The current setting of the evolution/creation debate in American public schools

Bradley Doyle Reynolds
William & Mary - School of Education

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THE CURRENT SETTING OF THE EVOLUTION/CREATION DEBATE IN AMERICAN PUBLIC SCHOOLS

A Dissertation

Presented to

The Faculty of the School of Education
The College of William and Mary in Virginia

In Partial Fulfillment
Of the Requirements for the Degree
Doctor of Philosophy

by
Bradley Doyle Reynolds
May 2003
THE CURRENT SETTING OF THE EVOLUTION/CREATION DEBATE IN
AMERICAN PUBLIC SCHOOLS

by

Bradley Doyle Reynolds

Approved May 2003

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b. d. r.

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THE CURRENT SETTING OF THE EVOLUTION/CREATION DEBATE IN AMERICAN PUBLIC SCHOOLS

Abstract

The history of public education in the United States is replete with attempts to secularize public education as well as attempts to sanctify public education. The legal battle between these two opposing concepts of public education has been long and tenacious, and is far from over. One front upon which this philosophical, political, and legal battle has been fought is the teaching of origins in biology classes of public schools. This study sought to address the question of the current status of the creation/evolution debate. Through content analysis of court cases, the study provided a legal framework concerning the teaching of origins in public schools. The study also provided a political/philosophical understanding of the current status through a content analysis of press articles. Further, the study provided an understanding of how current biology textbooks deal with the issue of origins. The findings reveal that the creation/evolution debate is current; however, the theory of Intelligent Design has now entered the fray. Finally, the findings reveal that the debate is taking place in courtrooms, legislative halls, and newspapers, but not in classrooms.

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SCHOOL OF EDUCATION

THE COLLEGE OF WILLIAM AND MARY IN VIRGINIA
THE CURRENT SETTING OF THE EVOLUTION/CREATION DEBATE IN
AMERICAN PUBLIC SCHOOLS
CHAPTER 1: THE PROBLEM

Introduction

There is a cultural war raging from the classrooms of America's public schools to the footsteps of the Supreme Court. It is a war concerning the scientific curricula in public high schools. The central issue of this war is the teaching of alternate theories of origins in biology classes of public schools.

The debate in public schools concerning creation and evolution can be traced back to 1925 and the Scopes trial. Creation had been taught since the inception of public education in America; however, in the early twentieth century Darwin's evolutionary theory began to take front seat in science education. The debate continued in the public schools until 1987 when the Supreme Court found it unconstitutional for a state to mandate the teaching of creation because it advances the religious belief that a supernatural being created humankind (Edwards v. Aguillard, 1987).

Yet, the flames of this war have been fueled again in 2002 when the Ohio Board of Education debated whether to include the Intelligent Design (ID) theory of origins as an alternate theory to evolution (Clines, 2002). The ID theory postulates that there is sufficient evidence of design in life to demonstrate that life could not have arisen by chance or evolution. Life was designed or created by an Intelligent Designer or Creator. Unlike previous creation theories ID does not presuppose who or what this Intelligent Being is.

The action of the Ohio Board of Education was preceded by the "No Child Left Behind" Act of the US Congress in 2001. In the conference report of this Act, Senator
Rick Santorum of Pennsylvania, expressing a desire for academic freedom within the science classroom rather than a dogmatic approach to teaching biological evolution, introduced an amendment that was overwhelmingly accepted by Congress recognizing that a quality science education should prepare students to distinguish the data and testable theories of science from religious or philosophical claims that are made in the name of science. Where topics are taught that may generate controversy (such as biological evolution) the curriculum should help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society. (No Child Left Behind Act, 2002)

This is now federal policy as reflected by the US Department of Education. It is interesting to note that the scientists who applauded this bill are the same ones who have encouraged the “teach the controversy” approach using ID as an alternate theory of origins (Discovery Institute, 2001).

The apparent legitimacy of ID as an alternate theory of origins may cause more educators and states to consider changing their science curriculum. “When two groups of experts disagree about a controversial subject that intersects the public school curriculum students should learn about both perspectives” (Meyer, 2002, p. 1).

This debate can be confusing because of the nature and interpretations of legal issues. Furthermore, both the evolution theory and the creation theory have undergone significant adjustments to accommodate new scientific theories. This study shall seek to provide clarification on these issues.
Purpose of the Study

The purpose of this study is to provide descriptive data and content analysis of the current setting of the creation/evolution debate in American public schools. Specifically, this study answered these questions:

1. What is the legal history of and basis for teaching creation/evolution in the public schools?

2. What are the dimensions of the creation/evolution controversy as reflected in the American popular press?

3. What is the status of content for teaching creation/evolution as reflected in selected high school biology textbooks?

This study was exploratory and descriptive in nature. It provided descriptive data and a content analysis of legal cases that are of interest to the creation/evolution debate in public schools. Furthermore, it provided a content analysis of articles in the popular press considering this issue and a content analysis of selected high school biology textbooks.

Significance of the Study

This study is of interest and benefit to anyone who has a stake in the curricula of American public schools. The results of this study should be of special interest to states, educators, and society as a whole.

States should be particularly interested because the “legal control of public education resides with the state as one of its sovereign powers” (McCarthy, Cambron-McCabe, & Thomas, 1998, p. 2). Furthermore, all state constitutions specifically address

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the legislative responsibility for establishing and regulating public schools (McCarthy, Cambron-McCabe, & Thomas, 1998). Therefore, state legislatures should be responsive to any critical educational issue.

Second, educators should be particularly interested in this study in that it is informative concerning a contemporary educational issue. Educators, by definition, should make informed decisions. However, in order to make such decisions educators must be aware of current debates and trends. "Knowledge is an elemental, irreducible aspect of teacher empowerment" (Lichtenstein, McLauglin, & Knudsen, 1992, p. 40). In 1992 Lichtenstein, McLauglin, and Knudsen found three areas where knowledge empowered teachers: 1) knowledge of professional community; 2) knowledge of educational policy; and 3) knowledge of subject area. This study will provide educators with a knowledge base concerning the evolution/creation debate in public schools.

Third, this issue is of utmost relevance to society's goal of educating children. Legal concerns and academic freedom are concepts that are connected with this issue. If it is legal and scientifically valid to teach the theory of ID as an alternate theory of origins then it should be done since "academic freedom includes the right of teachers to speak freely about their subjects, to experiment with new ideas, and to select appropriate teaching materials and methods" (Fischer, Schimmel, & Kelly, 1999, p. 159). However, if it is neither legal nor scientifically valid then it should not be taught. The Courts have made it clear that teachers can be restricted from airing "their personal views in class" and they cannot "use their classrooms to proselytize students" (McCarthy, Cambron-McCabe & Thomas, 1998, p. 287).
Definitions of Related Terms

A major problem that complicates any study of creation and evolution is the lack of consistent definitions of key terms. Terms like evolution and macroevolution are often used interchangeably. Since clear definitions are vital for a concise understanding of the issue, the following terms will be operationally defined:

Abiogenesis - The hypothesis that life can come into being from non-living material (Microsoft Word 2000 Dictionary).

Creation - The view that a creator brought the universe, its contents, and its inhabitants into being from literally nothing (Wallace, 2002).

Darwinian Evolution - The belief that present-day species have evolved from simpler life ancestors (Wallace, 2002).

Evolution - The notion of a continuous naturalistic, mechanistic process by which all living things have arisen from a single living source, which itself arose by a similar process from a non-living inanimate world (Wallace, 2002).

Intelligent Design - A theory that biological organisms owe their origin to preexistent Intelligence (Davis & Kenyon, 1999).

Macroevolution - The theory that biological population changes take place on a large enough scale to produce new phyla in the biological world (Wallace, 2002).

Microevolution - Genetic variation (Wallace, 2002).


Presupposition - A belief which is accepted before the next step in logic is developed (Wallace, 2002).
Punctuated Equilibrium - A pattern in evolution in which long stable periods are interrupted by brief periods of more rapid change (Miller & Levine, 2002).

Stasis - The primarily constant morphology of a species over a long period of geologic time (Davis & Kenyon, 1999).

Theory - A well-tested explanation that unifies a broad range of observations (Miller & Levine, 2002).

Worldview - A comprehensive interpretation of the universe and humanity (Microsoft Word 2000 Dictionary).

Limitations

The author recognizes that this was not primarily a quantitative study. Much of the information presented is not quantified. The author is further aware that the data will be interpreted differently based upon individual worldviews. This does not negate the importance of such a study nor does it negate the intention of the author to try and be as objective as possible.

The study was limited in the degree to which it could delve into scientific theories and observations. Since evolution and creation involve such diverse scientific disciplines as paleontology, biology, sociology, geology, cosmology, and astronomy; and since each of these disciplines has a library of documents, theories, and questions, it would be incomprehensible to cover every facet of each discipline. This study addressed these disciplines as demanded by the theories presented, but it did so in a general fashion rather than in detail.
Finally, this study referred to laws concerning the teaching of creation and evolution in the public schools. Since the theory of creation is being replaced with the theory of ID there is a limitation of ignorance concerning the courts and the position they may take on this issue.

Assumptions

Listed below are the major assumptions underlying this study:

1) The biology textbooks used for this study are representative of biology textbooks used across the country.

2) Articles written in popular press concerning this issue will provide insight to the public debate.

3) Courts have given school boards and teachers certain parameters regarding the teaching of creation and evolution in science classes.

4) Current science theories have progressed.
CHAPTER 2: LITERATURE REVIEW

In order to grasp the current legal, political, and philosophical context for teaching evolution and creation in public schools a history of the creation/evolution debate is necessary. This literature review gives the reader an understanding of the theory of creation as sought to be taught in public schools in the past, an overview of the theory of evolution and its development, a summary of the ID theory, and an analysis of how the courts arrived at the current interpretation of the First Amendment and its application to the teaching of creation in public schools. This literature review is prepares the reader for the study by giving him/her a context by which the study should be understood.

What is it about the debate on teaching creation that brings out so many emotions and division (Keller & Coles, 1999) between well-meaning parents and school authorities? The answer certainly lies within the belief system of every individual. But why is it so heated in American public schools as opposed to other countries? Obviously, the answer to this question has many variables including the plurality, democracy, culture, and independence of the American society. But, without a doubt, the history of American education plays a part in the stimuli of this emotional debate. At one time, American public schools were far more creation and religion friendly than they are today. Joseph Story, a Supreme Court justice from 1811-1845 said

Probably at the time of the adoption of the Constitution, and of the amendment to it now under consideration (First Amendment), the general if not the universal sentiment in America was, that Christianity ought to receive encouragement from the State so far as was not incompatible with the private rights of conscience and
the freedom of religious worship. An attempt to level all religions, and to make it a matter of state policy to hold all in utter indifference, would have created universal disapprobation, if not universal indignation. (Story, 1891, p. 630-632)

This review traced the history of the relationship between Church and State in American education, and revealed the impact that this history has had on the creation/evolution debate. Of special importance to the history of education in this nation are the legal cases that set precedent for school policy. Therefore, this review also traced the court cases which either encouraged or impeded the role of religion in the public school system. Finally, the theories of creation and evolution are foundational to this study so this review traced the development of these theories and the claimed scientific evidence for their validity.

