

Darwin and the Impact of “The Origin of Species”

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Pre-Darwinian views of Life:

- ▶ Creationism
- ▶ Perfect and constant forms
- ▶ Purposeful and Designed

Challenge of Evolution

- ▶ Change challenges our desire for stability
- ▶ Man is not the focal point of Creation
- ▶ Man is an animal
- ▶ God is not essential to Physical World

Artificial Selection and Domestic Breeding

- ▶ Dogs, horses and cattle have been varied by selective design in breeding by artificial selection

Journey of the Beagle

- ▶ Five years
- ▶ Galapagos islands—iguanas and tortoises; 13 different varieties of finches— island was far enough from mainland that it experienced isolated evolution and resulting variation in species
- ▶ Beetles; animal skins and bones

Previous ideas of evolution

- ▶ Greeks
- ▶ De la Marck—all life arose from a single organism; change happens as an organism responds to environment
- ▶ Giraffes are tall because they need to eat leaves off tall trees
- ▶ False: genes explain the “how” of evolution, not Need

How Evolution Works

- ▶ Each organism has unique traits (genes)
- ▶ Struggle for survival
- ▶ Inherent differences in individuals gives advantage in survival and procreation

Natural Selection

- ▶ “As many more individuals of each species are born than can possibly survive; and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form.” (68)

Limits on Population Growth

- ▶ Available Food
- ▶ Preying upon by other animals
- ▶ Climate
- ▶ Disease

Sexual Selection

- ▶ “This depends not on a struggle for existence but on a struggle between the males for possession of the females; the result is not death to the unsuccessful competitor, but few or no offspring. Sexual selection is, therefore, less rigorous than natural selection. Generally, the most vigorous males, those which are best fitted for their places in nature, will leave most progeny. But in many cases, victory will depend not on general vigour, but on having special weapons, confined to the male sex.” (136)

Speed of Evolution

- ▶ Darwin: “I do believe that natural selection will always act very slowly, often only at long intervals of time, and generally on only a very few of the inhabitants of the same region at the same time. I further believe, that this very slow, intermittent action of natural selection accords perfectly well with what geology tells us of the rate and manner at which the inhabitants of this world have changed.” (151)

Randomness versus Design

- ▶ Evolution is NOT random
- ▶ Mutation IS random
- ▶ But the selection process is directed by the power of survival

Societal Response

- ▶ Religious condemnation as atheism
- ▶ Scientific support largely
- ▶ June 30, 1860: debate at British Association for the Advancement of Science; Bishop Samuel Wilberforce; T.H. Huxley, biologist; Bishop asked Huxley whether he was descended from a monkey on his grandmother's side or his grandfather's. He responded he would rather have an ape for a grandfather than disrupt a scientific debate with personal attacks.

Scientific Theory

- ▶ Common speech: Theory = uncertain idea or a “hunch”
- ▶ Science begins with a hypothesis and tests to confirm. Science always leaves open the possibility of modifying as new information or data appear.
- ▶ “The formal scientific definition of theory is quite different from the everyday meaning of the word. It refers to a comprehensive explanation of some aspect of nature that is supported by a vast body of evidence.” (NAS, <http://www.nas.edu/evolution/TheoryOrFact.html>)
- ▶ Scientific laws are descriptive of a phenomenon that always occurs in a specific way. Theory differs from Law in that Theory attempts to explain the mechanism, the How as opposed to the What.
- ▶ Evolutionary Theory is supported by observations in Geology, Archaeology, Biology, Micro-Biology, and more.
- ▶ But the specific details of how evolution works is still subject to modification.

Modern Day Implications

- ▶ Fly vaccine must be redesigned each year due to evolution of flu
- ▶ Pesticide resistant pests
- ▶ Aids virus mutates and drugs stop working
- ▶ Medicine become obsolete as bacteria and viruses evolve; you are supposed to use the whole prescription because you want to kill as many as possible and not allow some to survive and gain resistance
- ▶ Bacterial resistance to penicillin
- ▶ Malaria and mosquitoes—as mosquitoes evolve we find it harder to eradicate them

Human Evolution

- ▶ Slow compared to small organisms like bacteria
- ▶ 95% of our dna is the same as Stone Age man
- ▶ Social Change has outpaced human genetic evolution—explains some social problems
- ▶ We are equipped to respond to emergencies with fight/flight response; adrenalin and blood sugar chemistry; but in modern contexts that may not be appropriate and can cause conflict.
- ▶ Fatty and high caloric diet is not suited to our modern lifestyle

Social Darwinism

- ▶ Problematic
- ▶ “Survival of the fittest” never used by Darwin; cannot be used to justify moral or ethical behavior or rules
- ▶ Darwin’s vision: survival of those “best adapted”
- ▶ Eugenics: problem is that you can’t predict future challenges or define what human is most fit
- ▶ Evolution is not about change from lesser to greater or worse to better; it is simply change in response to conditions
- ▶ Evolution is properly used to describe species and not individuals

Conclusion

- ▶ Darwin's Theory of Evolution radically changed our view of Nature and Mankind
- ▶ Nature was not created for Mankind to control, use, and enjoy. It is not fixed and unchanging.
- ▶ Nature changes; Man changes; Man is part of Nature.
- ▶ As a challenge to traditional religious views that took the Bible as a literal history of the world including the Natural World, his theory advanced Secularism; Modernism.
- ▶ Practically speaking, Evolutionary Theory lays groundwork for advances in medicine, agriculture (evolution of Pests, Weeds and Pathogens), Conservation Biology and Environmental Science, Anthropology.