

Scientific Inquiry in Public Schools

**A Research Project Submitted to the Faculty of the
Department of Education: Curriculum and Instruction**

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Portland, Oregon

July 1, 1996

Introduction

Since Charles Darwin published *The Origin of Species* in 1859, Christian Fundamentalists have waged war against its evolutionary teachings. In 1925, fundamentalist and evolutionist forces first clashed in court at the criminal trial of John Scopes. The Tennessee schoolteacher was convicted of violating a state law prohibiting the teaching of evolution, hence the anti-evolution law was upheld by the Tennessee Supreme Court (Scopes v. States). Forty years after the Scopes trial the United States Supreme Court in *Epperson v. Arkansas* concluded that the prohibition concerning teaching evolution in public schools violated the first amendment (Epperson v. Arkansas).

Recognizing that the courts will not allow the teaching of evolution to be suppressed, Christian Fundamentalists no longer attempt to eradicate the instruction of evolution in public schools. Instead they have adopted a strategy to require equal time for their creationistic views regarding the origins of matter and life to be presented in the classroom. Creationists argue that evolution is an inadequate explanation of human presence on earth. They contend that scientific evidence supports creationism equally as well as it does evolution, and therefore must be given coequal time in public school instruction.

A flurry of legislative and judicial actions in the 1980's has not slowed or altered creationists' zeal to influence science instruction in the public schools of our nation. This has become an increasingly significant issue for educators, who are often pressured to present a model of origins that reflects the beliefs of the school community.

Despite the established place of evolution in modern science, the teaching of evolution remains controversial in many school districts throughout the nation. Organizations such as the *Institute for Creation Research* and the *Creation Research Society* seek to change public school curricula, so that their account of origins, "scientific creationism", is taught side by side with evolution. On the local level pressure will continue to be exerted on school boards to adopt the two-model approach through legislation, administrative actions and textbook adoptions.

The controversy surrounding the teaching of origins in public schools is a confusing tangle of emotion, debate, legislation, and litigation. The purpose of this document is to

help clarify the issues, examine the Creationist arguments, and give direction to the problem of teaching origins in the public school curriculum.

Legal History

The religion clauses of the First Amendment of the United States Constitution places two significant limitations on Congress and state legislatures. The first amendment mandates that government "shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof." The establishment clause originally was intended to be a guarantee of the separation of church and state, furthermore it has been interpreted to mean that government must remain neutral regarding religion. The free exercise clause prevents regulation or significant burdening of an individuals religious beliefs (Levit, 1985).

On March 19, 1981, the Governor of Arkansas, Frank White, signed Act 590, a bill entitled the "Balanced Treatment for Creation-Science and Evolution-Science Act" (Ark. Stat. 1981). The primary requirements of the Act were that public schools give equal time to the theories of evolution and creation in addition to providing library materials, textbooks, and other educational materials that give balanced treatment to the two theories.

Creationists argue that the teaching of evolution alone is an establishment violation, because it promotes the religion of secular humanism in addition to denying their free exercise rights by not allowing the teaching of creationism. In response, evolutionists refer to the United States Supreme Court decision in *Epperson v. Arkansas* to argue that evolutionary theory is purely scientific and therefore not religious, and that the teaching of creationism in tandem with evolutionary theory is an establishment of Fundamentalist Christian religion (Levit, 1985).

A law suit was filed on May 27th, 1981, in the United States District Court for Eastern Arkansas, challenging the constitutionality of Act 590. The plaintiffs argued that the bill constituted an establishment of religion and that the Act interfered with academic freedom. The defendants responded that the Act did not foster excessive entanglement between the state and religion, and that the bill actually advanced academic freedom by giving students the opportunity to learn about two model of creation (Levit, 1985).

In 1982, the Arkansas federal district court set an important precedent reference for creationism cases. *McLean v. Arkansas Board of Education* rendered a court ruling on the validity of balanced treatment legislation and a legal definition of science. The decision reduced the creationism debate to a simple interdisciplinary proposition: if creation theory is scientific, it passes constitutional muster and may be taught in public school science classes; if creationism is nonscientific, its primary purpose is probably religious and therefore it is a violation of the establishment clause to teach the creation model in public school science classes (Levit, 1985).

The essential characteristics of science as defined by the court are as follows: (1) It is guided by natural law; (2) It has to be explanatory by reference to natural law; (3) It is testable against the empirical world; (4) Its conclusions are tentative....; and (5) It is falsifiable (Ark. Stat., 1981).

In examining the Act's definition of "creation science", Judge William R. Overton found that the statute's account of creation science, which included a theory of the sudden creation of man, occurrence of a world wide flood, and concepts concerning a supreme being that are inherently religious, has as its unmentioned reference the first eleven chapters of the Book of Genesis. Judge Overton concluded that the language of Act 590, which included references to a worldwide flood and a supernatural creator to explain the origin of man, failed as science because it could not be explained by reference to natural law, was nontestable and nonfalsifiable: "Since 'creation science' is not science, the conclusion is inescapable that the only real effect of Act 590 is the advancement of religion." (Overton, 1982)

The defendants argued that the teaching of evolution alone was a violation of the establishment clause, because evolution promoted the secular humanist religion. The court noted that if creation science is science and not religion, as the defendants claim, it is difficult to see how the teaching of a science could neutralize the religious nature of evolution. The court also pointed out that if evolution were a religion the remedy would simply be to stop teaching evolution (Levit, 1985).

Finally, the defendants urged that creationism should be taught in public schools, because the majority of Americans thought it should be taught if evolution was taught. The court rejected a majority rule theory noting that the application and content of the First Amendment principles are not determined by public opinion polls or by majority vote. Thus, the court granted an injunction permanently prohibiting enforcement of the Arkansas Balanced Treatment Act (Overton, 1982).

In 1987, the United States Supreme Court held unconstitutional Louisiana's "Creationism Act". This statute prohibited the teaching of evolution in public schools, except when it was accompanied by instruction in "creation science". In *Edwards v. Aguillard* the court established that by advancing the religious belief that a supernatural being created humankind, which is embraced by the term "creation science", the act impermissibly endorses religion (Edwards v. Aguillard, 1987).

In summary, school officials may not prohibit the teaching of evolutionary theory. (Epperson v. Arkansas, 1967), neither can they require science teachers give equal time or weight to evolutionary theory and scientific creationism (Edwards v. Aguillard, 1987). Similarly, a total ban on all discussions of human origins would be unconstitutional, because the Constitution does not forbid teaching about religion. Consequently, there is no objection to teaching a course on origins, provided that religious theories of human origins are identified as such, not classified as science, and not endorsed by the school (Oregon, 1988).

While South Carolina's Attorney General has determined that science teachers may discuss creationism in their classes (South Carolina, 1989), the Tennessee Attorney General has ruled that discussion of creationism or other religious theories may not take place in science classes, however science teachers may state that some religious groups disagree with the theory of evolution (Tennessee, 1988).

In *Webster v. New Lenox School District* the court found that a school district may prohibit an instructor from teaching "creation science", in fulfilling its responsibility to ensure that the First Amendment's establishment clause is not violated, and religious beliefs are not injected into the public school curriculum. The court upheld a district court finding that the school district had not violated teachers free speech rights when it prohibited the teaching of "creation science", since it is a form of religious advocacy (*Webster v. New Lenox School District*, 1990).

In *Peloza v. Capistrano School District* the court upheld a district court finding that a teacher's First Amendment right to free exercise of religion is not violated by a school district's requirement that evolution be taught in biology classes. Rejecting the plaintiff's definition of "evolutionism" as being a religion, the Court found that the district had simply and appropriately required a science teacher to teach a scientific theory in biology class (*Peloza v. Capistrano School District*, 1994).

