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Special Studies in Evolution

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The World of Ancient Man

I. W. Cornwall

The author's purpose is to allow the reader to visualize the environment of ancient man with its altered land forms, river systems, forestation, and climate. His thesis is that archaeologists cannot form a true picture of ancient man unless they can determin the conditions in which he lived and how his surroundings affected his everyday life. Eitht factors are cited as being instrumental in determining an environment: place, climate, land-forms, rocks and minerals, soils, plants, animals, and time. A chapter is alloted to each factor and its influence. Man must have originated in a tropical climate since it afforded early man an abundant food supply and protection against cold. Several species of men arose, but Homo sapiens eventually remained as the only survivor. Climate affected the extent of man's migrations and type of shelter. Land forms, soils, and available minerals determined whether early men became hunters, herdsmen, farmers, or industrialists. Several methods are described which enable the archaeologist to study early man including pollen-analysis, tree-ring study, sedimentation layers, and Carbon-14 dating techniques.

The author's conclusion is an appeal to archaeologists to be scientists rather than merely students of early cultures to insure a more complete understanding of the conditions in which early man loved.

Charles Darwin's Autobiography

Charles Darwin's Autobiography shows him to have been a man seeking the truth by compiling mountains of indisputable facts. His search led him to a theory of evolution that others had proposed in various forms, but without his twenty years of personal observations to support them. Insight to the nature of this giant of the biological sciences, and the cool detachment with which he compiled and evaluated his observations are evident in the Autobiography.

The foundations for biology, chemistry, geology, and anthropology were being laid in the early 1800's when Darwin lived. As a youth he took an interest in all of these subjects. He was able to decide on a study of science after considering careers in medicine and religion. Being among the British upperclass and assured of an adequate inheritence from his father, he did not feel sufficiently motivated to learn medicine. He studied religion only to satisfy the desire of his father. Young Darwin was regarded as being only an average student and excelled only at snipe hunting and horseback riding.

By Darwin's own account his five year voyage on the Beagle was the most important event of his life. He served as a naturalist without pay keeping a daily journal (The Voyage of the Beagle) that was the source material for his Origin of the Species.

Darwin was noted for his extreme modesty which he attributes in his Autobiography to his mediocre intellence. The reader gets the impression that he may have suffered from an inferiority complex. The accounts he gives of his work and dealings with others coupled with the section by his son, Sir Francis Darwin, shows Charles Darwin to have been dedicated to his work and family. He had no desire for personal fame of fortune and produced all of his writings living with his family, disdaining numerous invitations to speak and travel abroad.

The Origin of Species

Charles Darwin

This book is interesting today not so much as scientific reading, but as evidence of how far the biological sciences have advanced in 100 years. Darwin devotes 500 pages to support a theory of evolution that is almost taken for granted today. In a manner that would appear lacking as a scientific work today he used deduction rather than facts and figures to support his theory. This was unavoidable since the sciences of geology, archeology, and genetics were not developed enough in the middle 1800's to supply Darwin with solid evidence for his claims. It is remarkable to me that he was able to postulate his theory merely on the basis of personal observations without any solid source material for reference.

The early chapters deal with variation of species under domestication and the natural state and the difficulties in separating varities from species. The first major claim of the book is that new species have arisen continuously and are continuing to arise and that the larger genera vary more frequently than the smaller genera.

The next section concerns the struggle for existence among all the forms of life to such a degree that "every organic being naturally increases at so high a rate that if not destroyed, the earth would soon be covered by the progeny of a single pair." From this it follows that only the strongest life forms can survive. The struggle for life is most severe among individuals of the same species since they all have the same needs.

Natural selection, or the survival of the fittest, is used to explain how the stronger forms prevail. The weaker forms of a group die early and leave no offspring. Sexual selection insures that the strongest of a group will produce the most offspring. Darwin noted the value of the hybrid cross and that great variability in terms of individual differences for a species were favorable.

He then defends his view that there is continuing divergence of existing forms into new or stronger species as opposed to numerous species being present at the time of creation that have remained unchanged to the present. His explaination here is hampered by his ignorance of genetics and mutation, but he does cite climatic change as a contributing factor. A section on the Laws of Variation holds that disuse of parts aided by natural selection

can account for the degeneration of a part. He probably would not have said this if he had understood the principles of genetics.

The remainder of the book is a defense of the theories already stated. He believes natural selection to be a gradual refinement of organs over the ages, but points out some of the flaws in his theory. For instance, he can not account for modifications that are of no direct service, past or present, to an individual. Nor can he explain a cross between two related species that yields sterile offspring. The rate at which species become extinct and have new ones replace then was not known when the book was written. Present day knowledge of genetics and archaeology explain many of these difficulties.

The Voyage of the Beagle

The voyage Charles Darwin made on HMS Beagle from December 1831 to October 1836 was the most important event of his life. He left England uncertain of his life's work after securing a position on the Beagle as a natural- by chance. He returned with a journal that served as the nucleus for twenty years of additional observations and the basis for The Origin of Species, a work which has had a profound effect on evolutionary theory.

The majority of Darwin's journal is devoted to his biological and geological observations, but also included are fascinating accounts of adventures his party encountered in its travels. His accounts of the South American Indian wars rival those of any Western novel. The sad commentary on the poverty, ignorance, and dictatorial military rule that was common in the 1830's shows the heritage that is South America's today. Slashing comments on the conditions imposed on slaves in the countries visited are also included.

