



“Baby dinosaurs in the Ark?”

Reflections on Organic Evolution, Creationism and Intelligent Design

by Julian S. Kenny • January 18th 2006

Abstract

The lecture commences with a statement on the nature of scientific theories and scientific methods, the current concept of a “species” as a gene pool reproductively isolated from other gene pools and traces the history of explanations of the diversity of life and the basics of Darwin’s and Wallace’s proposal of evolution. It then reviews the current scientific acceptance of the fact and theory of evolution, giving examples of micro- and macro- evolution and the range of evidence that supports this. It briefly comments on creationism and intelligent design, concluding that these notions are not science.

Introductory

It may seem a strange title to choose for a general lecture on Evolutionary Biology. I will explain later. When I was originally invited by the Humanist’s society to deliver this general lecture I willingly agreed, accepting that it is a subject on which I have lectured to Biology students at the University of the West Indies over the years. The subject was never covered in a single lecture but required several. Even then a few lectures in the course of two weeks or so was always inadequate. Subsequent to agreeing to give this lecture the Secretary of the Association asked me to include some commentary on “Creationism” and “Intelligent Design. This I agreed to without reservation but at the same time recognizing that it would necessitate much organization of the presentation to suit the time frame of a lecture and the unknown diversity of the audience and their interests.

So now the title. It is drawn from a brief commentary on the BBC World radio in which the interviewer was interviewing a teacher from an on the fringe private school in London on the subject of intelligent design, taught to his charges – 8-12 years of age. The teacher explained to the interviewer that Noah took onto the ark a pair of baby dinosaurs! I suppose that teacher knew of the gigantic *Apatosaurus* and *Allosaurus*, dinosaurs of the Mesozoic and reasoned that any child with an enquiring mind would question how Noah would fit these into the Ark and feed them during the “Flood”. One was a huge herbivore, the largest land animal ever, the other a large carnivore several weighing tonnes. They had to be babies. Neat!

This lecture is divided into separate sections and as the audience will note it does not commence with Darwin and his major work, “*On the Origin of Species by the Means of Natural Selection or the Preservation of Favoured Races in the Struggle for Life*”, published in 1859 (and nothing too do with the origin of life). It looks first at the basics of what is a scientific theory, what is the scientific method and equally importantly the concept of a species. It then traces notions of evolution of species prior to Darwin, and I might add Wallace, the joint Darwin and Wallace theory of evolution of species by natural selection, and leads to a broad summary of



contemporary scientific understanding of the theory, noting the wide range of additional evidence that supports the theory, evidence that simply was not available to Darwin and Wallace and this part concludes with a brief summary of primate evolution, including man. A few examples are given to illustrate important elements of the mechanism of organic evolution. The lecture concludes with brief commentaries on the topics of Creationism and Intelligent Design, mainly to put in perspective the fundamental incompatibility of these notions with Science and scientific knowledge.

Scientific theory

The philosophy or foundation of science is observation of facts, development of hypotheses that might explain facts, and refinement of hypotheses and testing them, and construction of theories. In essence science is about discovery of reality. What exactly is a theory? You may choose from different dictionaries but generally it is a sort of proposal or supposition that uses facts or even assumptions to construct an explanation of the proposal. Scientific theories demand an element of predictability, that is, it should be possible on the soundness of the theory to make predictions of outcomes of such theory. Theories on any phenomenon, or belief for that matter, can never really be proven. They can nevertheless be disproved, simply on the basis of fitness of facts with theory or on elucidation of new facts. It was once central dogma that the sun, moon and stars revolved around the earth, a theory disproved by the science of astronomy. There are still today people who believe that the Earth is flat, a theory readily disproved with satellite imagery.

Scientific method

The scientific method is basically an orderly approach of observation and description of facts, groups of facts or phenomena, formulation of an hypothesis that predicts some general result, the testing of the hypothesis, and the experimental testing by others confirming the validity of the hypothesis. The important point to note is that others must test using the same methods before any validity is accepted. The cold fusion fraud of some years ago and the more recent human stem cell fraud in Korea illustrate the self-correcting characteristic of the scientific method. Hypotheses may partly or largely explain some phenomenon and only continuous refinement produces a theory of high probability.