The New Fundamentalist Tactic

Many educators maintain that the theory of evolution should be included in science textbooks as the sole explanation for origins, and if the theory of special creation is taught at all, it must be restricted to social science classes. Fundamentalists claim that neither evolution nor creation qualifies as a scientific theory, because they have never been witnessed by human observers. Both theories are not subject to the experimental method, and therefore both are non-falsifiable. They claim evolutionary theory is no more scientific than creation theory and both are only validated by their ability to accurately correlate and explain historical data such as the fossil record. The Fundamentalists also state that if creation must be excluded from science in public school, because it requires a Creator, which is inherently religious, then evolution must also be omitted, because it is atheistic, which is also a religious belief (Gish, 1981).

Dr. Henry Morris of the Institute for Creation Research states, "Creation is just as much a science as is evolution, and evolution is just as much religion as is creation... The two-model approach is the fair and balanced presentation of evidence and arguments both pro and con relative to both models of origins." (Creation Science Research, 1980)

Dr. Gish, Associate Director of the Institute for Creation Research, states in his book *Creation, Evolution and Public Education*:

"This rigid indoctrination in evolutionary dogma, with the exclusion of the completing concept of special creation, results in young people being indoctrinated in a non-theistic, naturalistic, humanistic religious

philosophy in the guise of science. Science is perverted, academic freedom is denied, the educational process suffers, and constitutional guarantees of religious freedom are violated."

Currently, fundamentalists are still pressuring state textbook selection committees to adopt texts that present creationism as a scientifically valid theory. Creationists have moved from arguing that evolutionary theory is religious to arguing that both evolutionary theory and creationism are equally scientific and protected under the First Amendment and Fourteenth Amendments of the U.S. Constitution and the Civil Rights Act of 1964 (Creation Science Report, 1980). Teachers are being coerced by their constituent communities to include creationism in their science classes. In essence, fundamentalists are continuing to attempt to get creationism into public school curricula on the grounds of academic freedom regardless of past court decisions invalidating equal treatment laws.

The Creationist Position: Biblical/Historical Perspective

When one looks at the myths of the cultures surrounding the Hebrew nation during Biblical times, one senses that the current debate over creationism would have seemed very strange, if not unintelligible, to the writers and readers of Genesis. The critical question that the book of Genesis answered for the Jews was polytheism versus monotheism. The identity of Yahweh as the one true Creator God was the burning issue of the day, because every nation surrounding Israel, both great and small, was polytheistic; including many of the Jews themselves (Waldo, 1985). For the ancient Jewish faith a divinized nature posed not only a fundamental religious problem, but a national threat to the identity and existence of the Hebrew people.

For the historic Jews, the issue was idolatry, not science; theology, not chronology; affirmation of faith in one transcendent God. Therefore, the primary question answered by the book of Genesis is theistic and not scientific. Fundamentalists, who have attempted to remain loyal to the Bible by turning the Genesis creation account into a kind of science or literal history, have not done justice to its original intent. They have persisted in keeping the theory of creation in the public consciousness, because the issue of origins is tantamount to their identity. Like the Jews of ancient Israel, many Christians see the issue of creation vs. evolution as a piece of the larger cosmic struggle between good and evil. They contend that social actions are based on beliefs, and the collective actions of groups and societies are based on their collective beliefs. Therefore, our world view, if based on evolutionary natural selection, will change our view of truth and ethics. Fundamentalists see evolution as a philosophy that eliminates God and produces a purposeless world without moral direction that will destroy humanity through its justified evil (Mitchell, 1994).

The religious movement known as Fundamentalism began in nineteenth century America as part of evangelical Protestantism's response to social changes, new religious thought, and Darwinism. Fundamentalists viewed these developments as attacks on the Bible and responsible for a decline in traditional values. Following World War I, Fundamentalism

took action with legislation aimed at the prohibition of teaching evolution in public schools, because they felt it was responsible for the nation's moral decay. In the 1960's, there was another resurgence of concern among Fundamentalists about the loss of traditional values and growing secularism in society. This was followed by the introduction of "scientific creationism" as a method of saving the nation through the teaching of Biblical creationism in public schools (Overton, 1982).

Fundamentalist Christian believers will never surrender creationism on the altar of evolution, because they believe the issue of special creation is a distinctive sign of their allegiance to their Creator God. In fact, many fundamentalists believe that the issue of origins will be extremely significant in the "final days" of earth's history, because the apocalyptic prophecy of the Bible in Revelation 14: 7, states: "... worship him that made heaven, and earth, and the sea, and the foundations of the waters." Hence, Fundamentalist Christians will continue to pursue the issue of origins teaching in public schools regardless of governmental laws, because they believe it is their duty, ministry, and responsibility to serve a higher law, that of the Creator of the universe.

Scientific Case for Creationist Theory

Although the *McLean* court concluded that creationism is not scientific, because it is nontestifiable and nonfalsifiable, creationists insist there is scientific evidence to support their theory. Creationism depends upon the assumption that a supernatural creator exists who constructed and maintains the universe. The problem with this faith assumption is that it is not susceptible to scientific observation or testing, yet creationists still insist that science can be used to support their views of origins, and that evolution is just as much religion as creation is science.

Although Darwin's thesis has undergone modification and revision, virtually the entire mainstream scientific community accepts evolution as the most valid theory of origins. The opposing view, scientific creationism, that has been espoused by a few isolated research centers and institutes is almost totally without standing in recognized scientific circles. This is probably because their research is directed toward the discovery of inconsistencies in the data supporting evolution, and the publication of arguments for the creationist viewpoint. Their work is not research in the traditional scientific sense, because it involves no direct observation or experimentation and is not subjected to peer review by the entire scientific community.

It has been noted by the *McLean* court that creation scientists often search to find support for the literal wording of the Genesis account in existing data, rather than conducting empirical research to test their hypothesis. The creation model has many variations, but for this discussion scientific creationism advanced by the *Institute for Creation Research* will be presented, because this is the Fundamentalist approach addressed by legislative attempts in the political arena. Scientific creationism includes the following theories:

- 1) The universe and the solar system were suddenly created.

- 2) Life was suddenly created.
- 3) All present living kinds of animals and plants have remained fixed since creation, other than extinctions, and genetic variations in originally created kinds has only occurred within narrow limits.
- 4) Mutation and natural selection are insufficient to have brought about any emergence of present living kinds from a simple primordial organism.
- 5) Man and apes have a separate ancestry.
- 6) The earth's geologic features appear to have been fashioned largely by rapid, catastrophic processes that affected the earth on a global and regional scale.
- 7) The inception of the earth and of living kinds may have been relatively recent.

The scientific model of creation, in summary, includes the evidence for sudden creation of complex and diversified kinds of life, with systematic gaps persisting between different kinds, and with genetic variation only occurring within each kind (Gish, 1981).

No doubt a majority of the scientific community embraces the mechanistic, natural processes of evolutionary theory as the only logical explanation of origins, but 85% of Americans share the view that the world is a product of a divine creator (U.S. News and World Report, 1991). The media often portrays evolution as the school of thought that individuals should adhere to, primarily because most, though not all, scientists believe in it. While it is acceptable to believe in a God as the driving force behind the universe, creationists are pictured as obstructions, who would do significant harm to the scientific educational process in this country if allowed to teach creationism in our public schools (Pullum, 1993).

It is commonly believed that the theory of evolution is the only scientific explanation of origins and that the theory of special creation is based solely on religious beliefs. It is also widely accepted that the theory of evolution is supported by such a vast body of scientific evidence, and encountering so few contradictions, it should be accepted as an established fact. Yet, Fundamentalists claim a growing number of scientists are becoming convinced that there are basic contradictions between evolutionary theory and empirical scientific data as well as known scientific laws (Gish, 1981).