The most interesting portions of the book to me concerned Darwin's observations of foreign plant and animal life that had been introduced by Europeans to the South American and Pacific areas. Often these new species decimated the native population and though the term "survival of the fittest" was not used in the book, the reader can certainly tell where Darwin got the idea for it.

Darwin's most scientific accounts and the bulk of his book deal with his stay in South America. His descriptions of New Zealand, Australia, and the Pacific atolls amount to a travelogue. He is more interested in the formation the the Pacific archepelegos than in their flora and fauna.

In the summary of his journal Darwin credits the five year voyage with teaching him "good-humored patience, freedom from selfishness, the habit of acting for himself, and of making the best of every occurrence." Returning home with the self-discipline he had lacked before, Charles Darwin was ready to begin one the great careers in biology.

The Death of Adam

John C. Green

The author's purpose was to describe the revolution in human thought which took place in the interval between John Ray's The Wisdom of God Manifested in the Works of the Creation (1691) and Charles Darwin's Origin of the Species (1859). He succeeds in tracing the system of Western thought which based its concept of the world on literal interpretation of Scripture and tradition to the true use of the scientific method in explaining natural phenomena. The contributions of physics, astronomy, geology, anthropology, archaeology, botany, and zoology in formulation the present concept of organic evolution in detailed. Advancement in the social sciences, philosophy, and religion accompanied the systematic organization of the natural sciences.

Summaries of the works of leading thinkers of an era are used by the author to illustrate the impact of their ideas on the times. It is difficult to imagine a time when it was believed that the earth was only 6,000 years old, that it had once been Perfect, with present life forms created in seven 24 hour days, that it had suffered a great Fall, and had then been covered by a great Deluge. Equally difficult to imagine is an age that questioned the existence of fossils or the extinction of any species. Yet these were accepted 17th century beliefs that had gone unquestioned until Newton demonstrated that heavenly bodies obeyed the laws of physics. From that time to the present science has been used to explain the earth and its organic evolution. Present day science hold the dey to man's control of his continuing evolution or his destruction.

Evolution in Action

Julian Huxley

Huxley divides creation into three phases of evolution: inorganic, biological, and human. Inorganic evolution concerns the expanding universe composed of random galaxies, gas clouds, and radiation beams. He sees no evidence of purpose in these stars composed for the most part of simple, unrelated molecules. Biological evolution is possible on innumerable planets of the universe which have environments capable of sustaining life. This type of evolution is more systematic and builds ever more complex chains of protein molecules. Biological evolution makes natural selection possible and accelerates the rate of evolutionary progress. Human evolution is the most restricted phase of the evolutionary process because of the delicate environment it demands. According to Huxley, man's most important unit of evolution is his transmittible culture, not genetic advance as it is in lower forms of life.

After a brief discussion discounting the recapitulation theory Huxley proposes that life originated from inorganic material. He discounts a supernatural origin as being unscientific. Once the biological evolutionary process has begun, he maintains, it is irreversible.

Two basic principles of evolution are postulated: natural selection, which includes reproduction and mutation, and Biological improvement formed by natural selection and time. In any evolutionary process mutation serves as the raw material and natural selection determins the direction it takes. Natural selection provides three basic functions: It allows positive evolutionary changes, it maintains present levels of improvement, and it prevents degeneration. Biological improvement is any change which enables an organism to increase its chances for survival or reproduction. It is not universal as lower life forms have persisted despite the rise of higher ones.

Many groups become specialized through evolution. An organ or appendege may become highly modified giving the group an advantage over its competitors. But specialization is often one sided and involves the loss or degeneration of another trait. Eventually there is a limit to improvement of the part and either stabilization or extinction will occur. Most improvements involve specialization, but some are what the author terms advances, the development of higher and more integrated organization, or whenever any radically

new part is developed. Huxley deems the development of the nervous system as the greatest biological advance.

The highest ranking nervous system is man's because it allows him a language and an ability to share experiences with other men. When early man reached this state, he was for the first time truly above all other animals.

The author discusses the difference between biological improvement and progress, which is a series of advances that do not stand in the way of further advances. Requirements for evolutionary progress are an increased mutation rate, bilateral symmetry, exploration of the environment for food by forward movement, and the formation of a head with sense organs, brain, and mouth.

The section on human evolution is an appeal for the use of eugenics to improve the leaders of our species.

Early Evolution of Life

Richard S. Young
Cyril Ponnamperuma

The pamphlet begins by listing the teree stages of chemical evolution: inorganic, organic, and biochemical. Inorganic evolution involved the organization of diffuse hydrogen clouds into the solar system and the simple atmospheres of the planets. On earth this was made of methane, nitrogen, and water. Ultra violet light, cosmic radiation, and sunlight synthesized the atmosphere into organic compounds containing oxygen, including sugars, proteins, and ring structures. Over millions of years the oceans became a warm soup of organic compunds which ultimately formed DNA by chance making the first living cell. Another theory holds that the carbon for the syntnesis of organic compounds came fron comets containing cyanides that collided with the earth.

The authors describe how the primitive earth's atmosphere was duplicated in the laboratory and charged with a spark producing organic compounds including ATP, the energy source for living cells. The possibilities of life on other planets in our solar system is also discussed along with random selection of molecule structures in forming protoplasm.

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