The species concept and higher taxa

Perhaps this is the central stumbling block for many, though not for biologists. Originally species were defined or described largely on the basis of their form. Thus the literature is replete with many “descriptions” of the same species as different ones largely on the basis of zeal of the individual taxonomist, and, the limited material available. This is especially the case of species of wide distribution where in one place it is given a particular scientific name while at some distant location it might be given another, all on the basis of form and non-interbreeding. A classic case of this is the herring gull and the lesser black backed gull found in western Europe. Where they meet but do not interbreed they are the ends of a circum-temperate distribution pattern of one species. Today species are considered a gene pool in which there may be variable expression of form over the range of the pool. But one essential component is that there is some gene flow between different ponds of the gene pool.



History of evolution

Notions or explanations of the diversity of life, and indeed the origins of life, have been around for at least two millennia. I do not think that it is necessary to trace this except to note that prior to Darwin and Wallace, Lamarck postulated a theory of inheritance of acquired characteristics, a theory that fell by the wayside with the publication of origin of species.

Darwin's and Wallace's theory

The theory is a picture of simplicity. There is considerable variability of form of a species and as the environment changes or varies those individuals which are better fitted to survival survive and breed and their offspring are selected out and continue to breed. Given time, species change form and become new species by this process. A species that disperses to distant or changed habitats go through the same process as it adapts to the new environment. While this is the core of the conclusion Darwin and Wallace arrived at, neither had the diverse range of scientific knowledge that is available to contemporary scientists. At the same time Darwin and scientists of his era all accepted the many tenets of religion of the time, based largely on theological considerations. Note that Darwin at one stage in his life was to join the church, and that he became agnostic in the later years of his life.

Current understandings in Evolutionary Biology

The basic understanding of organic evolution today is that of changes in the gene pool of a breeding or potentially interbreeding population of animals or plants in time, the changes being derived from natural selection, genetic drift and mutation. Darwin and Wallace, like most of the scientists of his era, accepted divine creation, and were limited by the science of the day. Darwin had no knowledge of molecular biology, biochemistry, genetics and the DNA molecule while the fossil record was not as extensive as it is today. Theirs nevertheless was the major biological milestone of the nineteenth century, comparable with the discovery of the structure of the DNA molecule in the twentieth century. It is also important to note that biologists distinguish between microevolution or the changes in the gene pools of a species in comparatively short time and macroevolution that takes place over longer periods and involves physical separation of gene pool to different localities, with adaptive radiation leading to new but related species.

The DNA molecule is a self-replicating molecule found in all living organisms and is the code that guides the synthesis of proteins that are the enzymatic and structural components of living organisms. Segments of the molecules are the genes that vary in function. Some may turn on and turn off other genes. Some may code general structure. Some may code syntheses of particular enzymes. Some may code particular structures. Some may code individual proteins. The mechanism of transferring the code is via another nucleic acid, RNA, which copies a part of the DNA molecule and triggers the particular synthesis at the cellular level. Darwin and Wallace had no knowledge of this, even though at the same time the monk Gregor Mendel with his pea crossing experiments discovered the basics of inheritance, the "gene" and the science of genetics was born. Curiously Darwin also indulged in plant crossing experiments with unrelated primulas, but having difficulties with numbers did not see the significance of his results, that were comparable with Mendel's. Humans share many genes with many different forms of life, including the humble yeast. Humans share well over 95% of their genes with the chimpanzee.



Darwin and Wallace accepted natural selection acting on the variability of species acting over a long time as the mechanism forming new species, but had no knowledge of the mechanisms of genes, genetic drift and mutation.

Scientists of Darwin's time accepted that the age of the Earth was rather greater than the accepted 6000 year calculations of Bishop Ussher using the Bible. Indeed, prior to Darwin and Wallace it was proposed by leading geologists such as Lyell on the basis of sedimentation that the Earth had to be millions of years old. It was only after the discovery of radioactivity that it became possible to date rocks accurately. The method is essentially that of measuring the rate of decay in a sample of rock through the amount of an isotope of an element remaining since solidification of the rock. No one method covers all radio-dating. Carbon dating is, for example, only useful for relatively short periods of time. Others include the Potassium/Argon, Uranium/Lead and Strontium/Rubidium, useful for older rocks. Traces of primitive life have been found in primitive rocks dating back about 2.5 million years. At the end of the pre-Cambrian period some 600 MYA, the fossil record shows the existence of all existing phyla.

