us that our sun and his attendant planets are all moving in space, and that many of the stars have proper motions. There are nebulæ which may be the beginnings of suns; and we know that there is an end of our earth—at least in its existing state—inasmuch as the ether through which we have the sensation of sight, and which, so far as we know, pervades all space, offers a resistance, though slight, to bodies moving through it; and must therefore in time destroy the motion of our earth round the sun, just as the friction of the tides on the earth must in time destroy its diurnal rotation, and put an end to the distinction of night and day. Though indeed a much more rapid conclusion of the present state of humanity is perhaps to be found in the dissipation of our coal, iron, and other metals; and, according to Liebig, of those chemical products which are necessary to the production of our food, and which we waste in unprofitable sewage.

Grand as is the celestial world, another instrument—the microscope, also the result of abstract reasoning—has disclosed a scene almost as sublime in its minuteness: we are surrounded by myriads of wonderful beings too small to be visible to the unassisted eye.

Then, as was written below Franklin's bust, "Eripuit cœlo fulmen," man has made the lightning his servant; has shown by another series of abstract reasonings the identity of electricity and magnetism; and has invented an instrument—the electric telegraph—by which he can hold instantaneous communication with his fellow-men on the other side of the globe.

It is true, as observed by the writer of the article in the 'Westminster Review,' whom we have quoted, that the present state of human knowledge is the result of the labour, often wasted, of many generations; and that scientific knowledge is comparatively a thing of to-day, and is progressing at a rapidly accelerating rate. But the capacity to acquire this knowledge is a thing innate in man. The lowest savages are capable of receiving instruction. It is said that the children of the native Australians, when taken into our schools, show as great an aptitude for learning as white children; and the Fuegians, mentioned by Mr. Darwin in his 'Naturalist's Journal,' after a short residence in England and on board the 'Beagle,' showed an amount of knowledge quite equal to what any average European would have acquired under the same circumstances; and the Australians and Fuegians, we are told, are among the lowest races of mankind. It has been shrewdly remarked by Mr. Wallace, that their capacity of learning shows that the brain power of savages is much beyond the requirements of their actual condition of life, and therefore could not have been acquired by natural selection, as its value could not have been felt—a very strong point in favour of the argument from design.

This knowledge man has obtained partly by the most abstract reasoning, partly by observation, made by most delicate instruments which he has invented for the purpose; and this is but a slight sketch of what man has done in the field of science, probably but a trifle compared with what he is capable of doing in the future. Then man, as our inquiries have shown, has a desire to know his origin; he has a sense of the sublime and beautiful; he has moral attributes which throw his scientific powers into the shade; and he has a deep religious belief.

We are aware that it is said that savages have no religious belief, and that therefore religion is not natural to man, but is the invention of a priesthood. This position, however, is clearly untenable; for allowing that civilized races are descended from savages, and that the lowest savages have no religion—a doubtful point,—the fact that, as mankind advanced, they have universally adopted some form of religious belief, is sufficient evidence that religion is congenial to man's nature. There is something inherent to the intelligence of man which naturally becomes religion whenever that intelligence expands. Had this not been the case, no priestly influence could have given man his religious feeling, nor indeed could a priesthood have ever existed. A body of men could not have been found in every country ready to inculcate a religion which they did not believe upon a people who had no sympathy with them; they must in many cases have held erroneous views, but they sincerely believed them.

The vast stones of Stonehenge, on Salisbury Plain, which must have been brought from a great distance by a quasi-savage race, destitute of mechanical knowledge, are as conclusive evidence of the religious feeling of the people of that time, as is the splendid pile of York Minster of the devotion of their successors.

And now we will take leave of the reader with this remark, that it is difficult to believe that the mind of man, capable of discovering and understanding such marvels and possessed of such feelings, is nothing, as Professor

Owen * seems to imply, but the sum of living phenomena which are modes of force into which other forms of force have passed from potential to active states, and reciprocally. It is difficult to believe that man has no soul, or that man, such as he is, and the gorilla, which is one of the grossest of animals, have been evolved by the same process of utilitarian evolution from the same ape-like ancestor.

Professor Huxley † has taken infinite pains to show that the brain of apes is anatomically very similar to that of man ; and the chemical difference between them, if any, must be very slight. How then is there such an enormous difference in their powers ?

We must remember that according to Mr. Darwin's view there was nothing miraculous about the variation in the ape-like ancestor which led to the production of man ; that variation must therefore have been one of those habitually occurring in the organism ; and we should expect as a natural result that there should have been many similar

* Owen, 'Vertebrata,' vol. iii. p. 824.

† 'Man's Place in Nature.'

variations, and that the ape family should have exhibited a variety of more or less close approximations to humanity; instead of which we find, that except in so far as there is some bodily likeness, they are farther removed from man than many other beasts. They are not so intelligent as the dog or the elephant, and so far are evidence against any occurrence of such variations as would be necessary to initiate the production of man.

These considerations alone might perhaps justify us in rejecting the theory of automatic evolution as incapable of accounting for the origin of the organic world, but we must remember that we stand upon surer ground, that there can be no form of *automatic* evolution but variation and the survival of the fittest, and that, as we have seen, there are some natural objects which cannot have been formed in this manner, and which compel us to acknowledge the action of an intelligent will.

THE END.

INDEX.

A.

B.

C.

H.

I.

K.

L.

M.

N.

O.

P.

R.

S.

T.

V.

W.

CLAY AND TAYLOR, PRINTERS, BUNGAY.