Is there scientific evidence to substantiate the creationists' claims of special creation? The *Institute for Creation Research* would like us to think of their position as a trustworthy scientific explanation of origins.

Following is a somewhat lengthy summary of arguments used to support creationism from a scientific position. It is included here to serve a reference and resource for those dealing with the Fundamentalist position of scientific creationism as a valid theory for origins.

Origin of the Universe

Why does matter exist? Where did it come from and for what purpose? Evolution assumes that matter is somehow self-existent, whereas creation directs matter for a purpose. Many features of our universe reveal evidence of design. Comparing the order, design and arrangement of the solar systems and galaxies to that of the atoms, molecules and the unique patterns in nature reveals a significant organization that attests to an intelligent Creator (Coffin, 1969).

The Big Bang theory is refuted by the following astronomical evidence and observations:

A) If the original super-dense mass was of the size hypothesized by the Big Bang theory, it would have collapsed rather than explode, because the force of gravity would be so great that even light photons could not escape. It would become a black hole, thus the whole idea of original mass is doubtful (Mitchell, 1994).

B) Edwin Hubbles 'red shift' discovery in 1924, may be due to the mutual collisions of photons and the depletion of their energy when acting over long distances or to the decrease of the speed of light (Kofahl and Segraves, 1975; Norman and Setterfield, 1987).

C) Radio telescopes show that some quasars appear to expand at two or three times the speed of light even though the Theory of Relativity states that nothing can exceed the speed of light. Therefore, if the quasars are actually at the distances indicated by their red shifts, this would be an unreliable method of astronomical measurement, and would bring into question of whether and how much the universe is expanding (White, 1978).

D) The Big Bang theory would indicate that the chemical composition of stars should change considerably with time as they evolve from one type to another, but the spectra of a variety of stars of widely different supposed ages shows their atmospheric composition to be relatively similar to our Sun. The most reasonable explanation is that all were formed at the same time several thousand years ago, and there has not been enough time for differences in chemical composition to take place (Slusher, 1974; White, 1978).

E) Today's background radiation in the universe is 2.8 degrees Kelvin, known as "3 K radiation". If it is the residue of the Big Bang from the early period of rapid expansion, it must show inhomogeneities if galaxies were to form. This has not been observed. The 3 K radiation is very homogeneous at all scales and this poses a serious problem for the Big Bang theory (Mitchell, 1994).

F) In the formation of our solar system it is assumed that particles would stick together as they collide, but this does not occur in any known situation. It is difficult to conceive that rotating eddies of dust could have survived long enough to condense into planets before they would have disbursed or fallen into the Sun.

Since the Sun makes up 99.8% of the mass of the solar system, what mechanism preserved the other .2% from the becoming part of the Sun and forming into planets? Why does the Sun with over 99% of the mass of the solar system have only 2% of its angular momentum (spin)? How does one explain the fact that planets such as Uranus and Venus have retrograde rotations in relation to the direction of their orbits if they supposedly came out of the Sun's original rotating mass (Mitchell, 1994).

G) Current theories can not explain the existence of comets, because the vaporized matter in their tails is lost at a rate which would end the life of all comets in approximately 100,000 years (White, 1985).

H) The composition of the planets is substantially different from the Sun, therefore they must have had a different origin. Only about 1% of the Sun's mass consists of any elements except hydrogen and helium, while on Earth and the other planets these elements are minor constituents. The Big Bang theory claims that all elements were built up in the first few minutes, and the fleeing matter thereafter formed stars, planets, and galaxies. If neutron capture was the process by which elements were built, as has been suggested, it is not clear how atoms could build up past helium in the absence of any stable atom of a mass of 5 or 8 (Fowler, 1956).

I) According to the Big Bang theory the Earth is about 4.5 billion years old. This means that the layer of meteoric dust on Earth should be 16.5 meters thick, but only some 9,000 years' accumulation is found in the oceans and the moon has only 2.5 centimeters. More fundamentally, all dust in the solar system should long ago have disappeared into the Sun, whose gravity causes particles in space to slow down and fall into it. This sweeping effect would at present rates have cleared the whole solar system of dust as far as Pluto in 2.5 million years (Morris, 1983; White, 1978).

J) Research by Norman and Setterfield suggest that the speed of light has decreased over time. Their computer models suggest that the universe is about 6000 years old. Because radioactive decay rates are a function of the speed of light, their research could have far reaching implications for radiometric dating, red shift measurements, fossil transport constants, and astronomical observations (Norman and Setterfield, 1987).

Summary: The First Law of Thermodynamics states that the total quantity of matter and energy in the universe is constant. The Second Law of Thermodynamics states that matter and energy always tend to change from complex ordered states to disordered states. Therefore, the universe could not create itself, and could not have existed forever, or it would have run down long ago. The universe, including matter and energy, apparently must have been created. The Big Bang theory of the origin of the universe contradicts much physical evidence and seemingly can only be accepted by faith (Slusher, 1978).

The Origin of Life

It is impossible to reproduce the conditions that existed during the early stages of Earth's development. We have no reliable evidence that documents those conditions, therefore any laboratory experimental conditions that attempt to duplicate the "primeval soup" would be purely speculative. Although laboratory experiments have shown that it is possible to synthesize simple organic molecules in a hypothetically primeval atmosphere, those molecules do not even remotely approach the synthesis of life from non-living matter (Gish, 1981).

The gap between primeval soup and a single living cell is immense. The simplest cell has an enormously complex overall chemical plan that is basically the same for all living organisms. There is no evidence of biologically transitional groups of organic life forms that preceded the vast complexity of the simple cell. At a molecular level each class is unique, isolated, and unlinked by intermediates. Cellular origin by natural inorganic processes would involve an inconceivably unlikely feat of self-organization in a very brief period of time and the chances of this occurring by random processes are negligible. Nothing in our knowledge can lead us to believe that primeval matter had or could develop the properties of living things (Mitchell, 1994).

A final consideration concerns the atmosphere surrounding the hypothesized primeval soup. It is thought that an essential condition for the generation of life from non-living matter would require a reducing atmosphere, because oxygen would quickly have oxidized any organic molecules formed. Geological investigation confirms that the Earth's crustal rock is highly oxygenated, and there is no evidence today that plant life can arise from anaerobic photosynthesis. Any development of life beyond the first cell would have required an abundance of oxygen to build further living cells and to provide an ozone layer to filter out destructive ultraviolet radiation from the Sun. It is not possible to have anaerobic blue-green bacteria produce the necessary amount of oxygen quickly enough to prevent the ultraviolet rays from sterilizing any living matter, and had ozone been abundant in the atmosphere previously, it would have shielded the Earth from the ultraviolet rays which are thought to have provided the energy for the process of chemical evolution. Therefore, the chance of life originating from non-living matter by natural processes amounts to an impossibility (Zimmerman, 1971).

Geological Considerations

Geology was the first science to adopt the uniformitarian view of Earth processes. The geological column shows about five major episodes of tectonic upheaval followed by a similar number of quiescent phases of sedimentation. Although the uniformitarian view would accord this process many millions of years, there are a number of reasons why a history of only several thousand years punctuated by a universal deluge is more credible.

Arguments for a relatively young Earth are based on the rate of ejection of lava and water from the Earth's interior, the rate of accumulation of salt in the sea, the high proportion of turbidities among sedimentary rocks, the shallowness of the ocean floor deposits, and the

relatively rapid rate at which they can accumulate. Indications for diluvial action are the ubiquity of marine deposits, the wide geographical extent of some sedimentary layers, the characteristics of coal and chert beds, and the rapid burial and perfect preservation of specimens by huge sedimentary deposits (Mitchell, 1994).