The fossil record available to Darwin was comparatively scant. It is much expanded by orders of magnitude and reliable dating. There are many more sequences demonstrating clearly the relationship of the whales with hoofed animals, the seals and walrus with carnivores. Even the long held view of the origin of quadrupeds from the lobe-finned fishes is in doubt today with the discovery of aquatic precursors with webbed feet in earlier strata.

The evidence from the field of biogeography supports the fact of evolution. There are many examples from which to choose. Amongst the carnivores are for example the bears. Ask the question. Are there any bears in Australia? Or the marsupials? Are there marsupials in Europe? Or polar bears in Antarctica or penguins in the Arctic?

Comparative morphology and embryology also support the fact of evolution. Embryology in that body form and development demonstrates affinities. Vertebrates all have common features. The different types of vertebrates all have characteristics that identify them as fishes, amphibians, reptiles and birds. Mammals all have structural features in common with the group, yet they are as different in form as a vampire bat and blue whale. Reptiles, birds and mammals all have a common embryological developmental pattern. And I doubt that anyone in the audience would be able to distinguish between a chick and a pig or a pope at the early stages of embryological development.

Current understanding of human evolution

Many may not want to accept it but we belong to an order of mammals called the Primates. This Order shares with two others, the insectivores and the chiroptera (bats), many anatomical features, such as dentition and appendages. The primates include some primitive primates, the lemurs, lorises and tarsiers, the old world monkeys, new world monkeys, apes and man, all in taxonomically designated families. The apes fall in the family Pongidae while man is placed in a separate family, the Hominidae, but many biologists agree that it is vanity and history that separate man from the modern apes, a grouping that on the basis of genetic closeness might better be placed in a single primate family. There is now a considerable fossil record, in some cases including even an entire skeleton, that traces human evolution backward to perhaps 3 MYA



when hominids diverge from the common line of the anthropoid apes. Darwin knew only *Homo sapiens* and *Homo neanderthalensis* and naturalists of the day were all looking for the “missing link” between man and apes. Of course, they were looking in the wrong place. Africa holds the key and there is now a series of transitional forms of hominids in the series *Sahelanthropus* – *Australopithecus* – *Homo*, with more than one species in the later series. One thing is clear. Bipedalism arose earlier than larger cranial capacity. Perhaps the most startling fossil find was of a miniature *Homo* species a few years ago on an island in the Far East, a different species that co-existed with *H. sapiens*, not necessarily in the same space.

Some Examples of evolution in action before one’s eyes

There are many examples that may be used to illustrate the phenomenon of evolution in action or microevolution. The peppered moth, *Biston betularia*, is one such example illustrating the effects of a changing environment and natural selection on the gene pool of a particular species. The species is a common moth that is found in Europe. It occurs in two forms, the peppered form, a whitish mottled form and a melanistic or black form. The frequencies of these forms over their range are skewed depending on the colour of the background on which it rests. In industrial areas darkened by soot and grime the melanistic form is the more abundant. In country areas not so affected the peppered form is more numerous. But what is significant is that once an industrial area has been cleaned up the frequencies of the melanistic form are reduced. All this within a few decades!

But there are many more, to be seen. Finches, fish, bacteria, domestic animals, several plants, bacteria, viruses. The evolution of the various “breeds” of domestic animals is selection, albeit artificial. One local example of note is the blind cave fish of Cumaca Cave in northeast Trinidad. The frequencies of the eyeless form have declined since they were first discovered a few decades ago. They have now virtually disappeared as a consequence probably of genetic drift. These are examples of microevolution. Both microevolution and macroevolution may be seen today in the short-term changes of beak size in individual Galapagos finch species, as well as their longer-term adaptive radiation of finches in the islands.

Creationism

Creationism, Creation and sometimes Creation Science are all the same thing. Basically, creationism is founded on a central acceptance that all species are created by “God” as described in the Hebrew Bible in the Book of Genesis. Other religions and cultures also have their notions, some of which may differ in detail from Genesis. There are nevertheless many other myths of creation. In the Christian churches there is some diversity in interpretation of the writings of the Hebrew Bible. Some at one end of the spectrum consider that everything written in the Bible must be taken literally, like Jonah or the Ark. Others at the other end of the spectrum accept that the Bible must not be taken literally but support the central thesis of Genesis of creation of the universe, our solar system including the planet earth and all living organisms on it. Between them there is a range of acceptances.

The modern creationist movement is essentially a product of the right wing Christian fundamentalists of the United States of America and its public proponents use a comparatively common approach, aimed largely at discrediting “Darwinism”, consisting of a few select



distorted arguments. The most common are the age of the earth, select and partial quotations from Darwin, similar select quotations from contemporary scientists attempting to demonstrate uncertainty amongst the top evolutionary biologists, some questions whose answers are beyond their comprehension, the supposed conflict with the second law of thermodynamics, the failure to create life, and, of course, the lack of “transitional” fossil forms. One extreme claim is that there is a site where human footprints are found beside dinosaur tracks on the same sedimentary rocks proving that they co-existed – unfortunately they will not say where this may be seen.

All of this can easily be dismissed. Radio-dating of rocks employing different methods and different minerals indicate greater ages. The Cretaceous/Tertiary boundary has been measured at about 65 MYA. Partial quotations are that – partial quotations taken out of context. Evolutionary biologists do in fact have differences, many of these being articulated publicly. This is the norm of scientific enquiry and as more data becomes available differences disappear. The supposed violation of the second law of thermodynamics, which states that that entropy of a closed system (the degree of disorder of the system) is that it cannot decrease. This demonstrates misunderstanding of thermodynamics. The Earth is not a closed system but is constantly fed energy from the sun, enough to drive the increasing order of living systems. It is strange that the argument of failure to create life is employed. While scientists have from time to time thought of this it is not a major thrust. Scientists have nevertheless synthesized simple macromolecules *in vitro* employing electrical discharge in a reducing atmosphere of ammonia, methane, carbon dioxide and water vapour. Perhaps the most perplexing is the misunderstanding and distortion of what are considered transitional fossil forms. As noted above palaeontology records numerous series, including horses, whales and hominids, as well as other vertebrates, and invertebrates.

The most significant point to emphasize is that creationism seeks to discredit Darwin who developed the theory of organic evolution almost 150 years ago, and not current developments in the field since Darwin's time.

Intelligent Design

The idea of intelligent design is not exactly new. Long before Darwin there was the notion of some sort of supernatural or cosmic designer responsible for all “creation”. Indeed, about two hundred years ago, long before Darwin, the Anglican theologian, William Paley, proposed the watchmaker analogy. Hence, Richard Dawkins' *Blind Watchmaker*. You find a watch in a field and you must conclude designing human intellect. You see a living animal in the same field and you must conclude a supernatural creator. The contemporary intelligent design proponents use the same approach changing the components of the argument and use some, and only some, scientific facts to pose their theory. But any argument of an intelligent designer, entity, body, source or whatever, must logically accept that the diversity of the taxa could also lead to a supposition that there may have been a designer for each kingdom, phylum, class, order, family, genus or even species. Logically also each intelligent designer might also have a super intelligent designer and it another designer *ad infinitum*. Whatever the intelligent design movement is, it is certainly not science that is universal and certainly creates knowledge, subject to critique and correction. Intelligent design is simply another morph of creationism, and a political expression of one large group of a rightwing Christian grouping in the United States of America. Another rightwing Christian grouping, the Roman Catholic Church through the chief astronomer in the



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Vatican has dismissed the movement as not being science, and just pretending to be science. The Vatican has had a lot of experience in this area. Teach it where you want it says, but not in science classes, a view I share. The Church was burnt in the past.

Conclusion

Evolution theory and fact is strongly supported by the wide range of evidence from diverse branches of science. Creationism and intelligent design is religious belief and not science, is unable to contest the scientific evidence, and above all is not accepted by all religions including Christian religions. It is a product of American Christian fundamentalism and is essentially a political statement, exploiting gullibility and fear of a particular people for political power. The historical fact of the mutual slaughter of adherents of the three monotheistic religions, as well as others, over centuries can only point to lousy design. Extinction of species? Lousy design! HIV and other horrors – intelligent punishment!

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