A Brief History of the Relationship Between Church and State in American Education and the Court Cases that Affected School Policy

Relationship Between Church and State in the Colonial Era

In the 1600's the early settlers in the New World desired to educate their children and the Indian children in their vicinity ‘in true religion’ and the principles of civilized life (Urban & Wagner, 1996). With a very high percentage of colonists being Christian and differing only by denomination there was a unity of promoting Christian principles in the early schools, as revealed in the charters of Virginia, Massachusetts, Maryland, North Carolina, Rhode Island, Pennsylvania, Connecticut, New Hampshire, and New Jersey. In fact, Harvard, Yale, Dartmouth, Princeton, and William and Mary were founded by
religious denominations to prepare missionaries for the New World. However, most
Southern colonies tended to accept the “prevailing European precept that education was
essentially a private matter, a family concern” (Urban & Wagner, 1996, p. 22). Yet,
many Southern colonies did begin a “Sunday-school” to aid in the training of children.
Ministers would supplement their income by teaching children both religion and the
civilized way of life. Moreover, missionary societies established “charity schools” in
almost all the colonies. These societies provided education for poor children without
charge. In the Northern colonies there was a much more concerted effort to provide free-
schools for the entire community, supported by the funds drawn from “the common stock

Education appears to have been a primary concern of the Founding Fathers. Upon
reading statements from Thomas Jefferson, George Washington, Benjamin Rush and
others this becomes clear. But why was education not mentioned in the Constitution? It
is impossible to say. Yet, there are some good reasons why the Fathers may have chosen
not to mention it: (1) other documents addressed the issue; (2) the national government
was to be limited and therefore states should address the issue; (3) national funding
would have been difficult with the war-ravaged new nation. However, they did address
the issue of education elsewhere. Benjamin Rush, a signer of the Declaration of
Independence and the first Founder to call for free public education stated:

The only foundation for a useful education in a republic is to be laid in religion.
Without this there can be no virtue, and without virtue there can be no liberty, and
liberty is the object and life of all republican governments. (Rush, 1951, p. 299)
Also, on August 7, 1789, President George Washington signed into law a powerful piece of legislature which was known as the Northwest Ordinance. No new state could enter the Union unless they agreed to this Ordinance. Article III of the Ordinance states: “Religion, morality, and knowledge, being necessary to good government and the happiness of mankind, schools and the means of education, shall forever be encouraged.” The Northwest Ordinance also reserved the sixteenth section of each township specifically for “the maintenance of public schools within each township.” It appears that the Founding Fathers and the new nation saw education as primary and part of education was religion. Yet, they left the duty of educating young people up to the individual states and communities.

The point of interest for this study is that the writers of the First Amendment apparently encouraged religion in every school, public or private. This religious encouragement and freedom paved the way for the early schools within the nation to teach religion alongside reading, writing, and arithmetic (Urban & Wagner, 1996).

Relationship Between Church and State from 1800-1899

In the 1820’s the Common School movement swept across the northern states. “The term common school refers to a type of schooling that would educate all in common, using the same curriculum” (Urban & Wagner, 1996, p. 93). The common school was advocated by President Andrew Jackson and the Whig party. Yet, it was not to be financed and enforced on the federal level but rather on the local and state level. The common school was free and open to all children regardless of status. It was supported mostly by local property taxes. Thus, common schools depended on their
immediate community, organized usually around “more than one district or neighborhood, and included a town or city or township board of education” (Urban & Wagner, 1996, p. 97). Usually, teachers were faced with large, unstructured classes with the focus of the teaching being centered on moral lessons. Even Horace Mann advocated “the teaching of broad Christian principles free from narrow sectarian interpretation” (Urban & Wagner, 1996, p. 61).

While President Jackson’s push for common schools was accepted in the Northeast and Midwest, it took a long time for the South to accept it. The “tendency of Southerners to rely primarily on voluntary parental, community, and church initiatives in educating their children persisted throughout most of the region down to the Civil War” (Urban & Wagner, 1996, p. 118). The focus of education in the South was white children. Although the Northern schools were basically segregated by 1830, the South really did not even offer public education to black children. Yet, through missionary efforts and Sunday schools, many black children in the South were taught how to read, write, do arithmetic, and live morally.

The aftermath of the Civil War brought huge changes to American education. The national government became far more powerful and centralized after the Civil War. Direct federal taxation and legislature helped to build this new government. The new federal government marked a new way of doing government; many of the powers that had been relinquished to the states were now taken back by the nation. One was the power to choose how to educate one’s children. During the Reconstruction Era, a Southern state would not be re-accepted into the nation without a new state constitution that included language guaranteeing a system of free public schools for its citizenry.
“This federal intervention in state educational policy was a new development, unprecedented historically…” (Urban & Wagner, 1996, p. 162).

The common school now had to be accepted and implemented in the Southern states and by “1880, over 65 percent of American children, ages 5-17 were enrolled in public schools” (Hiner, 2000, pg. 3). However, the vast majority of these were enrolled in elementary school; there was still a low percentage enrolled in high schools. The high school had originated in the urban areas where classes were divided by age. The concept spread rapidly throughout the nation. By the turn of the century the concept of an elementary and high school, both dividing its students into classes categorized by age, was almost universally accepted in our nation.

Within the public education system religion was still encouraged. In fact, the courts appeared to interpret the First Amendment’s purpose regarding freedom of religion as encouraging religion in every school and in government and yet prohibiting a law, which either established a national religion or prohibited people from freely exercising their religion. This is seen in the following cases, where the U. S. Supreme Court saw the United States not as a secular nation but as a Christian nation.

**Vidal v. Girard’s Executors, 1844**

This case involved the $7 million estate of a man named Stephen Girard. Mr. Girard was a native of France, who had arrived in America before the Declaration of Independence and had lived in Philadelphia until his death in 1831. He bequeathed his entire estate to the city of Philadelphia with the provision that an orphanage and college be constructed according to his stipulations.
Girard's heirs filed suit claiming that a trust could be given only to an individual and not a city. Thus, the suit was centered on who would gain possession of the estate: the city or Girard's heirs. The city of Philadelphia won the suit, but the U. S. Supreme Court in its decision also addressed a very important issue concerning religion and education.

In Girard's will, he required:

... that no ecclesiastic, missionary, or minister of any sect whatsoever, shall hold or exercise any station or duty whatever in the said college; nor shall any such person ever be admitted for any purpose, or as a visitor, within the premises.... My desire is, that all the instructors and teachers in the college shall take pains to instill into the minds of the scholars, the purest principles of morality. (Vidal v. Girard, 43 U.S. 133, 1844)

Yet, even the city's lawyers felt the requirement stipulated against teaching religion was "obnoxious." Justice Joseph Story, who was appointed to the Court by President James Madison, the chief architect of the Constitution, delivered the unanimous opinion.

He stated:

Christianity...is not to be maliciously and openly reviled and blasphemed against, to the annoyance of believers or the injury of public....It is unnecessary for us, however, to consider the establishment of a school or college, for the propagation of...Deism, or any other form of infidelity. Such a case is not to be presumed to exist in a Christian Nation. (Vidal v. Girard, 43 U. S. 198, 1844)

Justice Story continued by pointing out that the will did not prohibit Christian instruction, just clergy. This was acceptable and laymen could teach Christian principles.
Why may not laymen instruct in the general principles of Christianity as well as ecclesiastics....And we cannot overlook the blessings, which such (lay)men by their conduct, as well as their instructions may, nay must impart to their youthful pupils. Why may not the Bible, and especially the New Testament, without note or comment, be read and taught as divine revelation in the (school)—its general precepts expounded its evidences explained and its glorious principles of morality inculcated?...Where can the purest principles of morality be learned so clearly or so perfectly as from the New Testament. (Vidal v. Girard. 43 U. S. 200, 1844)

In this early court case, the U. S. Supreme Court made it clear that separating Christianity from education was not the intent of the First Amendment.

Davis v. Beason, 1889

This case involved the practice of bigamy and polygamy by Mormons in the western states. Samuel Davis had been convicted of bigamy and polygamy and had been fined and sentenced to jail. He sued, stating that his sexual practices were a part of his religious belief and thus protected under the First and Fourteenth Amendments.

Justice Stephen Field, appointed by Abraham Lincoln, delivered the opinion of the Court. Of significance to this review is his clear implication that this is a Christian nation. He stated:

Bigamy and polygamy are crimes by the laws of all civilized and Christian countries. They are crimes by the laws of the United States....They tend to destroy the purity of the marriage relation, to disturb the peace of families, to degrade women, and to debase man....To extend exemption from punishment for
such crimes would be to shock the moral judgement of the community. To call their advocacy a tenet of religion is to offend the common sense of mankind.

There have been sects, which denied as a part of their religious tenets that there should be any marriage tie, and advocated promiscuous intercourse of the sexes as prompted by the passions of its members....Should a sect of either of these kinds ever find its way into this country, swift punishment would follow the carrying into effect of its doctrines, and no heed would be given to the pretence that...their supports could be protected in their exercise by the Constitution of the United States. Probably never before in the history of this country has it been seriously contended that the whole punitive power of the government for acts, recognized by the general consent of the Christian world...must be suspended in order that the tenets of a religious sect...may be carried out without hindrance.”

(Davis v. Beason, 133 U. S. 341-343, 1890)

The final 19th century Supreme Court case that will be reviewed because of its importance upon the bond between Christianity and American education is:

Church of the Holy Trinity v. United States, 1892

This case focused on an 1885 federal law, which made it illegal for any person, company, partnership, or corporation in any way to encourage the importation of aliens to the United States for the purposes of labor. In 1887, the Church of the Holy Trinity of New York employed a minister from England as its pastor. The U. S. Attorney General challenged that employment and the case made it to the Supreme Court. In its decision, the Court dealt first with the “absurd” application of laws. By “absurd” the Court meant...
the enforcement of the letter of the law to the detriment of the spirit of the law. Thus, although the church’s alleged violation certainly fell under the letter of the law, it did not go against the spirit of the law.

In rendering its decision the Court stated: “No purpose of action against religion can be imputed to any legislation, state or national, because this is a religious people.... This is a Christian nation” (Church of the Holy Trinity v. U. S., 143 U. S. 465, 471, 1892). The Court finished its ruling by showing that truly this was a Christian nation. The Court declared, “This is a religious people. This is historically true. From the discovery of this continent to the present hour, there is a single voice making this affirmation” (Church of the Holy Trinity v. U. S., 143 U. S. 465, 1892). The Court then traced documents from Christopher Columbus through their present day affirming that statement. This documentation showed unequivocally that this was a Christian nation. Quoting from Christopher Columbus’ commission, the first grant made to Sir Walter Raleigh, the first charter of Virginia and other colonies, the Compact made by the Pilgrims and the Declaration of Independence: this historical discourse continued until the Court concluded:

There is no dissonance in these declarations. There is a universal language pervading them all, having one meaning: they affirm and reaffirm that this is a religious nation. These are not individual sayings, declarations of private persons: they are organic utterances; they speak the voice of the entire people. While because of a general recognition of this truth, the question has seldom been presented to the courts, yet we find that in Updegraph v The Commonwealth, it was decided that, ‘Christianity, general Christianity, is, and always has been, a
part of the common law...not Christianity with an established church...but Christianity with liberty of conscience to all men.' And in The People v. Ruggles, Chancellor Kent, the great commentator on American law, speaking as Chief Justice of the Supreme Court at New York said: 'The people of this State, in common with the people of this country, profess the general doctrines of Christianity, as the rule of their faith and practice...We are a Christian people, and the morality of the country is deeply engrafted upon Christianity, and not upon the doctrines or worship of those imposters (other religions)'. These and many other matters which might be noticed, add a volume of unofficial declarations to the mass of organic utterances that this is a Christian Nation. (Church of the Holy Trinity v. U. S., 143 U. S. 470-471, 1892)

These three cases (Vidal v. Girard, Davis v. Beason, Church of the Holy Trinity v. U.S.) reveal that during the 19th century the courts felt this country was a Christian nation. As such, the teaching of creation was commensurate with the Constitution. Table 1 helps to understand the courts’ view during the 19th century of this nation and the Constitution.

<table>
<thead>
<tr>
<th>Court cases</th>
<th>Is this a Christian nation?</th>
<th>Is it constitutional for the government to encourage Christianity?</th>
<th>Relevance for this study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vidal v. Girard</td>
<td>Yes</td>
<td>Yes</td>
<td>Christian instruction is encouraged in public education by the Supreme Court.</td>
</tr>
<tr>
<td>Davis v. Beason</td>
<td>Yes</td>
<td>Not addressed</td>
<td>This is a Christian nation.</td>
</tr>
<tr>
<td>Church of the Holy Trinity v. U.S.</td>
<td>Yes</td>
<td>Yes</td>
<td>This country was founded on Christianity and should be guided by Christian principles.</td>
</tr>
</tbody>
</table>

It is clear from the legal and educational history that the 19th century was one in which religion (Christianity) was encouraged in public schools. But something else
occurred in the 19th century that would inevitably bring a wedge between Christianity and public education. In 1859, Charles Darwin published *On the Origin of Species by Means of Natural Selection*. This groundbreaking book popularized his theory of species evolving from other species. The scientific community sought for and found evidence to support Darwin's theory. Until the acceptance of this theory, creation, which agreed with the Christian view of the world, was taught in public schools. In fact, even after the evolutionary theory became popular, many states still required that creation be taught in public schools (*Epperson v. Arkansas*, 1968). However, the bond that Christianity and the public schools had held since before the inception of this nation was beginning to crack in the early 20th century. But, it would still take a few decades before true change was wrought.

*Relationship Between Church and State from 1900-1968*

The 20th century began with an emphasis on mandatory school attendance laws. The educational community, as well as the state and federal governments, desired to educate more of the children in this nation.

The early 1900's saw the United States move into the era of modernity. With an emphasis on "outputs" and organization, the public schools became more centralized and homogenous (Hiner, 2000). Vocational and trade schools began appearing around the country, and although schools were now being set up for a homogenous culture, there was a large influx of immigrants during this time.

As the nation entered the 1920's, the educational ladder became very connected. Beginning with kindergarten and continuing through elementary school the rungs
climbed through junior high school, high school, junior college, college, and finally, graduate and professional school.

At all levels of the educational ladder, the needs of the other levels were considered. Relationships between elementary and secondary schools were formal, while links between elementary schools and kindergartens, particularly if the kindergartens were private were less formal. Although relationships between high schools and colleges were not highly formalized, no high school could long ignore the wants and needs of higher education without endangering the acceptability of its students. Thus, the various rungs of the educational ladder provided a relatively smooth progression from one level to the next, a progression that was guided by an increasingly systematic testing system. (Urban & Wagner, 1996, p. 225)

Since higher institutions of learning had adopted the theory of evolution and high schools were designed to prepare students for colleges, a problem arose. How could a public high school prepare a student for college without teaching that student evolution, and how could a public high school teach a student evolution without breaking the law many states had forbidding the teaching of evolution? This is exactly the situation in which John Thomas Scopes found himself in 1925.

The state of Tennessee required science teachers to teach creation and made it illegal to teach evolution. John Thomas Scopes agreed to be a defendant in the case that sought to reverse the state statute (Scopes v. State, 1925). Upon hearing the case, the Court found Scopes guilty of teaching evolution and fined him $100. However, this case gained national attention and the scientific theory of evolution was presented to the
nation. The very fact that evolution had now gained so much attention was a victory for those who sought to rid the public schools of teaching creation and replace it with the theory of evolution. Although the statute making it illegal to teach evolution remained on the books in Tennessee, it was now generally agreed not to prosecute violators.

In 1932, Franklin Delanor Roosevelt was elected to the presidency. His New Deal strategy, implemented to overcome the effects of the Depression, brought a large degree of centralization to the federal government. Not since the end of the Civil War had the federal government experienced such a growth in power and authority over the states. Inevitably, this began to work its way into the public schools as the government would soon aid schools financially and regulate schools more closely.

From 1900 to 1968 the United States entered into modernity. In so doing, the "old school" philosophy was challenged. This philosophy of using public schools to teach children reading, writing, arithmetic, and religion was being replaced with a philosophy that would remove religion from the equation. This move to the secularization of schools may be seen in court cases, which ultimately laid the foundation to make the mandated teaching of creation in public schools illegal.

_Everson v. Board of Education_, 1947

Perhaps the most important case that affected the later rulings on the creation/evolution debate was in 1947 when the Supreme Court rendered a decision in _Everson v. Board of Education_. This case involved the state-funded transportation of children to Catholic schools. The Court ruled that this was legal and constitutional. However, in it's ruling it made a statement that would be used time and time again to
keep government and public schools from encouraging Christianity. The Court stated, "the First Amendment has erected a wall between church and state. That wall must be kept high and impregnable. We could not approve the slightest breach" (Everson v. Board of Education, 330 U. S. 18, 1947).

What the Court meant by church is Christianity or any other religion. With that interpretation of "church" the Court interpreted the First Amendment totally different from the interpretation of the Supreme Courts historically. To put it another way, the Court's new interpretation of the First Amendment had zero precedents and, in fact, went directly against every previous precedent. However, the Court did interpret the First Amendment in accord with the current philosophy of their time. As times had changed, many philosophies had changed, and thus through the Court, the meaning of the First Amendment changed. This case set the stage for the Court to determine what would now be the relationship of Christianity to government and thus to public schools.

McCollum v. Board of Education, 1948

In 1948 the Supreme Court heard McCollum v. Board of Education. The controversy in this case was over elective religious classes offered in Illinois public schools. The Court delineated the facts:

Interested members of the Jewish, Roman Catholic, and a few Protestant faiths formed a voluntary association called the Champaign Council on Religious Education to offer classes in religious instruction to public school pupils in grades four to nine inclusive. Classes were made up of pupils whose parents signed printed cards requesting that their children be permitted to attend; they were held
weekly, thirty minutes for the lower grades, forty-five minutes for the higher. The council employed the religious teachers at no expense to the school authorities, but the instructors were subject to the approval and supervision of the superintendent of schools. The classes were taught in three separate religious groups by Protestant teachers, Catholic Priests, and a Jewish rabbi. \( \textit{McCollum v. Board of Education, 333 U.S., 207-209, 1948} \)

Appellant Vashti McCollum filed suit against the Champaign Board of Education, claiming this type of practice was unconstitutional under the First Amendment. After hearing the case, the Court found in favor of McCollum stating that the use of public funds to teach voluntary students (who had parental permission) religious instruction, is unconstitutional according to the First Amendment.

\textit{Zorach v. Clauson, 1952}

The McCollum case was the first to place restrictions on religion in the public schools. Interesting, however is the 1952 case, \textit{Zorach v. Clauson}. In this case, the Court found that students in public schools may receive “religious instruction” during the school day but it must occur off campus. It seems clear from this ruling that the Court struggled with how to interpret this new meaning of the First Amendment in relationship to its historical meaning. How could “religious instruction” be unconstitutional when the public schools had practiced it since before the revolution and were encouraged to do so by the framers of the Constitution? Yet, how could it not be unconstitutional according to the new definition of “church” in \textit{Everson v. Board of Education}? This struggle is seen within the comments of the Court in its decision:
The First Amendment, however, does not say that in every and all respects there
shall be a separation of Church and State....Otherwise, the state and religion
would be aliens to each other—hostile, suspicious, and even unfriendly...We are a
religious people whose institutions presuppose a Supreme Being...

When the state encourages religious instruction or cooperates with religious
authorities by adjusting the schedule of public events to sectarian needs, it follows
the best of our traditions. For it then respects the religious nature of our people
and accommodates the public service to their spiritual needs. To hold that it may
not would be to find in the Constitution a requirement that the government show a
callous indifference to religious groups. That would be preferring those who
believe in no religion over those who do believe....We find no Constitutional
requirement which makes it necessary for government to be hostile to religion and
to throw its weight against efforts to widen the effective scope of religious
influence.” (Zorach v. Clauson, 343 U. S., 312-314, 1952)

*Engel v. Vitale, 1962*

In 1962 and 1963 the U. S. Supreme Court came to a clearer understanding of how to
apply the new interpretation of the First Amendment to education. In 1962, the Court
heard the case, *Engel v. Vitale*. This was a case concerning the state of New York
authorizing a short, voluntary, non-denominational prayer for recitation at the start of
each school day. The prayer simply stated, “Almighty God, we acknowledge our
dependence upon thee, and we beg thy blessings upon us, our parents, our teachers, and
our Country.” The Court found that neither the prayer’s non-denominational character
nor its voluntary character saved it from unconstitutionality (*Engel v. Vitale*, 1962). In rendering this decision, the Court began to make clear the new meaning of "separation of Church and State." This phrase, "separation of Church and State," was the Court’s favorite phrase in interpreting the First Amendment’s clauses that “Congress shall make no law respecting the establishment of religion or prohibiting the free exercise thereof.” The Court declared, “Prayer in its public school system breaches the constitutional wall of separation between Church and State.” This breach was realized because the Court found that this prayer had no secular purpose and its primary effect was to advance religion. Thus, the removal of religious instruction, prayers, and symbols was underway.

It is interesting to note that in rendering this decision the Court did not cite one single precedent. Cognizant of this fact, one year later the Court defended this inappropriate legal behavior by stating, “only last year (1962) these principles were so universally recognized that the Court without the citation of a single case...reaffirmed them” (*Abington Township v. Schempp*, 374 U. S. 220-221, 1963). Thus, it appears that the Court felt that society as a whole had moved into a new era in which it did not want religion encouraged by government. Whether America was ready or not, “the whole thorny problem of religion in public education was thus inevitably raised” (Cremin, 1963, p. 38).

*Abington Township v. Schempp, 1963*

In 1963, the Court continued to drive a wedge between religion and education in the case *Abington Township v. Schempp*. In this case, the Commonwealth of Pennsylvania by law required that
at least ten verses from the Holy Bible shall be read, without comment, at the opening of each public school on each school day. Any child shall be excused from such Bible reading, or attending such Bible reading, upon the written request of his parent of guardian. (*Abington Township v. Schempp*, 374 U. S. 205, 1963)

The verses were to be selected by the student and there were to be “no prefatory statements, no questions asked or solicited, no comments or explanations made, and no interpretations given at or during the exercises” (*Abington Township v. Schempp*, 374 U. S. 207, 1963).

The Schempp family brought suit contending that their rights under the First Amendment were violated. In its decision, the Court found it unconstitutional to have mandated Bible-reading in public schools even though students could be excused from participating.

Of significance to this study is a statement that makes clear the Court’s new understanding of the First Amendment. The Court stated, “The (First) Amendment’s purpose was not to strike merely at the official establishment of a single sect….It was to create a complete and permanent separation of the spheres of religious activity and civil authority” (*Abington Township v. Schempp*, 374 U. S. 217, 1963). While this statement is historically inaccurate as far as the Founding Father’s purpose of the First Amendment, it is very accurate as far as the Court’s *new* understanding of the Amendment.

This historical and legal background concerning religion and public education will help put into perspective the current situation of the evolution/creation debate. In fact, this debate once again made its way to the courts in 1968. The Epperson v. Arkansas case in 1968 marked a new era in the creation/evolution debate when the
Supreme Court became involved and declared that anti-evolution laws were unconstitutional and also viewed creation as a religious theory.

Relationship Between Church and State from 1968 – Present

In the sixties and seventies, the federal government became very involved in public education. From the Elementary and Secondary Education Act (ESEA) of 1965 (giving disadvantaged poor children better access to an education) to the Education for All Handicapped Children Act of 1975 (PL.94-142) the government began utilizing its federal control to ensure equality for all in the public schools.

A national report in the early eighties (A Nation at Risk) prompted a renewed commitment to excellence in the public schools. Some have called the time from 1980 to the present as a time when the educational movement went from “equality to excellence” (Urban & Wagner, 1996, p. 323). It was during this time that the nation became attentive to standards testing of children.

The eighties and nineties saw an influx of court cases in which school districts and teachers challenged the rulings of the early sixties. This is very important in understanding the creation/evolution debate for two reasons. First, in equating creation to religion, the courts effectively removed the mandated teaching of creation in public schools. This removal has continually been affirmed since 1968. Second, those who would desire that school districts require creation be taught alongside evolution are making huge efforts to show that the theory of creation does not have to be a faith belief but is scientifically valid. In so showing, they will have made a strong argument that
creation does not infringe on the wall of separation but rather is a legitimate scientific theory.

*Epperson v. Arkansas, 1968*

After the Scopes trial in 1925, Arkansas passed an anti-evolution law. This law made it illegal to teach evolution within a public school in Arkansas. In 1965, after trying to repeal this law for years, the Arkansas Education Association (AEA) found Susan Epperson as a plaintiff to challenge the law. Now, “for the first time since the Scopes trial in 1925, there would be a lawsuit to challenge an anti-evolution law” (Moore, 1998, p. 653). Chancellor Murray O. Reed of the State’s Chancery Court heard the case and decided that the law was unconstitutional. The State’s Attorney General appealed Reed’s ruling to the Arkansas Supreme Court. The Court reversed Reed’s decision and upheld the anti-evolution law. Epperson filed an appeal and, in 1968, the Supreme Court heard *Epperson v. Arkansas*. The Court, in its decision, stated that such a law is unconstitutional since it attempts to “establish a religious position in a public school” (Moore, 1998, p. 658).

Now, for the first time, the Supreme Court found that outlawing the teaching of evolution in public schools is unconstitutional. The importance of this decision lies within the fact that the Court saw creation as a religious position in the public schools. Inevitably, this would give the courts leeway in the future not only to force schools to allow evolution to be taught but, to outlaw any mandates requiring that creation be taught.
Lemon v. Kurzman, 1971

Just three years later the Court rendered a decision on a case that had far reaching effects in public schools. In *Lemon v. Kurzman*, the Court reviewed two state statutes. Rhode Island had a statute providing a salary supplement to non-public teachers if the eligible teachers agreed not to teach courses in religion. This statute was struck down by the Court, as was a Pennsylvania law which allowed the State to purchase 'secular educational services' from non-public schools if the materials contained no 'religious teaching' (*Lemon v. Kurzman*, 1971).

The importance of this case on evolution and creation had more to do with what is called the *Lemon test* than the decision that the Court rendered. In making their decision the Court set up a test to decide if a public religious activity is constitutional. This test states that a "public religious activity is constitutional if: (1) it has a predominately secular purpose; (2) it neither inhibits nor advances religion; and (3) it creates no 'excessive entanglement' between government and religion" (*Lemon v. Kurzman*, 404 U.S. 612-613, 1971). The first two prongs of this test were developed in the 1962 *Engel v. Vitale* case, whereas the third prong of this test originated in the 1970 *Walz v. Tax Commission* case. All cases concerning creation/evolution that have come to the courts since 1971 are usually determined based upon their meeting the criteria of the *Lemon test*. However, the courts have lately utilized two other litmus tests known as the *Endorsement test* and the *Coercion test* (*Freiler v. Tangipahoa Parish Board of Education*, 1999).
Another case that is interesting to the discussion is *Stone v. Graham*, 1980. This review has shown the close relationship that was once afforded religion and public education. It has also shown how that relationship has been broken. This continued in the early part of the eighties. *Stone v. Graham* is an excellent example. This case concerned the hanging of the Ten Commandments in the hallway of a public school. The Court decided that to do so would be unconstitutional. The Court made it clear that:

The pre-eminent purpose for posting the Ten Commandments on schoolroom walls is plainly religious in nature. The Ten Commandments are undeniably a sacred text in the Jewish and Christian faiths, and no legislative recitation of a supposed secular purpose can blind us to that fact. (*Stone v. Graham*, 449 U. S. 39, 41, 1980)

*Wallace v. Jaffree*, 1984

In 1984, the Court in *Wallace v. Jaffree*, found that a mandated period of silence by public schools, held before school began is unconstitutional if the purpose is for prayer. This is a case where the Alabama legislature apparently tried to find a way around the 1962 *Engel v. Vitale* ruling. While the moment of silence is perfectly constitutional, the fact that the legislature enacted it for the purpose of prayer made it unconstitutional in the Court's mind (*Wallace v. Jaffree*, 1984).
By 1987, states and communities across the nation, but especially in the South were constantly trying to find ways to return to the pre-1962-63 era. In fact, in 1981, Louisiana Governor David Treen sought to force school districts to teach “Creationism” alongside evolution in the classroom by signing into law the “Creationism Act” of 1981. Since 1968, it had generally been accepted by national policy to teach evolution and not creation. However, many districts continued to teach science according to community norms. In Louisiana however, the state decided to mandate that if a district taught evolution they must also teach creation.

Appellees filed suit in *Edwards v. Aguillard* and, in 1987, the Supreme Court found the Act “unconstitutional.” Finding, that by advancing the religious belief that a supernatural being created humankind, the act impermissibly endorses religion (*Edwards v. Aguillard*, 1987).

The U. S. circuit courts have been plagued in the nineties with cases of school districts or teachers constantly trying to find new ways to get around the new case laws. Of special note are three cases.


In 1990, in *Webster v. New Lenox School District*, Ray Webster, a social studies teacher at the Oaster-Oakview Junior High School in New Lenox, Illinois, was constrained by the school board to “restrict his classroom instruction to the curriculum and refrain from advocating a particular religious viewpoint (creation science)” (*Webster v. New Lenox*, 917 F2nd 1005, 1990). Mr. Webster brought suit arguing that the school
board's prohibitions constituted censorship in violation of the First and Fourteenth Amendments. He argued that the school board should permit him to teach a non-evolutionary theory of creation in his social studies class. The Seventh Circuit Court of Appeals upheld a district court's finding that a school district may prohibit a teacher from teaching creation science even though he/she claims that it violates his/her freedom of speech (Webster v. New Lenox, 1990).

Peloza v. Capistrano Unified School District, 1994

In 1994, John E. Peloza, a high school biology teacher in California, sued the Capistrano Unified School District. Peloza alleged that the school district required him to teach "evolutionism" and that evolutionism is a religious belief system. Thus, he alleged that such a requirement violated his rights under the (1) Free Speech Clause of the First Amendment; (2) Establishment Clause of the First Amendment; (3) Due Process Clause of the Fourteenth Amendment and (4) Equal Protection Clause of the Fourteenth Amendment. Peloza argued that he did not want to teach either creation or evolution in his biology class because both are philosophical belief systems rather than true scientific theories (Peloza v. Capistrano Unified School District, 1994). Yet, in its decision the Ninth Circuit Court of Appeals upheld a district court's 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 class. In so finding the court dismissed the idea of a "religion of evolutionism" (Peloza v. Capistrano Unified School District, 1994).
Freiler v. Tangipahoa Parish Board of Education, 1999

In 1999, the Fifth Circuit Court of Appeals heard Freiler v. Tangipahoa Parish Board of Education. In this case, the Tangipahoa Parish Board of Education adopted a resolution disclaiming the endorsement of evolution.

Parents of children in the Tangipahoa Parish Public Schools brought suit to enjoin their school board from mandating that this disclaimer be read. The Fifth Circuit Court of Appeals affirmed a district court's ruling that it is unconstitutional for a school board to require teachers to read aloud a disclaimer whenever they teach about evolution (Freiler v. Tangipahoa Parish Board of Education, 1999).

Summary

From the inception of this country until 1987 it was legal for school boards to require that creation be taught as a theory of origins in the science curricula of the public schools. Many factors led to the 1987 Supreme Court decision finding that the teaching of creation in public schools is now unconstitutional. Some of these include: (A) the Supreme Court's 1947 finding that the First Amendment implied a separation of Church and State which in turn meant that no publicly financed entity should encourage Christian views; (B) the scientifically accepted and approved theory of evolution which calls into question the validity of the theory of creation; (C) the changing plurality of this nation. This background is important to keep in mind when one seeks to understand the current setting of the creation/evolution debate.
Evolution - Theory

Evolutionary theory assumes that an Intelligent Designer either does not exist or has never been imminently involved with the natural progression of the universe. Yet the universe did not just appear. How did the universe progress and from what? While it appears that there are many evolutionary theories for the origin and progression of the universe (Big Bounce, Eternal Existence), the majority of evolutionists seem to agree to some form of the Big Bang theory.

The Big Bang theory is based upon the Doppler-Fiseau Effect. The Doppler-Fiseau Effect is based upon the theory that light waves striking the retina of the eye decrease as a source is moving away from the retina. Thus, as a source moves away the light waves have a lower frequency. The lower the frequency the more red an object appears. Therefore, one sees galaxies that are very distant as having a dominant red color and moving at an increasing speed. It is thus theorized that all the galaxies are moving away from what once was the center of the universe (Spencer, 1990). Hubble's Law takes the Doppler-Fiseau effect and extrapolates back some 20 billion years to a time when this astronomically large expanding universe was compressed into a volume the size of an atom. If Hubble is correct, scientists should find a low energy, very long wavelength, background microwave radiation. This radiation was found in 1965 (Spencer, 1990). This theory implies that all matter, in essence, came from nothing and had a beginning. The theory accepts this minor weakness and proceeds to the challenge of life on earth arising from non-life.

The theory continues: once the universe had come into being, from the quantum fluctuation within an atom, the Earth was formed. This occurred billions of years ago.
Yet, its surface and atmosphere were entirely different than they are today. The surface of the earth was nearly 95% covered in water and the average temperature of the earth was much greater because of chemical activity. It is then theorized that the right chemicals combined within the sea to produce the common ancestor of all life. This ancestor was a replicating molecule. Most scientists believe this ancestor to be some form of RNA. They point out that RNA has been shown, in some laboratories, to have catalytic capabilities (Colby, 1996). “This ancestor gave rise to three major lineages of life. These are prokaryotes, archaeabacteria, and eukaryotes” (Colby, 1996, p. 20). Each of these lineages independently formed a DNA genome and thus evolved mechanisms to transcribe DNA into RNA. “The first cells must have been anaerobic because there was no oxygen in the atmosphere. In addition, they were probably thermophilic (heat-loving) and fermentative. These cells produced bacterial communities from which photosynthesis evolved” (Colby, 1996, p. 21).

After this, oxygen levels increased to the point that it was dangerous to living things. “In response, many species went extinct, some continued to thrive in anaerobic microenvironments and several lineages independently evolved oxygen respiration” (Colby, 1996, p. 21). From these lineages animals evolved.

How did so many species evolve from one ancestor? In order to understand how living things have evolved one must understand alleles. “Alleles are different versions of the same gene. Thus, humans can have A, B, or O alleles that determine one aspect of their blood type” (Colby, 1996, p. 3).

The different alleles produce genetic variation, which may be increased by mutations. A mutation occurs when the “cellular machinery that copies DNA” makes a
mistake (Colby, 1996, p. 8). These mistakes alter the sequence of a gene, and thus mutate it. Most mutant alleles never survive. Those that do are most commonly either deleterious or neutral. Yet it is possible for beneficial alleles to survive and thus change a population, as the individual, in which it survived, will reproduce the allele in the offspring because it is beneficial. A beneficial allele is one that makes the population more fit for survival. Thus, slowly over billions of years animals have evolved through mutations and the survival of the fittest.

*Evolution and the Fossil Record*

Evolutionists point to the fossil record as proof that the theory of evolution is true. It could be said that the fossil record is the strongest evidence for the theory of evolution. Scientists often cite the geologic column and the fossil record to show how species evolved from other species through minor changes that occurred over long periods of time. The evolutionary theory "predicts that fossils should appear in a temporal progression, in a nested hierarchy of lineages, and that it should be possible to link modern animals to older, very different animals" (Hunt, 1997, Part 1A, p. 6).

Evolutionists claim to have traced the evolution of primitive jawless fish to modern man through the fossil record. The evolutionary journey in most theories is something like this: transition from primitive jawless fish to bony fish; transition from primitive bony fish to amphibians; transition from amphibians to the first reptiles (amniotes); transition from reptiles (synapsid) to mammals; transition from apelike mammals to man. In support of this theory it is revealed, "paleontologists have discovered several superb examples of intermediary forms and sequences, more than
enough to convince any fair-minded skeptic about the reality of life's physical
genealogy" (Hunt, 1997, Part 2C, p. 8).

The fossil record further reveals that, as a general rule, simpler animals are found
lower in the earth's crust than more complex animals. This placement implies that they
existed before the more complex animals and these more complex animals evolved from
them. This coupled with the transitional fossils that have been found is strong evidence
for evolution.

Evolution and Biology

Evolution requires that sometime in the past, life arose from non-life. How can
this be? Is abiogenesis (life arising from non-life) possible? Scientists believe that given
a different environment that was much friendlier to life arising from a combination of
chemicals, it is very possible that abiogenesis could occur. Further, if it were shown that
the early years of this planet had a friendly atmosphere and environment for life to arise
from a combination of chemicals, would this not go far in supporting the evolutionary
theory and logically explaining how life began? Certainly it would.

As stated earlier, the theory of evolution is explained by maintaining that the first
life form was a replicating molecule that evolved through a combination of chemicals in a
prebiotic sea. This was possible because of the totally different atmosphere and
topography of the earth.

Dr. Stanley Miller of the University of California at San Diego points out that "we
really don't know what the earth was like three or four billion years ago" (Henahan,
1999, p. 1). However, if chemicals were to react in a prebiotic soup to produce life, then
the earth would have needed a reducing atmosphere containing methane, ammonia, hydrogen and water. It has been theorized that the earth had such an atmosphere since all of the outer planets of this solar system—Jupiter, Saturn, Uranus and Neptune—have this kind of atmosphere.

Dr. Miller states, "as long as you have...basic chemicals and a reducing atmosphere, you have everything you need" (Henahan, 1999, p. I). In fact, in the early 1950's, Dr. Miller, working in the laboratory of Harold C. Urep at the University of Chicago, did the first experiment designed to clarify the chemical reactions that occurred on the primitive earth. In the flask at the bottom, he created an "ocean" of water, which he heated, forcing water vapor to circulate through the apparatus. The flask at the top contained an "atmosphere" consisting of methane, ammonia, hydrogen, and the circulating water vapor.

Next, he exposed the gases to a continuous electrical discharge (lighting), causing the gases to interact. Water-soluble products of those reactions then passed through a condenser and dissolved in the mock ocean. The experiment yielded many amino acids and enabled Miller to explain how they had formed. (Henahan, 1999, p. I)

It is theorized that these amino acids developed into some kind of pre-RNA that would be self-replicating and thus the first life molecule from which all life evolved. Yet there is still disagreement over the temperature of the atmosphere. Some feel it had to be very warm to produce these chemical reactions but, if it was higher than 25° C, then it appears that the organic materials would simply decompose. Whatever course life took.
evolutionists believe they have shown in the laboratory that it is possible for it to have arisen from non-life through chemical reactions producing amino acids which, in certain environments, have been theorized to produce a replicating RNA molecule. Once you have an “RNA replication, Darwinian evolution (is) possible” (Duve, 1999, p.1).

Whether one believes it is possible for abiogenesis to occur or not, one further question should be asked. Could all life presently on earth have arisen from a common ancestor? In other words, is there enough biological diversity in genes to account for all of the diversity of life to have come through evolutionary processes from a common ancestor?

Dr. Richard Dawkins, biologist at Oxford University, maintains that, through the processes of beneficial mutation and natural selection, evolution of all life from a common ancestor is “well-nigh inevitable” (Dawkins, 1996a, p. 137). Dr. Dawkins argues that genes do have beneficial mutations from time to time. These mutations change the new organism very slightly from its parents. This slight change is then built upon by following generations with other slight changes, each beneficial mutation creating a little more difference between the evolving species and the parent species. Dr. Dawkins uses the term “cumulative selection” to refer to this process, “in which each improvement, however slight, is used as a basis for future building” (Dawkins, 1996a, p. 99). Thus, he states that in the evolution of the eye “a simple, rudimentary, half-cocked eye...is better than none at all” (Dawkins, 1996a, p. 41). He believes that the eye could have evolved. If the eye could have evolved, then any complex organ could have evolved and thus organisms could have evolved from a common ancestor. Each species taking a different route according to the beneficial mutation that may have occurred in its
parents. He points out that he does not know of "a single case of a complex organ that could not have been formed by numerous successive slight modifications" (Dawkins, 1996a, p. 91). Certainly, the human eye and, for that matter, any organ could have arisen "from something slightly different from itself" (Dawkins, 1996a, p. 77). Using this type of philosophical strategy as well as computer-based programs, Dr. Dawkins reveals the inevitability of evolution (given that organisms could, through DNA copying, make beneficial mistakes).

Creation – Theory

The theory of creation states that the universe, and more specifically the earth, was created by God. The exact process of how this occurred may have been through natural laws and thus a Big Bang occurrence.

Not only was the earth created, life on Earth was also created. Furthermore, God created all the different species on Earth.

It is important at this point to note the difference between microevolution and macroevolution. Microevolution is the shifting of genes within a species. Macroevolution is major transformation of organisms into new and different species over geological time. Creationists believe in microevolution. However, they maintain that macroevolution has never been observed and has not occurred.

The theory of creation continues by stating that sometime in the past this planet experienced a worldwide flood. This flood killed all living creatures (except a few from each species) and sorted them as floods do into the strata of the earth. All living creatures today are descendants from those surviving this worldwide catastrophe.
Creation and the Fossil Record

Most creation theories begin by explaining the weaknesses of evolution and then proceed to explain how the creation theory fits the evidence better. This is understandable; if creationists or evolutionists can prove that the other theory could not have occurred then there is only one other solution and that would be their theory.

The first weakness is anomalies. By anomalies it is meant that some fossils that should not exist in certain layers of the earth's crust exist there. From time to time a more complex animal is found in a strata that is too old for that animal to have existed in according to the evolutionary theory. In fact, some animals that have supposedly evolved from others are found in the same, and even lower, strata than their ancestors. Furthermore, some fossils have their feet in one stratum and their head in another stratum supposedly millions of years older. These fossils are all called anomalies in the evolutionary theory; there is no explanation for them and they seem to be exceptions to the rule.

The second weakness that some evolutionists admit, is that there are very few "transitional" fossils. Of course, they are quick to explain why. Nevertheless, it is a glaring weakness. The late Dr. Stephen Jay Gould, a staunch evolutionist and arguably the leading paleontologist of his day, helped develop a theory to explain why there are so few transitional fossils. Dr. Gould along with Dr. Niles Eldridge developed the Punctuated Equilibrium theory. This theory assumed that a small subpopulation of a species that were genetically isolated from the main population developed changes rapidly and, when re-introduced to their original homeland, were no longer able to
interbreed with the main population. Since these sub-populations developed changes quickly, there are few transitional fossils.

Concerning transitional fossils, creationists point out that species just “appear” in the fossil record, they do not change, and then they disappear. Evolutionists admit that this is usually the case. Dr. Gould stated:

I became deeply troubled by the Darwinian convention that attributed all non-gradualistic literal appearances to imperfections of the geological record. This traditional argument contains no logical holes, but the practical consequences struck me as unacceptable...as one almost never found this anticipated form of gradual change up geological sections, and one therefore had to interpret the vastly predominant signal of stasis and geologically abrupt appearance as a sign of the record's imperfection, and therefore as no empirical guide to the nature of evolution. (Gould, 2002, pp. 38-39)

Philip Johnson, a professor of law at the University of California at Berkley, also questions the idea that there are numerous transitional fossils:

Paleontologists seem to have thought it their duty to protect the rest of us from the erroneous conclusions we might have drawn if we had known the actual state of the evidence. Gould described “the extreme rarity of transitional forms in the fossil record” as “the trade secret of paleontology.” (Johnson, 1993, p. 59)

Johnson believes that evolutionists have “stacked the deck” by not allowing the possibility of the evolution theory being incorrect.

Suppose that paleontologists became so committed to the (Darwin) way of thinking that fossil studies were published only if they supported the theory, and
were discarded as failures if they showed an absence of evolutionary change...that is what has happened. Darwinism passed the fossil test, but only because it was not allowed to fail. (Johnson, 1993, p. 48)

According to creationists, evolutionists admit that "in most cases, among mammals, the fossil break is so sharp and the gap so large that the origin of the order is speculative and much disputed" (Camp, 1998a, p. 6). In other words, although mammals are considered the best-documented case of macroevolution from the fossil record, there is little agreement as to which mammal came from which.

The evolutionary line from apes to man is also strongly challenged. Creationists argue that "supposed (Hominids) have relied on mere tooth or jaw fragments" (Browning, 1999, Evidence 4, p. 1). Piltdown Man was clearly a hoax of an ape's jaw placed with a human skull, yet some 500 books were written about it. Ramapithecus lasted for twenty years and now is known to be an extinct baboon. The Hesperithecus was a hominid which was created from a pig's tooth, yet it fooled the entire paleontology field and dental experts for fourteen years. Orce Man was based on the skullcap of a donkey. Other hominids are declared on the basis of a leg bone, hip, or knee piece.

Creationists further claim that it is a well-known fact that most fossils are found because the animal died in a catastrophe. In order for an animal to be fossilized it must be buried rapidly. Creationists believe in a worldwide catastrophe that affected the atmosphere and topology of the earth. They further believe that their theory explains the fossilization of creatures better. Creationists believe that a worldwide flood occurred. This catastrophe, with the following Ice Age, explains the disappearance of many species as well as the fossilization of animals and plants.
This theory would have allowed different strata to form rapidly and smaller animals would naturally settle lower than larger ones. It is claimed that this type of catastrophe would have caused the geologic column to form similar to how we find it. This theory also claims to be able to explain the many anomalies and irregularities found in the geologic column for which the theory of evolution has no explanation.

Creation and Biology

Dr. Henry Morris questions the idea that a complex system (life) could have arisen by chance from non-living matter. He calculates that the odds of "an organism composed of 100 integrated parts" arising by chance and natural processes would be "1 in \(10^{53}\)" and yet the simplest type of...molecule that could be said to be "living" is composed of a chain of at least 400 linked amino acids...it is inconceivable (to anyone but a doctrinaire evolutionist) that a living system could ever be formed by chance. Yet, if a Creator is excluded from the problem, there is no other way that at least the first living system could have been formed. (Morris, 1985. pp. 60-62)

Along these same lines, Dr. Larry Butler, professor of biochemistry at Purdue University issued the following challenge:

Assume any primordial soup you wish, with all the organic chemicals you specify — including enzymes, nucleic acids, sugars, or whatever you like, as long as they are not living. The mixture must be sterile, of course, to prevent bacterial contamination. Assume also any kind of atmosphere you wish, including any compounds known to be present anywhere in the solar system. Then assume any
kind of energy source you wish – electrical sparks, heat, ultraviolet light, or any known form of energy. Now show, either analytically or experimentally, that a truly living organism will arise out of this set of materials. (Morris, 1985, pp. 60-62)

No one has accepted his challenge.

Even if somehow life could have arisen from non-life, creationists still question how the human-eye or other complex organs could have evolved. The eye is incredibly complex; if one were to take away any one of its core components it would cease to function. Thus, all components must have evolved at once if they evolved, yet that sounds more like creation than evolution. This line of reasoning is used often by creationists. For example: How did lungs form if lungs are necessary for an animal to exist? And, how did certain species reproduce if it took millions of years for the reproduction systems to evolve?

Dr. Lee Spetner has also responded to Dr. Dawkins’ defense that evolution has produced all the diversity of life that exists. Dr. Spetner maintains that for cumulative selection to work, a lot of good mutations have to occur by chance. At each step of cumulative selection, a mutant with a positive selective value has to appear…survive and…take over the population. Then another good mutation has to appear for the next step, and so on…. But no one has ever shown that to be so. No one has ever shown that such a thing is likely—or even possible! (Spetner, 1997, p. 91)

Dr. Spetner reveals that if a simple organism is to develop into a more complex organism then information must be added. This has never been observed, however, but the loss of
information in organisms is observed constantly. In fact, Dr. Spetner clarifies that even beneficial mutations occur with either no change in information or a loss of information. He states:

there are point mutations that make bacteria resistant to antibiotics....But all these mutations reduce the information in the gene by making a protein less specific. They add no information....Not even one mutation has been observed that adds a little information to the genome. That surely shows that there are not the millions upon millions of potential mutations the theory demands. (Spetner, 1997, pp. 159-160)

What does account for the changes in species, like jaw structure. Dr. Spetner believes that the variation driving evolution is not random (and thus not macroevolution), but is triggered by the environment. He reveals that in cells the environment triggers changes in both the enzyme synthesis and hormones. This environmentally triggered change, coupled with the propensity of parents to pass that change on, accounts for the evolutionary processes that are seen. These processes occur on the species level but do not-nor can they-account for the development of all life from a common ancestor. In other words, species can change according to their environment, but this change is not to the extent required to produce totally new species, families, or phyla. It is change that is limited by the genetic information “created” within the species to give it adaptability in different environments. Thus, the species is not evolving into a new species, but is evolving into its environment. He believes the fossil record supports his theory because his theory accounts for sudden changes in jaw and tooth structure when an animal’s diet changes. Since most missing links consist mostly of teeth, he maintains that his findings
crush the theory of evolution. To support his theory, he points to the finches on the Galapagos Islands that have "changed" so quickly that "the required mutations and the required selection could not have occurred" (Spetner, 1997, p. 204). A change that occurs because of the environment, however, could very well account for the differences in the finches so quickly. This is also seen in many other animals, according to Spetner.

Intelligent Design

Since the theory of Intelligent Design (ID) is the topic that has been debated by scientists on major college campuses (Princeton, Stanford, Harvard, Northwestern University, University of New Mexico) across this nation as well as by state boards of education (Kansas, Ohio) it would be beneficial to expose educators to this theory. ID is unlike the theory of creation in that it does not speculate who or what the Intelligent Designer is. The following explanation of ID, using the words of its proponents, will help educators better understand the current debate.

In 1993, Professor Philip Johnson of the University of California at Berkeley invited a group of scientists and philosophers to a small beach town on the central coast of California. They came from major academic centers including Cambridge, Munich, and the University of Chicago to question (evolution).

(Illustra Media, 2002, excerpt from video)

From this meeting a new scientific theory or origins emerged from a realization that the theory of evolution could not adequately explain what is observed in nature.

Thomas Kuhn in his best-selling and groundbreaking book *The Structure of Scientific Revolutions* states:
Scientific Revolutions are inaugurated by a growing sense, again often restricted to a narrow subdivision of the scientific community, that an existing paradigm has ceased to function adequately in the exploration of an aspect of nature which that paradigm had previously led the way. (Kuhn, 1996, p. 92)

Kuhn further revealed that new paradigms in science are often met with manifest resistance because the “old” scientific community is still looking through the lens of the previous paradigm. Although the new model may better explain the anomalies with which the old paradigm was fraught still it will be met with resistance because the two groups are practicing “in different worlds...seeing different things when they look from the same point in the same direction” (Kuhn, 1996, p. 150).

Many ID theorists and scientists feel they are on the cutting edge of science with a new paradigm that answers the anomalies that have plagued the theory of evolution (Johnson, 1995). They further feel that the resistance to their theory is prejudiced by the old paradigm of evolution.

Science ought to be a search for truth without prejudging what is true...when you come to a puzzle you ought to bring to that puzzle every possible cause that might explain it...one of the problems with evolutionary theory is that it artificially rules out “intelligence” even before the evidence has a chance to speak. (Illustra Media, 2002, excerpt from video)

Design Inference

Dr. William Dembski, mathematician professor at Baylor University, explains the scientific basis for an ID theory by eliminating chance (evolution) through small
probabilities. This practice, according to Dembski, has a long history. To illustrate his point he quotes Marquis Pierre Simon de Laplace who questioned whether Cicero’s method of randomly shaking out letters from a receptacle could produce a word:

“On a table we see letters arranged in this order, Constantinople, and we judge that this arrangement is not the result of chance, not because it is less possible than the others, for if this word were not employed in any language we should not suspect it came from any particular cause, but this word being among us, it is incomparably more probable that some person has thus arranged the aforesaid letters than that this arrangement is due to chance.” A whole book, a single verse, nay, even a long word are so unlikely that we attribute their occurrence to something other than chance.

To show the absurdity of maintaining chance in the face of small probabilities Thomas Reid...asked: “If a man throws dies and both turn up aces, if he should throw 400 times would chance throw up 400 aces”...The answer...obviously is “no.” (Dembski, 1998, p. 1)

Dembski continues describing empirical evidence for intelligent design as “not just the sheer improbability of an event, but also the conformity of the event to a pattern” (Dembski, 1998, p. 3). ID scientists explain that the theory of evolution maintains that life arose by chance. Yet, if chance is eliminated by the impossibility of such an event occurring then design must be considered. Therefore, one can think of “design and chance as competing modes of explanation for which design prevails once chance is exhausted” (Dembski, 1998, p. 8). However, if scientists refuse to consider design because of their evolutionary paradigm, then no matter how impossible it is for life to
have arisen by chance it must have done so. ID proponents believe this is stacking the
deck so that the theory of evolution is beyond empirical testing (Johnson, 1993).

Michael Behe, Professor of Biochemistry at Lehigh University, describes the
debate for ID by imagining

a room in which a body lies crushed, flat as a pancake. A dozen detectives crawl
around, examining the floor with magnifying glasses for any clue to the identity
of the perpetrator. In the middle of the room, next to the body, stands a large,
gray elephant. The detectives carefully avoid bumping into the pachyderm's legs
as they crawl, and never glance at it. Over time the detectives get frustrated with
their lack of progress but resolutely press on, looking even more closely at the
floor. You see, textbooks say detectives must "get their man," so they never
consider elephants.

There is an elephant in the roomful of scientists who are trying to explain
the development of life. The elephant is labeled "intelligent design." To a person
who does not feel obliged to restrict his search to unintelligent causes, the
straightforward conclusion is that many biochemical systems were designed...

The conclusion of intelligent design flows naturally from the data itself—not from sacred books or sectarian beliefs. Inferring that biochemical systems
were designed by an intelligent agent is a humdrum process that requires no new
principles of logic or science. It comes simply from the hard work that
biochemistry has done over the past forty years, combined with consideration of
the way in which we reach conclusions of design every day. (Behe, 1996, pp.
192-193)
For example, if one were to see “John loves Mary” spelled out in the sand at a beach one would assume intelligence designed the writing because of 1) the improbability of such a design occurring by chance, and because of 2) the way the letters fit a pattern. Yet if one were to assume that intelligence did not produce such a pattern, then chance would have to explain it no matter the impossibility of such an event (Illustra Media, 2002).

**Irreducible Complexity**

The ID theory proceeds from the explanation of a design framework to an empirical observation of biological phenomenon. Behe states “(for the) Darwinian theory of evolution to be true, it has to account for the molecular structure of life” (Behe, 1996, p. 39). He then looks at this structure. Behe maintains that cells contain some irreducibly complex systems that had to be created. What he means by irreducibly complex is that within a single system which is composed of several well-matched, interacting parts, every part contributes to the basic function of the system and the removal of any one of the parts causes the system to cease functioning effectively.

The reason Behe is confident that an irreducibly complex system has to be created is that it cannot evolve. Darwin himself stated, “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” (Behe, 1996, p. 39). To put it another way, an irreducibly complex system by definition could not have evolved since it was not produced by slight modifications. Evolution is based on natural selection, but in order for a system to be a candidate for natural selection it must have a minimal function.
Thus, an irreducibly complex system could not have evolved; it must have just appeared from nothing (i.e. created). Behe claims that it is impossible to know if an eye could evolve because there are tens of thousands of different types of molecules involved; thus there currently is no way of listing them and speculating on the mutations that might have produced them. But one could look to the molecular level and see if it is possible for certain systems to have evolved.

Behe looks at the cilia, the flagella, blood coagulation, vesicular transport within cells, clonal selection, antibody diversity, the complement system of the immune system, and the AMP of the building block A in DNA. He concludes that each of these systems is irreducibly complex and therefore must have been created.

The description of a flagellum helps to understand Behe's dogmatism concerning evolution's inability to account for the origins of these complex biochemical systems. The flagellum tail runs at 100,000 rpms and is hard-wired to get feedback from the environment. Scientists have labeled the flagella as "the most efficient machine in the universe" (Illustra Media, 2002, excerpt from video). It has forty parts including a propeller, u-joint, rotor, drive shaft, and gears. If any part is missing it ceases to function. And unless it works natural selection will not select it to survive. Behe compares the complexity of this system to a well running factory, or space probe. In other words, it is incredibly complex; if one saw it functioning one would no more believe it evolved than that a factory evolved from materials lying around. The same can be said of the other biochemical systems he studied. In support of his premise he points out that in each system in the thousands of articles written in scientific journals, no scientist has ever proposed how they could have evolved. In fact, he claims "there has never been a
meeting, or a book, or a paper of details of the evolution of complex biochemical systems" (Behe, 1996, p. 179). In support of this claim he reveals that, although many evolution scientists reviewed his book, no one has yet to explain how these biochemical systems could have evolved (Dembski, & Kushiner, (Ed.) 2001).

**Impossibility of Life Arising from Non-Living Matter**

The ID theory not only challenges the idea that complex biochemical systems could have evolved, but also the idea that life itself could have evolved. Stanley Miller's experiment revealed to evolutionists that amino acids could have formed in the prebiotic soup of the early earth. However, Behe challenges this notion:

Making the molecules of life by chemical processes outside of a cell is actually rather easy. Any competent chemist can buy some chemicals from a supply company, weigh them in the correct proportion, dissolve them in an appropriate solution, heat them in a flask for a predetermined amount of time, and purify the desired chemical produced, away from unwanted chemicals produced by side reactions...

Most readers will quickly see the problem. There were no chemists four billion years ago. Neither were there any chemical supply houses, distillation flasks, nor any of the many other devices that the modern chemist uses daily in his or her laboratory, and which are necessary to get good results. A convincing origin-of-life scenario requires that intelligent direction of the chemical reactions be minimized as far as possible...Reasonable guesses about what substances were available on the early earth - such as Stanley Miller made - are a necessary
starting point. The trick for the researcher is to choose a probable starting point, then keep his hands off.

As an analogy, suppose a famous chef said that random natural processes could produce a chocolate cake. In his effort to prove it, we would not begrudge him taking whole plants – including wheat, cacao, and sugar cane – and placing them near a hot spring, in the hope that the heated water would extract the right materials and cook them. But we would become a little wary if the chef bought refined flour, cocoa, and sugar at the store, saying that he didn’t have time to wait for the hot water to extract the components from the plants…And we would walk away if he then measured the amounts of the components carefully, mixed them in a bowl, placed them in a pan, and baked them in his oven.

The experiment that Stanley Miller reported in 1952 stunned the world. As Miller has readily explained, however, that experiment was not the first such one he tried. Earlier he had set up his apparatus in a somewhat different manner and found that some oil was formed, but no amino acids. Since he thought amino acids would be the most interesting chemicals to find, he jiggled the apparatus around in hopes of producing them. (Behe, 1996, pp. 168-169)

Yet, even if the early earth did produce amino acids, the idea that amino acids could connect to form proteins is mind-boggling. Dean Kenyon, senior biology professor at San Francisco State University, was one of the leading chemical evolutionary theorists in the late 1960’s, 70’s and early 80’s. He devoted his life to explaining how life could originate through a purely natural process. In 1969, he co-authored a best-selling book on the origin of life by chemical processes (*Biochemical Predestination*). Kenyon
believed that he could explain how life began by explaining how proteins could have formed from amino acids which are believed to have developed in the prebiotic soup of the early earth. "Proteins are made of chains of amino acids and there are twenty different types of amino acids" (Illustra Media, 2002, excerpt from video). Biologists have compared amino acids to the alphabet. Alphabet letters can be arranged in a huge number of possible combinations, and it is the arrangement of the letters that determines if you have meaningful words and sentences (Illustra Media, 2002).

There are at least 30,000 distinct types of proteins, each made from a different combination of the same twenty amino acids. The amino acids in these proteins are arranged like letters to form chains often hundreds of units long (Illustra Media, 2002). If they are sequenced properly then the chain will form a functioning protein. If this arrangement is incorrectly sequenced, however, then it is a useless chain that will be destroyed in the cell. Kenyon, felt that he had the scientific explanation for origins. He believed that the chemical properties of amino acids caused them to be attracted to each other to form the long chains of proteins. Thus life was predestined by chemistry.

Kenyon began to doubt his own theory when one of his students asked him how the first proteins could have been assembled without the help of genetic instructions. These doubts multiplied when his research at a NASA research facility revealed that amino acids do not have the chemical capability to organize themselves (Illustra Media, 2002). The genetic instructions for the formation of proteins are stored in DNA. This complicated the matter even more because DNA "is the most densely packed and elaborately detailed assembly of information in the known universe" (Illustra Media, 2002, excerpt from video).
Kenyon was confronted with two choices: 1) either he had to explain where the genetic instructions of DNA came from; or 2) he had to explain how proteins could have arisen directly from amino acids without DNA in the primordial ocean. He realized he could do neither. "The more I thought about the enormous problem that all of us that worked in this field had neglected to address, the origins of genetic information itself, the more I realized I had to reassess my whole position regarding origins" (Illustra Media, 2002, excerpt from video). The reason Kenyon felt this way was because of the question of probability. The probability of generating two sentences by dropping Scrabble™ letters onto a tabletop is beyond the scope of chance occurrence. Yet, this probability is nothing compared to the odds of a protein in the simplest one-celled organism arising by chance since the genetic instructions required would fill hundreds of pages of printed text.

Yet, even if proteins could have been produced, that is only part of the problem according to Behe:

- Imagining a realistic scenario whereby natural processes may have made proteins on a prebiotic earth – although extremely difficult – is a walk in the park compared to imagining the formation of nucleic acids such as RNA. The big problem is that each nucleotide “building block” is itself built up from several components, and the processes that form the components are chemically incompatible...Gerald Joyce and Leslie Orgel – two scientists who have worked long and hard on the origin of life problem – call RNA “the prebiotic chemist’s nightmare.” They are brutally frank: “Scientists interested in the origins of life seem to divide neatly into two classes. The first, usually but not always molecular
biologists, believe that RNA must have been the first replicating molecule and that chemists are exaggerating the difficulties of nucleotide synthesis...The second group of scientists are much more pessimistic. They believe that the de novo appearance of oligonucleotides on the primitive earth would have been a near miracle. (The authors subscribe to this latter view)."

Even if the miracle-like coincidence should occur and RNA be produced, however, Joyce and Orgel see nothing but obstacles ahead...the miracle that produced chemically intact RNA would not be enough. Since the vast majority of RNAs do not have useful catalytic properties, a second miraculous coincidence would be needed to get just the right chemically intact RNA. (Behe, 1996, pp. 171-172)

Philip Johnson, in making the case for ID as a legitimate scientific theory, adds:

The simplest organism capable of independent life, the prokaryote bacterial cell, is a masterpiece of miniaturized complexity which makes a spaceship seem rather low-tech. Even if one assumes that something much simpler than a bacterial cell might suffice to start Darwinist evolution on its way – a DNA or RNA macromolecule, for example – the possibility that such a complex entity could assemble itself by chance is...about as likely as that "a tornado sweeping through a junkyard might assemble a Boeing 747 from the materials therein." (Johnson, 1993, pp. 105-106)

ID theorists claim that it is just impossible for life to have arisen from non-living matter. Thus, ID must be considered according to the rules of science because there is no natural cause that produces information (neither natural selection nor chance), but there is such a
cause when intelligence is considered. The theory of ID is based upon observation of the facts. When one looks at the evidence objectively, “without ruling out the possibility of design, design just leaps up as the most likely explanation” (Illustra Media, 2002, excerpt from video) and “scientists should follow the physical evidence wherever it leads, with no artificial restrictions” (Behe, 1996, p. 243).

**Philosophical Presuppositions**

The ID movement goes to great lengths to explain why the vast majority of scientists reject their theory. They claim it has more to do with philosophical presuppositions than scientific observations (Johnson, 1993). Johnson believes the new orthodoxy for scientists is materialistic naturalism rather than empiricism. That is to say that ID is rejected not on the basis of observable phenomenon but on the basis of a philosophical predisposition that all things must be explained by materialistic naturalism. Therefore, “Darwinism became unchallengeable scientific orthodoxy not because the creative power of the mutational selection mechanism was experimentally demonstrated, but because the scientific community adopted standards of evaluation that made something like Darwinism inevitable” (Johnson, 1995, p. 107). If one assumes that Darwinism is basically true then it is perfectly reasonable to adjust the theory as necessary to make it conform to observed facts. The problem is that the adjusting devises are so flexible that...they make it difficult to conceive of a way to test the claims of Darwinism empirically. (Johnson, 1993, p. 30)

Thus, the idea that “life evolved by a combination of chance and necessity...requires no proof” (Johnson, 1995, p. 107).
ID proponents further claim that their theory is also rejected on the basis that the
"likelihood of coercion and retaliation against theists is real...coming from the
scientific community, in the form of tenure denials and unfavorable peer reviews"
(Johnson, 1995, p. 100). Johnson cites three cases where prominent scientist and science
organizations react furiously to discredit individuals when evolution is questioned
(Johnson, 1995). He explains why this is so:

Suppose that the Darwinian mechanism of mutations and selection cannot really
create complex organs and organisms from simple beginnings...If an error of that
magnitude had to be confessed, the entire part of the grand metaphysical story that
deals with the history and nature of life would be called into question...When we
imagine the consequences that would follow from a discrediting of the Darwinian
theory, it is easy to understand why scientists defend the theory so fiercely.
(Johnson, 1995, p. 70)

Summary

The theory of evolution predicts that all life presently on earth has evolved from
at least one living organism that arose from a primordial soup of non-living matter on the
early earth. Evolutionists point to the fossil record and transitional fossils as evidence
that evolution has occurred. They also demonstrate through experiments that amino acids
easily could have formed on the early earth; once you have amino acids, proteins could
have formed, and proteins are the basis of life. Thus life could have arisen from non-
living matter.
Creationists, on the other hand, believe "God" created all living "species" of organisms on earth. They point out the lack of transitional fossils present and the anomalies and stasis found in the fossil record. They believe that a worldwide flood caused the geologic column to form as it is presently. They also demonstrate mathematically the impossibility of life arising by chance.

ID theory, as debated publicly, can be explained by three premises that were presented: (A) Design can be noticed empirically and can be proven by the elimination of chance; (B) Observation of complex biochemical systems and proteins points to the impossibility of chance (evolution) and cries out "design"; and (C) Scientists reject ID because of philosophical presuppositions and fear rather than scientific observations.
CHAPTER 3: CONCEPTUAL FRAMEWORK

This study examined the legal, political, and philosophical issues that surround the creation/evolution debate. There are three questions that drove this study:

1. What is the legal history of, and status for teaching creation/evolution in the public schools?
2. What are the dimensions of the creation/evolution controversy as reflected in American popular press?
3. What is the status of content for teaching creation/evolution as revealed in selected high school biology textbooks?

Methodology – Content Analysis

Content analysis was the methodology used to answer these questions. Typically, content analysis has to do with quantity; in this study, however, it was used primarily in a qualitative manner. This study was not concerned as much with frequency as it was with meaning. Thus, this is a qualitative study that utilized content to answer the questions that drove it. A description of the use of content analysis in answering the first three questions is presented. Then, a description of qualitative research is provided.

Content analysis involves collecting, comparing, and categorizing data for communication. Content analysis can be used to investigate numerous types of communication, from official records to personal documents (Gall, Borg, & Gall, 1996).

The application of content analysis for each of the questions of the study will include the following steps: (A) collection of data; (B) determination of a coding unit;
(C) determination of categories for the unit; (D) consideration of emergent categories; (E) analysis of data; (F) considering issues of reliability; and (G) insuring ethical safeguards and considerations. Each of these steps will be described.

1. What is the Legal History of and Status for Teaching Creation/Evolution in the Public Schools?

Collection of Data

In researching data for this question the researcher utilized triangulation. This ensured validity in the collection of the data. An initial collection of data was done through research in selected textbooks. Much work has been done concerning the application of the concept of separation of church and state to the creation and evolution debate in public schools. Legal scholars write on the current status of case law concerning public schools with attention given to “religion” in public schools. Two such works are: Teachers and the Law by Louis Fischer, David Schimmel, and Cynthia Kelly (1999); and Public School Law: Teacher’s and Student’s Rights by Martha M. McCarthy, Nelda H. Cambron-McCabe and Stephen B. Thomas (1998).

These two texts were used for the purpose of researching relevant cases for the creation/evolution topic. The chapters (headings) concerning religion and public schools were given particular attention. Cases cited in these chapters (or headings) were researched and read to determine their relevance to the question concerning creation/evolution. All cases determined to be relevant were copied for later use.
The researcher used Lexis-Nexis via the Internet to conduct the main research for this question. A key word search for creation/evolution was done to find cases that are relevant to this study. Once the cases were listed, an initial reading of the cases was done to determine the actual relevance to this question. All cases determined to be relevant were copied for later use.

The cases themselves proved instrumental in the data gathering process. The United States courts pay close attention to legal precedents before rendering a decision. A precedent is a previous case or occurrence taken as a rule. Thus, when a case comes before a court it is common practice for the court to research and cite previous cases and renderings that have similarities to the current case. Therefore, the researcher read each case and paid close attention to citings of other cases. The cited cases were also researched and read to determine their relevance to this question. All cases that were determined to be relevant were copied for data analysis.

Determination of a Coding Unit and Categories

One of the most important decisions to be made in content analysis is what unit of text will be studied. The most common options are word, word sense, sentence, paragraph, theme, and whole text.

Words are single symbols used in writing with distinguishable physical boundaries. Word sense distinguishes between multiple meanings of words. A sentence is a combination of words which is complete; expressing a thought. Using sentences as recording units requires human coding as opposed to computer coding. Paragraphs are short records that can be difficult to assign into single categories, but are used to develop
a particular aspect of the main subject. Themes are subjects that can be used successfully to describe an idea. Whole text is text that is larger than paragraphs and can be difficult to define (Weber, 1990).

The coding unit that is most appropriate with each of the questions of this study is the theme. In researching the legal cases surrounding the creation/evolution debate particular attention was given to the theme of creation/evolution.

Consideration of Emergent Categories

A careful effort was made to link the theme categories to the research questions. New theme categories, however, did emerge as the study progressed.

Data Analysis

All cases which were determined to be relevant to this study were re-read. During the re-reading the researcher looked for the theme of creation/evolution. All the cases that were determined to have the theme of creation/evolution were summarized with a brief description of the case and the decision rendered.

The summaries of each case were reviewed for significance and relevance concerning this study. All cases which were deemed significant were placed together, the rendering from the courts concerning relevant evolution/creation cases were synthesized, and a framework was developed to explain current case law and its application in public schools. This framework will guide educators concerning what is legal and what is not in regard to teaching alternate theories of origins in the public schools.
**Considering Issues of Reliability**

There are three types of reliability that pertain to content analysis methodology: stability, reproducibility, and accuracy (Krippendorf, 1980). A brief summary of each follows.

Stability checks for accuracy within the coder over time. Stability was checked in the first question by having the researcher re-code several of the first cases that were read.

Reproducibility refers to the extent that more than one coder arrives at the same results. The primary researcher coded a small sample of text from each question and a second coder coded the same sample to ensure coding was consistent.

Accuracy is rarely met in content analysis due to the unique nature of most analysis. Such is the case with this study. However, since the data utilized is readily available to the public, the reliability of this study is high.

**Ethical Safeguards and Considerations**

Content analysis is relatively unobtrusive since it involves text and not human subjects. Therefore, the questions that this study sought to answer are free from ethical compromise.
2. **What are the Dimensions of the Creation/Evolution Controversy as Reflected in American Popular Press?**

*Collection of Data*

In researching data for question #2 the researcher performed a content analysis via the Internet. The Lexis-Nexis Academic database was used for the gathering of data for this question. A keyword search for “creationism and public schools” was performed to find media articles relevant to this study. Once articles were listed, an initial reading was done to determine the actual relevance to this question. All articles determined to be relevant were copied for later use.

*Determination of a Coding Unit and Categories*

In researching the dimensions of the creation/evolution controversy as reflected in the American popular press, the themes of intelligent design, evolution, and controversy were utilized, as well as the emergent themes of creation and religion.

*Data Analysis*

All relevant material was reviewed and/or re-read searching for the themes of intelligent design, evolution, and controversy. Material deemed relevant to these themes was classified respectively. The researcher reviewed all material relevant to a theme and note similarities and differences. This was done for each theme. Once similarities and differences were noted, the researcher synthesized the material for each theme into a framework which provides an analysis of what has been reported concerning this debate.
Considering Issues of Reliability

Stability was checked in the second question by having the researcher re-code several of the press articles. Reproducibility was checked in the second question by having a second coder code several of the press articles.

3. What is the Status of Content for Teaching Creation/Evolution as Reflected in Selected High School Biology Textbooks?

Collection of Data

In researching data for question #3 the researcher contacted the educational departments for the states of Texas, Ohio, Kansas, Georgia, and Utah for a list of their recommended high school biology textbooks. These states were chosen either because of their participation in the controversy or their leadership in textbook curriculum. From these lists the four textbooks most often recommended were chosen.

Chapters concerning the origin of life and the process of evolution were given particular attention. These chapters were read from each textbook respectively.

Determination of a Coding Unit and Categories

In researching the status of current origins theories as taught in public schools, the themes of natural selection in evolution, punctual equilibrium in evolution, and beneficial mutations in evolution were utilized, as well as the emergent themes of Darwin, genetic drift, gene pools, and isolation.
Data Analysis

Selected chapters concerning the origin of life and the process of evolution were re-read searching for the themes of punctuated equilibrium, natural selection, Darwin, genetic drift, gene pools, isolation, and beneficial mutations. Material deemed relevant to these themes was classified respectively. The researcher reviewed all material relevant to a theme and noted similarities and differences. This was done for each theme. Once similarities and differences were noted, the researcher synthesized the material for each theme into a framework which provides the reader with general information as to what is taught concerning the origins of life in the public schools.

Considering Issues of Reliability

Stability will be checked in the third question by having the researcher re-code one of the chapters from the textbooks. Reproducibility was checked in the third question by having a second coder code several of the press articles.

Table 2 - Data Collection and Analysis

<table>
<thead>
<tr>
<th>Questions driving this study</th>
<th>Data collection</th>
<th>Data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the legal history of and status for teaching creation/evolution in the public schools?</td>
<td>Lexis-Nexis key-word search</td>
<td>Content analysis of court cases</td>
</tr>
<tr>
<td>What are the dimensions of the creation/evolution controversy as reflected in the American popular press?</td>
<td>InfoTrac OneFile and LexisNexis Academic key-word search</td>
<td>Content analysis of press articles</td>
</tr>
<tr>
<td>What is the status of content for teaching creation/evolution as reflected in selected high school biology textbooks?</td>
<td>Purposeful sample of biology textbooks</td>
<td>Content analysis of biology textbooks</td>
</tr>
</tbody>
</table>
Limitations of Analysis

The researcher used the method of content analysis to construct a qualitative study concerning the creation/evolution debate. Qualitative research is concerned with meaning rather than frequency. Since some phenomenon cannot be measured by frequency, qualitative research is, without a doubt, the best and only research to use at times. This was one of those times.

The main objective of qualitative research is understanding, rather than the ability to generalize or the identification of causes and effects (Creswell, 1998). The analysis of qualitative data discovered through research is intended to build understanding inductively, from the data, rather than deductively, from a priori hypotheses or categories (Gay & Airasian, 2000). Therefore, this study sought an understanding of the issue of teaching ID in the public schools. This understanding arose from the data that was discovered.

The researcher of this study is aware that qualitative research is value-laden rather than value-free. Thus, such research requires a human instrument—the researcher—to collect, analyze, and arrange the data. Since the researcher is value-laden, the research will be also.

The researcher cannot be totally objective in qualitative research because his decisions determining which items to include in the writing of the study cannot be made outside of his worldview. Yet, as stated above in this study, the researcher has remained as objective as possible in this realm.
CHAPTER 4: RESULTS

The purpose of this study was to examine legal, political, and philosophical issues that surround the creation/evolution debate. Content analysis methodology was employed to examine the following research questions which drove this study:

1. What is the legal history of and status for teaching creation/evolution in the public schools?

2. What are the dimensions of the creation/evolution controversy as reflected in American popular press?

3. What is the status of content for teaching creation/evolution as reflected in selected high school biology textbooks?

Question 1: What is the Legal History of and Status for Teaching Creation/Evolution in the Public Schools?

Results of the Data Collection

An initial collection of data for question 1 was done through research in Teachers and the Law by Louis Fischer, David Schimmel, and Cynthia Kelly (1999) and Public School Law: Teachers’ and Students’ Rights by Martha M. McCarthy, Nelda H. Cambrone-McCabe and Stephen B. Thomas (1998). In Teachers and the Law (Fischer, et. all, 1999) under the chapter “When can schools limit religious freedom?” sixty-seven cases were noted. After researching these cases ten were determined to be relevant and copied for later use. Of those only two dealt specifically with the creation/evolution
question (Edwards v. Aguillard, 1987; Peloza v. Capistrano, 1994). The other eight dealt with the concept of separation of church and state. In *Public School Law* (McCarthy, et al. 1998), under the chapter "Church-State Relations" one hundred and fourteen cases were noted. After researching these cases nineteen were determined to be relevant and copied for later use. Of these eight dealt specifically with the creation/evolution question (Scopes v. State, 1925; Epperson v. Arkansas, 1968; Wright v. Houston Independent School District, 1973; Edwards v. Aguillard, 1987; Daniel v. Waters, 1975; McLean v. Arkansas Board of Education, 1982; Peloza v. Capistrano Unified School District, 1994; Webster v. New Lenox School District, 1990) the other eleven dealt with the concept of separation of church and state.

The main data collection for this question was done through a keyword search for creation/evolution performed via the Lexis-Nexis database on the Internet. A keyword search for creation and evolution was conducted for Supreme Court cases. The results yielded 124 cases. Of these ten cases were determined to be relevant and copied for later use. Of these, two dealt specifically with the creation/evolution question (Edwards v. Aguillard, 1987; Epperson v. Arkansas, 1968) the other eight dealt with the concept of separation of church and state. A keyword search for creation and evolution was conducted for federal circuit court cases. The results yielded 324 cases. The researcher then determined to narrow the search by searching for cases that contained the words creation and evolution in the same paragraph. This search yielded 47 results. