

GEOLOGY

Darwin on Missing Links

"A Classic of Science"

Fossil Records of Species are Necessarily Incomplete But Intermediate Forms Link Ancient and More Recent Life

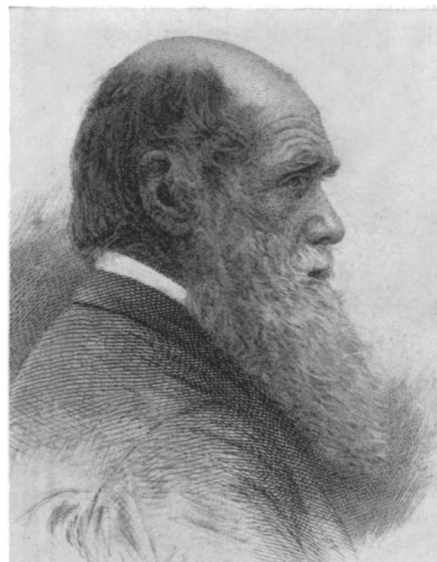
ON THE ORIGIN OF SPECIES by Means of Natural Selection, or The Preservation of Favoured Races in the Struggle for Life. By Charles Darwin. London: John Murray. 1859.

I HAVE ATTEMPTED to show that the geological record is extremely imperfect; that only a small portion of the globe has been geologically explored with care; that only certain classes of organic beings have been largely preserved in a fossil state; that the number both of specimens and of species, preserved in our museums, is absolutely as nothing compared with the incalculable number of generations which must have passed away even during a single formation; that, owing to subsidence being necessary for the accumulation of fossiliferous deposits thick enough to resist future degradation, enormous intervals of time have elapsed between the successive formations; that there has probably been more extinction during the periods of subsidence, and more variation during the periods of elevation, and during the latter the record will have been least perfectly kept; that each single formation has not been continuously deposited; that the duration of each formation is, perhaps, short compared with the average duration of specific forms; that migration has played an important part in the first appearance of new forms in any one area and formation; that widely ranging species are those which have varied most, and have oftenest given rise to new species; and that varieties have at first often been local. All these causes taken conjointly, must have tended to make the geological record extremely imperfect, and will to a large extent explain why we do not find interminable varieties, connecting together all the extinct and existing forms of life by the finest graduated steps.

He who rejects these views on the nature of the geological record, will rightly reject my whole theory. For he may ask in vain where are the numberless transitional links which must for-

merly have connected the closely allied or representative species, found in the several stages of the same great formation. He may disbelieve in the enormous intervals of time which have elapsed between our consecutive formations; he may overlook how important a part migration must have played, when the formations of any one great region alone, as that of Europe, are considered; he may urge the apparent, but often falsely apparent, sudden coming in of whole groups of species. He may ask where are the remains of those infinitely numerous organisms which must have existed long before the first bed of the Silurian system was deposited: I can answer this latter question only hypothetically, by saying that as far as we can see, where our oceans now extend they have for an enormous period extended, and where our oscillating continents now stand they have stood ever since the Silurian epoch; but that long before that period, the world may have presented a wholly different aspect; and that the older continents, formed of formations older than any known to us, may now all be in a metamorphosed condition, or may lie buried under the ocean.

Passing from these difficulties, all the other great leading facts in palaeontology seem to me simply to follow on the theory of descent with modification through natural selection. We can thus understand how it is that new species come in slowly and successively; how species of different classes do not necessarily change together, or at the same rate, or in the same degree; yet in the long run that all undergo modification to some extent. The extinction of old forms is the almost inevitable consequence of the production of new forms. We can understand why when a species has once disappeared it never reappears. Groups of species increase in numbers slowly, and endure for unequal periods of time; for the process of modification is necessarily slow, and depends on many complex contingencies. The dom-



CHARLES ROBERT DARWIN

inant species of the larger dominant groups tend to leave many modified descendants, and thus new sub-groups and groups are formed. As these are formed, the species of the less vigorous groups, from their inferiority inherited from a common progenitor, tend to become extinct together, and to leave no modified offspring on the face of the earth. But the utter extinction of a whole group of species may often be a very slow process, from the survival of a few descendants, lingering in protected and isolated situations. When a group has once wholly disappeared, it does not reappear: for the link of generation has been broken.

We can understand how the spreading of the dominant forms of life, which are those that oftenest vary, will in the long run tend to people the world with allied, but modified, descendants; and these will generally succeed in taking the places of those groups of species which are their inferiors in the struggle for existence. Hence, after long intervals of time, the productions of the world will appear to have changed simultaneously.

We can understand how it is that all the forms of life, ancient and recent, make together one grand system; for all are connected by generation. We can

understand, from the continued tendency to divergence of character, why the more ancient a form is, the more it generally differs from those now living. Why ancient and extinct forms often tend to fill up gaps between existing forms, sometimes blending two groups previously classed as distinct into one; but more commonly only bringing them a little closer together. The more ancient a form is, the more often, apparently, it displays characters in some degree intermediate between groups now distinct; for the more ancient a form is, the more nearly it will be related to, and consequently resemble, the common progenitor of groups, since become widely divergent. Extinct forms are seldom directly intermediate between existing forms; but are intermediate only by a long and circuitous course through many extinct and very different forms. We can clearly see why the organic remains of closely consecutive formations are more closely allied to each other, than are those of remote formations; for the forms are more closely linked together by generation: we can clearly see why the remains of an intermediate formation are intermediate in character.

The inhabitants of each successive period in the world's history have beaten their predecessors in the race for life, and are, in so far, higher in the scale of nature; and this may account for that vague yet ill-defined sentiment, felt by many palaeontologists, that organisation on the whole has progressed.

PHYSIOLOGY

Nudism Unnecessary For Sufficient Ultraviolet Light

NUDIST cultists and others who preach extreme exposure of the human body can not justify their fads on the grounds that they are necessary to prevent rickets.

Keep your hands and face uncovered in the moderate sunshine such as occurs at the latitude of middle New York state, Prof. Arthur Knudson of the Albany Medical College, told the American Association for the Advancement of Science, and there need be no fear of being afflicted with rickets, the disease of the bones that arises from lack of ultraviolet light or vitamin D.

Experiments with rats showed Prof.

"Maxwell's Demon"

who might get around the statistical second law of thermodynamics, appears in

THE NEXT CLASSIC OF SCIENCE

If it should hereafter be proved that ancient animals resemble to a certain extent the embryos of more recent animals of the same class, the fact will be intelligible. The succession of the same types of structure within the same areas during the later geological periods ceases to be mysterious, and is simply explained by inheritance.

If then the geological record be as imperfect as I believe it to be, and it may at least be asserted that the record cannot be proved to be much more perfect, the main objections to the theory of natural selection are greatly diminished or disappear. On the other hand, all the chief laws of palaeontology plainly proclaim, as it seems to me, that species have been produced by ordinary generation: old forms having been supplanted by new and improved forms of life, produced by the laws of variation still acting round us, and preserved by Natural Selection.

Science News Letter, July 16, 1932

PSYCHIATRY

Frequent Use of Hypnotism Urged Upon Psychiatrists

PSYCHIATRISTS have been advised by Dr. Oscar J. Raeder of Boston to make more frequent use of hypnotism both for diagnosing and treating mental disorders. At a recent meeting of the American Psychiatric Association Dr. Raeder described cases in which he found hypnosis a quick and ready means of discovering what ailed patients in whom no physical signs of disease appeared.

A patient complained of blindness, but his eye doctor could find nothing to account for his symptoms. At the first interview, he was hypnotised and it was suggested to him that after a short sleep he would be able to see. He woke up and found to his astonishment that he could look into bright light from a window without difficulty. This, however, was only the beginning, and the patient was told to return for further treatment. It was not necessary to use hypnotism again, however, for his confidence had been won and at the next interview the real nature of the disorder was found to be mental, based on a domestic difficulty. The patient recovered and of course had no further difficulty with his eyes.

Dr. Raeder described suggestibility as a peculiarity of the mind. In hypnosis, he explained, the mind is perfectly concentrated, with no outside distraction at all. In a light state of hypnosis the patient remembers everything that has happened during the time he was hypnotised, but in a very deep state he moves about in a trance and remembers nothing at all.

In treating disease, the lighter states are much more valuable. In these states there is a greater degree of consciousness, the patient's personality exercises a greater influence through other mental faculties, such as reasoning and judgment. In the lighter states suggestion must be given over a period of time, but the effect is much more lasting. In some cases, Dr. Raeder observed, hypnosis may be only a quicker way of getting at the patient's real trouble, but in other cases he believes that it is not only quicker but actually more effective for diagnosis and treatment.

Science News Letter, July 16, 1932

The thin cloud of gaseous particles throughout interstellar space is so rarefied that millions of cubic miles of it would weigh only a fraction of an ounce.

Knudson that if one-eightieth of the surface area of the skin were shaved and bared to the sun's radiation, greater healing of rickets was produced than if the whole animal were exposed. Although through three to four months of winter the sunshine does not contain curative rays, the body builds up sufficient reserves in summer to prevent rickets during the winter.

Ungloved hands and exposed faces of children or adults will give sufficient chance for the sun to do its protective work and nude sunbaths for normal persons would not seem necessary in the light of Prof. Knudson's experiments.

Science News Letter, July 16, 1932