The geological record provides abundant evidence that past Earth processes were substantially different from those of today. The following explanations are the scientific evidences used to support the claim that the Earth's age is much younger than current evolutionary theory allows.

Volcanic Crustal Accretion: At the current rate of lava outflow, the Earth's total crust could have accumulated in about 500 million years. The outflow has been atypically low since the 16th century, consequently the actual time required would have been much less. Also, volcanoes yearly add 4.2 cubic kilometers of water to the Earth's oceans. By this action alone, the Earth could be no older than 312 million years, however it is actually less due to non-volcanic water sources (Mitchell, 1994).

Ocean Salinity: At current deposition rates, to accumulate the present oceanic content of sodium would require 49 million years, and to accumulate the current chlorine content would take about 92 million years (Morris, 1974). This does not allow for any of these elements to have been present in the primordial oceans, which would further shorten the calculated times. Salt loss cannot be due to normal chemical precipitation, because the oceans are not supersaturated with either of the elements. Assuming the age of the Earth is 4.5 billion years, we would therefore have to assume that 99% of all the sodium and 98% of all the chlorine ever added to the seas has been removed from them in sediments, rock salt beds, or fossils, but we find no geological evidence to support this concept (Fox, 1952).

Seabed Sedimentation: The evolutionary view maintains that the continents have been in existence for about 1 billion years. At current erosion rates it would take 11 million years to erode all existing continents into the ocean. This suggests that continents should have been reduced to sea level by erosion at least ninety times, which is grossly at variance with known geological evidence. Geology recognizes only about four major cycles of erosion and deposition on a continental scale, none of which completely leveled pre-existing mountains. If during the one billion years of ocean-floor deposition only 3% of the expected sedimentation is present, even allowing for the recycling of sediments, either erosion rates must have been orders of magnitude less in the past, or the Earth must be much younger than current evolutionary theory allows (Nevins, 1990).

Rapid Natural Processes: Catastrophic events have characterized the earth's history. Huge floods, massive asteroid collisions, large volcanic eruptions, devastating landslides, and intense earthquakes have all left their marks on the earth. These events appear to explain the formation of mountain ranges, deposition sequences of sedimentary rocks with fossils, initiation of glacial ice ages, and mass extinction of dinosaurs and other animals. Uniform processes such as normal river sedimentation, small volcanoes, slow

erosion, and small earthquakes appear insufficient to explain large portions of the geologic record (Gish, 1973).

Marine Deposits: Recent research has tended to increase the proportion of sediments that are assigned a marine origin. The wide extent of some deposits are indicative of marine rather than of river born origin. The Shinarump Conglomerate is a water-laid sediment about 30 meters thick covering an area of 250,000 square kilometers in Utah, Colorado, Arizona, and New Mexico. A river could not have spread deposits this widely. This is also true of the Chinle Formation, which cover 450,000 square kilometers. These, as well as the larger Dakota and Morrison Formations, could only be the result of a global catastrophe, because there are no analogous sedimentary formations occurring in modern times that correlate with the magnitude of these deposits (Brand, 1976).

Coal Deposits: Coal formation has been traditionally ascribed to the slow burial of peat on land, but it is more likely to have originated as a result of rafting and burial under flood conditions. Brown coals, such as the German lignite, often show a delicate preservation of plants, animals, and insects. These are sometimes in fresh condition evidenced by chlorophyll that is still green and beautifully preserved insects. This indicates that they must have been entombed in an aseptic medium suddenly and completely or they would have decayed or changed in color within minutes (Coffin, 1983). Also, the thickness of coal seams are too great to be derived from terrestrial peat. A seam 10 meters thick would require 100 meters of peat, and these accumulations are not currently found anywhere on earth. Some coal beds in Australia are 240 meters thick, which would require an impossibly thick accumulation of peat. The size and depth of this world's coal deposits could only reasonably be created by a global flood condition (Morris, 1974).

Fossil Evidence: The fossil record is actually hostile to the evolution model, but conforms remarkably well to predictions based on the creation model. Complex forms of life appear abruptly in the fossil record in the Cambrian sedimentary deposits. Although these animals, which include such highly complex and diverse forms of life as brachiopods, trilobites, worms, jellyfish, sponges, sea urchins, sea cucumbers, as well as other crustaceans and mollusks, supposedly required about two or three billion years to evolve, not a single ancestor for any of these animals can be found anywhere on the face of the earth (Gish, 1973).

The remainder of the fossil record reveals a remarkable absence of the many transitional forms demanded by the theory of evolution. Gaps between all higher categories of plants and animals are systematic and almost always large (Simpson, 1960). Richard B. Goldschmidt, well-known geneticist and evolutionist, acknowledged that "practically all orders or families known appear suddenly and without any apparent transitions"(Goldschmidt, 1952). E.J.H. Corner, Cambridge University botanist and evolutionist, stated, "...I still think, to the unprejudiced, the fossil record of plants is in favor of special creation" (Corner, 1961). David B. Kitts, evolutionary paleontologist, states, "Despite the bright promise that paleontology provides a means for seeing evolution, it has presented some nasty difficulties for evolutionists, the most notorious of

which is the presence of 'gaps' in the fossil record. Evolution requires intermediate forms between species and paleontology does not provide them..." (Kitts, 1974).

In 1981, Harvard evolutionist Steven J. Gould testified before Judge Overton in the Arkansas Creation-Evolution trial stating, "The fact of evolution is supported by a rather well formed sequence of intermediate stages in the fossil record." However, Dr. Gould stated in the May 1977 issue of *Natural History* magazine, "The extreme rarity of transitional forms in the fossil record persists as a trade secret of paleontology. In any local area, a species does not arise gradually by the steady transition of its ancestors, it appears all at once and fully formed." The evolutionist Dr. Steven M. Stanley put it bluntly, "The known fossil record fails to document a single example of phyletic evolution accomplishing a major morphologic transition." (Stanley, 1981)

Fossil Preservation: An indication of rapid marine deposition characteristic of a global flood is the remarkable concentration and delicate preservation of many fossils. The Devonian Old Red Sandstone strata in Scotland contain fossil specimens that are so well preserved that their color is still evident. The sudden destruction of the fish within this 10,000 square mile strata is apparent by the marks of violent death. Their figures are contorted, contracted, curved, some with spines sticking out and fins fully spread that would suggest a quick brutal death, yet there is no evidence of predatory activity or bacterial decomposition. Other deposits reveal the delicate preservation of insects, jellyfish, and microscopic protozoa, therefore their entombment must have been accomplished swiftly by a massive amount of sediment (Nevins, 1975; Wheeler, 1978).

Fossil Sequence: It is generally assumed that the sequence of sedimentary layers in the earth's crust represents the evolution of life over millions of years. The creationist explanation for the order and arrangement of the geologic column claims there were no time gaps between sedimentary layers, the deposition was continuous, and that the fossils do not represent an evolutionary sequence, but are contemporaneous (Burdick, 1974).

The theory of ecological zonation is used to explain the sequential order and arrangement of the fossil index. Simply stated, the plants and animals of the pre-flood world were buried approximately in the biotic communities in which they lived (Coffin, 1969). Evidence to support that fossils are not in an evolutionary sequence include: rocks from the Precambrian upwards contain pollen and spores from spruce, hemlock, and fir; older rocks overlie of younger without apparent nonconformity or disturbance that invert the fossil sequence; the fossil sequence represents the distribution of ancient biotic life zones (Lammerts, 1984).

Mass Extinctions: Sudden appearance and stasis of species in the fossil record coupled with evidence for mass extinctions of entire phyla of plants and animals is the opposite of what Darwinian theory would predict. The fossil record shows a history of extinction dominated by global catastrophes rather than gradual evolutionary obsolescence. This creates a huge problem for those proposing gradual and continuous evolutionary change (Johnson, 1993).

Coral Reefs: It is sometimes noted by evolutionists that the formation and burial of coral reefs is inconsistent with the short biblical chronology. However, the total mass of material in a reef is a function not only of time but also of numbers of corals. A new reef established in Krakatoa after the eruption of 1883 grew at the rate of four centimeters a year. This rate of growth could certainly account for most of the coral reef deposits found around the world during the few thousand years since the Deluge (Whitcomb and Morris, 1974).

The Earth's Magnetic Field: It has been confirmed both by field observations and satellite observations that the Earth's magnetic field is decreasing. This decay has a half-life rate of 1,400 years, therefore it would have been many times as strong only a few thousand years ago, and values beyond 10,000 years would exceed a reasonable estimate for any planet, thus confirming a young aged Earth. Also, evidence that polarity reversals are both rapid and local argue against the idea of an old Earth (Barnes, 1981; 1983).

Radioactive Dating Methods

To determine the age of a rock from its contained radioactive materials, the geochronologist must know three things: 1) the relative amounts of parent isotope and daughter products at the time of the formation of the rock; 2) the rate at which the daughter material is formed from the parent material; 3) the relative amounts of parent isotopes and daughter products in the sample. Even if the present rate of radioactive decomposition can be determined, it is necessary to assume that it has been constant in the past. The geochronologist must make an assumption about relative proportions of parent and daughter material present when the rock was formed, which can never be more than a guess (Mitchell, 1994).

Radioactive decay methods involving lead are subject to error, because the minerals tested normally have much lead and only a little uranium or thorium. It is also difficult to ensure that the samples have not been contaminated by chemical change since their formation. Leaching of both uranium and lead is common (Acree, 1971). The same difficulty applies to helium, another decomposition product, which is difficult to measure accurately, because there is an unknown amount present in the original rocks. Furthermore, there is much too little helium in the earth and atmosphere to account for the amount of apparent radiogenic lead. Typical calculations for the age of the earth based on this method would yield 1.2 to 3.6 million years (Cook, 1957).

Radiometric dating methodology always assumes that radioactive decay rates are constant, but sometimes different values are obtained from the same rock. A study on contemporaneous Hawaiian basalt gave ages ranging from zero to 3.34 million years from the same sample (Evernden et al., 1964). Similarly, different methods of measuring the same rock can give widely different results (White, 1985). Perhaps neutron flux upset the uranium-lead-thorium time clocks and produced 'billion-year-old' minerals in a few thousand years (Slusher, 1974).

Pleochroic Haloes: The discovery of the significance of pleochroic haloes in dating the earth was presented in 1986, by Robert Gentry. He conducted highly technical experiments to establish exceptionally strong evidence for a young aged earth. His research reinforces doubts about uniformitarian chronology and helps establish creation science as a scientific process (Gentry, 1971; 1986).

Potassium-Argon Method: Potassium is a highly reactive element whose compounds are soluble and easily leached. It is also difficult to determine the amount of radiogenic argon. First, it is indistinguishable from non-radiogenic argon. Second, it is highly mobile and diffuses from mineral to mineral with ease and can enter rocks from the air. Thirdly, there is far too much argon in the earth for more than a small percentage of it to have been formed by radioactive decay. The mobility of both potassium and argon makes it particularly difficult to ensure that samples have suffered no chemical change since their formation (Morris, 1974).

Rubidium-Strontium Method: The uncertainty of the decay constant of rubidium means that the results must be calibrated against those from the uranium/lead method, and so are controlled by its reliability. Rubidium compounds are generally more soluble than strontium compounds and can be selectively leached out of the Rb-Sr system. Extraneous strontium can easily be incorporated into rubidium minerals from surrounding rocks, giving the appearance that radioactive decay has occurred when none has. There also is no valid way of determining the initial content of the isotope ^{87}Sr . This is at least ten times as abundant on earth as it should be if it was all formed from ^{87}Rb over 5 billion years. The method underestimates the possibilities of diffusion through natural ion exchange of ^{87}Sr after it has been generated by radioactive decay. The assumption that $^{87}\text{Sr}/^{86}\text{Sr}$ ratios are identical at zero age lies at the heart of the method and is questionable because this ratio varies widely in nature (Morris, 1974).

Radiocarbon Dating: The originator of carbon-14 dating methodology, Dr. Libby, conceded that its accuracy is probably risky beyond about 5,000 years (Slusher, 1973), for the following reasons: 1) Carbon is an outstandingly mobile element that reacts readily, therefore fossils that are free of chemical change since their formation are rare, for example; living mollusks have shown a radiocarbon age of 2,300 years (Morris, 1974). 2) The decay rate of carbon-14 may not be constant (Anderson, 1971). 3) Variations in the earth's magnetic field alters cosmic ray interaction with atmospheric formation of carbon-14 skewing decay rate results (Brown, 1979). 4) The amount of vegetation necessary for fossil fuel deposition indicates that atmospheric carbon-12/carbon-14 ratios must have significantly different in the past than they are today (Brown, 1988).

Thermoluminescence and Electron Spin Radiance: Both of these methods suffer from the same problem of sample contamination by free electrons from potassium, thorium, and uranium. The results can also be effected by earlier heating, moisture content, grinding of the sample and external beta rays. Because some dates vary by more than one-hundred percent, these methods are considered somewhat experimental (Bowen, 1991).

Dendrochronology: This method of historical research studies tree ring growth and is limited by its sampling base, because the oldest living tree is only about 5,000 years old. It has provided an independent check on radiocarbon dating that indicates a constant level of radiocarbon in the atmosphere for the last 3,500 years. Before this, error mounts rapidly until there is a 700 year discrepancy by 1,500 BC (Johnson, 1973).

Biological Considerations

Creationists accept micro-evolution and reject macro-evolution. Micro-evolution can be seen in domestic as well as non-domestic plants and animals, and is an established fact of nature often due to environmental adaptation. The variation Darwin noted among the finches of the Galapagos Islands due to natural selection based on genetic variation resulted in species survival for those best adapted to their environment. All the birds remain finches within the same gene pool and gave no evidence for the quantum leap to macro-evolution.

Macro-Evolution: The basic evolutionary argument for macro-evolution begins with the idea that favorable mutations give an advantage in natural selection to species which ultimately become the dominant population. Creationists counter with a number of reasons why this is not possible: 1) It is estimated that over 99% of mutations are harmful and over 90% are lethal to organisms that contain them (Lammerts, 1971). 2) Few mutations are inheritable and there is no evidence that the genetic code will induce them to continue in the same direction if they are inherited. 3) Mutational changes tend to be extremely slow requiring many generations to effect substantial change. Macromutational changes are impossible under any known conditions 4) Macro-evolution requires a multitude of simultaneous changes in an organism to effect change. 5) Mutational changes have limits beyond which no amount of selection could further them (Mitchell, 1994).

Missing Links: There are wide genetic gaps between the major kinds of life, and the fossil evidence does not bridge those evolutionary gaps with the type or amount of evidence necessary to substantiate macro-evolution. Especially destructive to the evolutionary theory are abrupt appearances of advanced fossils in the Cambrian rocks representing all modern phyla except two. Protozoa, which are thought to have been among the earliest forms of life, only appear after the Cambrian layer (Zimmerman, 1966).

Darwin foresaw the difficulty for evolutionary theory posed by such sudden appearances when he said in the first edition of *Origin*, "If it could be demonstrated that any complex organ existed, which could not possibly have been formed by numerous, successive slight modifications, my theory would absolutely break down." (Darwin, 1859)

There is a definite lack of transitional forms, which evolutionary theory would predict as forming a large part of the fossil record. Gould, a leading evolutionist also conceded, "The absence of fossil evidence for intermediary stages for major transitions in organic design, indeed our inability, even in our imagination, to construct functional

intermediates in many cases, has been a persistent and nagging problem for gradualistic evolution." (Gould, 1988)

Evidence shows that micro-evolution within kinds cannot lead to macro-evolution between kinds. Some evolutionary steps are so large that it is inconceivable that any process of natural selection acting on random mutations could ever make those transitions. One example of inexplicable evolutionary processes is the origin of flight. Almost every structure in a non-flying animal would require modification. Flight is supposed to have evolved four times separately and independently in insects, birds, mammals (bats), and reptiles (pterosaurs, now extinct). In each case it is supposed to have required many millions of years, and almost innumerable transitional forms would have been involved, yet none has been found. Although Archaeopteryx is sometimes labeled as a transitional form between reptiles and bird, it cannot fill the gap. Any claim it might have been a missing link is refuted by the finding of another bird species in the same deposit in which Archaeopteryx occurs, Upper Jurassic (Gish, 1986).

It is highly unlikely that smaller gaps between recognizably similar animals in comparable environments could bridge those gaps by an evolutionary process. Electric eels and some fishes capable of paralyzing their prey with electric shocks could not have developed this mechanism if its possessor needed it to survive. There is no evidence that electricity in any existing species is nascent. How could an ancestral electric eel have lived while the electrical parts were being developed? How could the ancestral form of bees survive while the complex specialization of a bee colony evolved?

The horse series has often been cited as an example for evolution, but any evolution that occurred is strictly between similar forms, and contains unbridged gaps. The fossils used to explain an increase in horse size show similar size variation to horses of today (Baker, 1976). The horse sequence only demonstrates micro- rather than macro-evolution. The very fact that it is used as one of the most convincing evidences for evolution actually argues strongly against the whole idea of macro-evolutionary change.

Non-Ancestral Forms: We know that acquired characteristics cannot be inherited, yet there are some members of the animal kingdom with highly distinctive physical characteristics for which there is no evidence of evolutionary ancestry. Elephants have no half-trunked intermediate form and giraffes have no fossil evidence of short necked ancestors. The giraffe's evolutionary origin could never have occurred unless it simultaneously developed an extra-large heart, neck blood vessel valves, and spongy tissue at the base of the brain to absorb excess blood, without which it cannot bend over to drink water.

Whales differ widely from the land mammals from which they are thought to have descended, yet we find no ancestral forms to explain how its hind limbs became tail flukes, pelvic bones reduced in size, forelimbs became paddles, musculature changes necessary for underwater sucking and nursing originated, or how baleen developed in some species of whales.

By what possible process of natural selection could a creature such as the bombardier beetle develop explosive chemicals to store within its system and dispense at its enemies. There is no way that an evolutionary process could operate at all without destroying the beetle (Gish, 1992).

Behavioral Change and Advanced Form: There are numerous examples of living forms utilizing a high level of complexity and sophistication of behavior and function that to achieve these advanced forms by random evolution seems inconceivable. When a baby spider spins its first web, even if it has never seen a web before, it makes one just like its forbears, but on a smaller scale. Skills that are instinctive are not preceded by inferior skills. Every ant, bee, and spider fulfills its life purpose with exactitude. There are no bunglers or semi-skilled workers (Tier, 1970).

Eyes could not have developed from single small changes, because a very large number of alterations would have had to occur simultaneously not only to the eye, but to its surrounding structure. There is no evidence for transitional forms, thus evolution by random mutation was clearly impossible (Tier, 1976).

The human brain consists of about ten thousand nerve cells. Each nerve cell puts out somewhere between 10,000 to 100,000 connecting fibers by which it makes contact with every other nerve cell. The total number of connections in the brain approaches 10^{15} . Numbers of this magnitude are beyond comprehension when considered in conjunction with the enormous complexity of each cell's function (Denton, 1985).

Homology: Homologous structures are often not specified by homologous genes and do not follow homologous patterns of embryological development, which would be required if they had common ancestry. Almost every gene that has been studied in higher organisms affects more than one organ system. This multiple effect known as pleiotropy, argues against the idea that homologous organs in different creatures indicate an origin from the same gene. An obvious example is that forelimbs and hindlimbs of all terrestrial vertebrates have the same pentadactyl design, yet it would be absurd to suggest that one evolved from the other or that both evolved from a common source. Homologies appear to owe their origin to an accordance of design in meeting similar practical need without necessarily involving genetic relationships (Denton, 1985).

Vestigial Structures: Ernst Haeckel's Theory of Embryological Recapitulation developed in the late 1800's has been refuted by modern research. For example, the human circulatory system is supposed to have started as a simple duct, part of which developed into a heart. Yet in the embryo the heart develops before the blood vessels. Every stage of human fetal development is uniquely human (Gish, 1986).

Punctuated Equilibrium: First proposed by Eldredge and Gould in 1973, the theory of Punctuated Equilibrium attempts to explain the large gaps in the fossil record as an inevitable phenomena of nature. The theory envisions evolution as occurring in small peripherally located populations, which then spread widely and undergo little further change (Eldredge and Gould, 1973). The theory still provides no mechanism for crossing

major biological gaps, and no mutation studied by geneticists has revealed any possibility for genetic changes of this magnitude.

Biological Creation Theory Summary: All life was due to special creation and exhibits the following characteristics:

- 1) It is too intricate and complex to appear by chance. 2) It appears in the fossil record without ancestors.
- 3) Life forms remain distinct from one another.
- 4) Life forms resist change into different kinds by modern breeding or genetic experimentation.
- 5) Life forms show no changes bridging basic taxonomic units such as families and higher categories.
- 6) Life forms reveal mutations as being often neutral, harmful, or degenerative.
- 7) All basic types of living organisms are contained in the fossil record even if some ancient types were extinct.
- 8) Life forms are relatively advanced in their first appearance in the fossil record.

These points are in accord with the fossil record and act as strong support for the creationist explanation for the biological origin of life (Mitchell, 1994).

The Origin Of Man

The ancient Greeks believed that Earth was the center of the universe. This was unchallenged until 1514, when Nicolaus Copernicus concluded that the sun was the center of the solar system, and Earth was just one of a flock of planets encircling it. Acceptance of scientific ideas that shatter our most cherished beliefs never comes easily. It took the Catholic church more than three centuries to acknowledge that it had wrongly condemned Galileo. Although Charles Darwin arrived at his theory of evolution in the late 1830's, he kept it to himself for two decades fearing that people would not appreciate his idea that we were not created in the image of God. No area of the creation/evolution debate stirs up more emotion than that of the origin and evolution of the human race, because it strikes at the heart of each theory's philosophical foundations of the nature, purpose, and goal of the human race.

Man is classified within the order primates, although highly imaginative transitional forms between man and ape-like creatures have been constructed by evolutionists based on fragmentary evidence, the fossil record actually documents the separate origin of primates in general (Kelso, 1974). In fact, evolutionist Lord Zuckerman states that there are no fossil traces of a transition from an ape-like creature to man (Zuckerman, 1970).

Primates are supposed to have descended from insectivorous ancestors, catarrhines, and prosimians, but no transitional forms have been found (Mitchell, 1994).

Since many evolutionists believe human ancestors branched off from apes about 30 million years ago, and the next supposed ancestors, australopithecines, are dated at one to three million years ago, there remains a gap of more than 25 million years during which hominids were supposedly evolving, yet not a single fossil hominid of that period has been discovered (Mitchell, 1994).

The next proposed evolutionary step was *Australopithecus africanus*. In 1973, Donald Johnson's team found about 40% of a fossilized female skeleton and named it 'Lucy'. They claimed it was 3.5 million years old and eventually classified with australopithecines. Research by Charles Oxnard utilizing all available australopithecine fragments concluded that they are not related to anything living today, man or ape, but were uniquely different (Oxnard, 1975). Australopithecines were no more adapted to bipedal locomotion than are chimpanzees and gorillas, which do occasionally walk bipedally (Gish, 1986).

The whole evolutionary scheme for man was thrown into confusion by the discovery of *Skull 1470* by Richard Leakey's team. Although Leakey assigned it the name *Homo habilis*, his co-author Alan Walker believed it that it should be classed as *Australopithecus* (Walker and Leakey, 1978). It appears doubtful whether *Homo habilis* walked upright or possessed other characteristics that would warrant placing it in the genus *Homo*. It seems more likely that it was an ape, although considerably different than many of today's species (Gish, 1986).

Both Java man, *Pithecanthropus erectus*, and Peking man, *Sinanthropus pekinensis*, have been placed by today's evolutionists into a single species, *Homo erectus*. Creationists insist that neither belong to *Homo erectus*, because they were both very ape-like (Gish, 1986).

Dr. Gish sums up creationists reasoning: "If *Australopithecus* and *Homo erectus* existed contemporaneously as has been suggested by Richard Leakey, how could one have been the evolutionary ancestor of the other? How could either be ancestral to man, when man's artifacts are found at a lower stratigraphic level directly underneath the fossil remains of these creatures? The evolutionary hypothesis for the origin of man becomes less and less plausible as more and more evidence becomes available."

Added to these discrepancies are a number of records which show human remains in geological strata earlier than the Pleistocene. Human bones and teeth have been found in coal. This include a skull from a German lignite deposit, presumably of the Tertiary age (Whitcomb and Morris 1974), two molars from a Tertiary coal deposit in Montana (White, 1978), a child's jawbone in Miocene coal in Tuscany, and human skeletons in Cretaceous rocks near Moab, Utah (Gish, 1975). Also, a shod human footprint has been found in Cambrian rock over some crushed trilobites, which is a layer some 600 million years older than the supposed origin of human kind (Baker, 1976).

Human artifacts have been found in rocks that are supposed to predate human life on earth. A gold chain was found imbedded in an Illinois coal deposit, as was an iron pot in Oklahoma. Spanish conquistadors found a rock encrusted iron nail 15 centimeters long in a Peruvian mine. Iron was not known to the Indians at that time. Workers in Massachusetts discovered a metal pot in solid rock five meters below the surface. The pot had inlaid floral designs in silver which showed a great deal of artistic ability and metallurgic technology (von Fange, 1974). A baked clay figure was found at a depth of 90 meters in Pliocene strata in Nampa, Idaho (White, 1978). These deposits range in age from 2 to 300 million years old and indicate the presents of human remains far older than current evolutionary theory allows (Mitchell, 1994).

Anthropology, Archeology, and Human Origins

There is no tradition so widespread among all peoples of the world as that of the Flood. There have been over 220 Flood legends collect by anthropologists from every continent and major culture in the world (Stickling, 1972). As tribes migrated further from Ararat, the flood traditions become more and more distorted. This corroborates the theory that the flood stories have a common origin and are not exaggerated tales of local catastrophes (Keane, 1991). The most detailed records, as might be expected, are from the Middle East and the eastern Mediterranean. The Gilgamesh Epic, from the ancient library at Nineveh of King Assurbanipal, dates from 668BC., and is in close agreement with the Genesis account (Rehwinkel, 1967). Also, cultural genealogies of peoples such as the Egyptian, Babylonian, Celtic, and Saxons have provided creationists with support for the young age of the earth of approximately 6000 years (Cooper, 1991).

There is considerable archeological evidence that humans had access to technologies which far surpassed what would be expected by their simple lifestyles. The exquisite European Upper Paleolithic cave art beginning with the Cro-Magnon *Aurignacian* period and ending with the Altamira cave art of northern Spain show levels of artistic sensitivity and technical competence comparable to artists today (Mitchell, 1994). The great pyramids of Egypt, the magnificent Stonehenge, and the great Indian Temples of the Americas are a few examples of megalithic building technologies used to construct astronomical observatories of the highest accuracy (Wood, 1978). Such indications of early intelligence argue against the view that humans were only just emerging from a primitive evolutionary ancestry, and raise the strong possibility that some knowledge was carried forward from the antediluvian past (Mitchell, 1994).

Why does recorded human history only begin about 3000BC? If humans were on this planet for three to four million years, surely there would have existed written language before this time. When we consider the sophisticated architectural accomplishments of what are considered the earliest civilizations, it seems odd that their predecessors left no recorded history. It appears as if advanced civilizations began almost simultaneously around the world just a few thousand years ago. It is also puzzling that humanity could sudden multiply and dominate the earth in a few thousand years, when human evolutionary development was apparently so slow over a several million year period.

Summary: Fundamentalist Christians attempt to utilize scientific data to substantiate creationism as a valid scientific theory, but the case for creationism derives its origin from Scripture, so actually it cannot qualify as a scientific theory. Although some of the scientific data seems to support the concept of special creation, the supernatural characteristics of the event have not been observed by human witnesses and are unrepeatable historical events that are not subject to the experimental method. Creationists contend that, because it is impossible to disprove the possibility of creation, it remains feasible. They also maintain that the creation model is not only a viable alternative to evolution, but it is actually a far superior model and more plausible scientific explanation of origins.

The Nature of Science

In broadest terms, scientists seek a systematic organization of knowledge about the universe. This knowledge is based on explanatory principles whose verifiable consequences can be tested by independent observers. Science encompasses a large body of evidence collected by repeated observations and experiments. Although its goal is to approach true explanations as closely as possible, its investigators claim no final or permanent explanatory truths. Science changes and evolves as new information is tested and emerges as the most probable explanation of phenomena (National Academy of Sciences, 1984).

An idea that has not yet been sufficiently tested is called a hypothesis. Rigor in testing hypotheses is the heart of science. After substantial observational or experimental support has accumulated, and a hypothesis has survived repeated opportunities for disproof, it may become the accepted theory explaining the original facts. It is also possible that a theory, which has withstood previous testing, may eventually be disproved.

In science, facts are determined by observation or measurement of natural or experimental phenomena. A hypothesis is a proposed explanation of those facts. A theory is a hypothesis that has gained wide acceptance, because it has survived rigorous investigation of its predictions. Higher levels of generalization are formulated into scientific laws. A law identifies a class of regularities in nature from which there has been no known deviation after many observations or trials. It is usually expressed mathematically and can tell us the way, but not the why of nature.

Scientific investigators seek to understand natural phenomena by direct observation and experimentation. Scientific interpretations of facts are always provisional and must be testable. Statements made by any authority, revelation, or appeal to the supernatural are not germane to this process.

In creationism both authority and revelation take precedence over scientific evidence, because its conclusions are based on a religious belief system that is not subject to change. Creationism accepts as authoritative a conclusion seen as unalterable, and then seeks to support that conclusion by reinterpreting the facts from its preconceived position to formulate new supporting theories.

No laws were ever passed saying that evolution had to be taught in public school science classes. The prestige of evolutionary theory has been built by its impact on the thousands of scientists, who have learned its power and usefulness as a unifying framework for scientific investigation to help explain in naturalistic terms how matter and life came into existence. To ignore that evolution occurred or to classify it as a form of dogma is to deprive public school students of the most fundamental organizational concept in the biological sciences. No other biological concept has been more extensively tested or more thoroughly corroborated than the evolutionary history of organisms. However, the mechanisms by which evolution occurred are not agreed upon in detail, and they remain an area for continuing research, discussion, and discovery (National Academy of Sciences, 1984).

Scientists, like many others, are touched with awe at the order and complexity of nature. Religion provides one way for human beings to be comfortable with these marvels. Nonetheless, the goal of science is to seek naturalistic explanations for phenomena such as the origins of life, the earth, and the universe within the framework of natural laws and scientific principles of testability. No body of beliefs that has its origin in religious doctrinal material rather than scientific observation should be admissible as science within the public school system (National Academy of Sciences, 1984).

Teaching Origins in Public Schools

The creation evolution controversy in public education has grown in intensity since the famous Scopes Trial of 1925. At that time the American Civil Liberties Union (ACLU) argued for inclusion of evolutionary theory in the science curriculum. In 1968 the United States Supreme Court ruled that the 1928 Arkansas anti-evolution law was unconstitutional, because it failed the secular purpose test (*Epperson v. Arkansas*, 1968). Today the ACLU and others insist that creationism should be excluded from the science classroom, and that only evolution should be taught as a scientifically acceptable theory of origins. The creationist theory is primarily a religious view and as such the courts have determined it can not be fostered by public schools, and declared it unconstitutional, because it failed all three establishment law tests (*McLean v. Board of Education*, 1982).

Surveys have consistently shown that a substantial majority of Americans believe that humanity and the cosmos were created by a process involving supernatural intervention. A Gallup Poll conducted in July of 1982, revealed that 82% of Americans believed that God was involved in this process, while only 9% believed that God was not involved, and 9% had no opinion (Newsweek, 1982). Similar results were obtained in 1991, and reported in U.S. News and World Report by Jeffery Sheler.

We may conclude that a majority of the students in our public schools might find disturbing inconsistencies between their religious beliefs and the evolutionary ideas encountered in science classes. Scientific truth is not established by popular vote, and scientific facts must not be ignored or modified to accommodate the religious beliefs of our students, but educators must be sensitive to their students' opinions and belief systems if truth is to prevail.

It is obvious that the discrepancy between what Americans believe and what is constitutionally allowable as science instruction within our public school system will continue to be problematic in the future. Fundamentalist Christians will continue to utilize this broad base of public sentiment to maintain their efforts to influence science curriculum in public school.

What, if anything, can be done to solve this dilemma? I would propose the following:

1) Teach evolution in the critical manner that would be appropriate for any field of empirical science.

A persistent criticism of science instruction is that evolution is taught as dogma. Major evolutionary transformations are often presented as though they were historical observations. While some teachers emphasize the theoretical nature of evolution, rarely is a critical view taken of this field of science. Teachers could present evidence that seems to support evolutionary theory as well as evidence that seems incompatible with this interpretation of origins, such as previously stated in this paper under *Scientific Case for Creationist Theory*. The truth will prevail if we can let evolution speak for itself, and use critical inquiry to facilitate student learning.

It is inconceivable that the ACLU or others might challenge the scientific investigation of evolution in the science classroom. No court to date has thus far prohibited instruction concerning purely scientific evidence merely because it "happens to coincide or harmonize with the tenets of some or all religions." (*McGowan*, 336 U.S. at 442)

It's evident that whatever model of instruction a teacher incorporates in the classroom involves a personal choice that is influenced by time, place and culture. The society in which the instructor works usually exerts the greatest influence on educational content and methods, therefore teachers need to be intellectually flexible enough to adapt appropriate curricular innovation that results from culturally dominant themes.

Currently, teachers are transforming the traditional didactic authoritarian approach that pervaded education for many years to a more cognitive cooperative strategy that allows the teacher and student to collaborate in acquiring knowledge through a process of inquiry. Students and teachers are asked to examine subject matter content for its purpose, structure, model, and argument to discover its organizational design and relevancy in relation to other domains of knowledge. This is helpful if students are going to be taught how to think and not just what to think.

One way to accomplish critical inquiry would be a student "Origins Research Project". The origins question is an ideal vehicle for developing student's analytical skills, integrating diverse topics and fields of science, while providing students with opportunities to study in an important area of science without infringing on diverse religious views that are the prerogatives of the individual and their parents.

Students who participate in an "Origins Research Project" will demonstrate how scientific inquiry really works. Each student would be asked to develop a theory of origins that best fits known scientific evidence. After doing investigative research, students would write a paper presenting their findings. Religious beliefs, while possibly important to the student's overall conclusions, are not to be part of this paper. The basis for evaluating student projects would be the breadth of research, critical thinking, sound logic, and detailed comparisons of the data.

The teacher's primary role would be: (a) to develop each student's analytical skills in science; (b) to prevent religious aspects from entering into any classroom discussions, and; (c) to challenge and stimulate the student's thinking. Teachers should frequently ask questions such as:

What assumptions are being made when interpreting this data?

Can those assumptions be tested? If not, how are they valid?

Do other scientists agree? Why or why not?

What are some other explanations or ways of interpreting the same data?

What evidence is there for other conclusions?

The teacher's role is not direct instruction of the material, because the scope of the subject matter is so broad that it would be unreasonable to expect teachers to master it quickly enough to present it, and most teachers have presuppositions that could easily bias the student's decision-making process. The teacher's goal is to teach students how to think, not what to think.

There are a number of formats that teachers might use to facilitate this project such as: separate appearances of outside experts, panel discussions, bulletin board displays, student oral presentations, or video presentations. The Internet provides instant access to more than enough material from a variety of perspectives that most students can utilize faster than other resources.

2) Teach the topic of origins within the social science curriculum.

American culture is one in which a religiously diverse nation of people have embraced a democratic ideal. The religious-democratic realm is one in which differing and often conflicting religious views must be tolerated and allowed free and full expression. If the public schools dealt only with scientific matters, the problem of creationism would not be an issue, because of its inherently religious nature. Although the courts have prohibited the teaching of religion, they have not prohibited teaching about religion (*Stone v. Graham*, 1980). Teaching about religion is a necessary part of the social science curriculum since religion is an integral part of American society. In this approach any

number of views about origins could be discussed without violating the principle of separation of church and state.

Conclusion

It should be clear that, legally, the Fundamentalists do not have a case. Any effort to ban evolution by virtue of its conflict with religious dogma is an effort to bring sectarian religious prohibitions into public school. This is unconstitutional, as is any effort to add creationism to science curriculum. Mandating inclusion of any subject area curriculum based on religious ideology remains illegal under the U.S. Constitution, and is contrary to academic freedom. It is not the business of the legislature to determine what is or is not science. This task belongs to the scientific community.

In themselves, scientific discoveries about the operations of nature neither affirm nor deny the existence of God. Science merely describes how physical things work. The book of Genesis was never intended as a scientific technical treatise, whose aim was to delineate the origins, structure, and properties of the physical order of nature. If that simple yet crucial point were accepted by Fundamentalists, the whole intense controversy over origins would cease.

Although the opponents of evolution are correct in saying that natural process have not absolutely confirmed macro-evolution, modern science has made enormous strides in explaining the physical origin and development of organisms through the evolutionary process. Even though the facts of evolution might not be a problem for many Americans, what those facts represent is one of the most basic philosophical issues within our society. By attempting to define humanity on the basis of biological origin or Divine creation, we are essentially creating our own cultural models that will shape our future, both individually and collectively.

Human physical nature is seen in Theism as only the instrument of his higher, spiritual nature, which has both an origin and destiny not ultimately reducible to material source or explanation. Claims that the essence of human existence are more than the physical world lie outside the realm of scientific investigation. Fundamentalist Christians fail to understand that when evolution and all its ramifications are accepted, it can do no more than trace human biological origins, and therefore poses no threat to their spiritual nature. The methods of science are confined to exploring the physical order of the universe not its purpose or ultimate destiny. Therefore, only true science, with no preconceived religious conclusions, is constitutionally permissible scientific inquiry within the public school classroom.

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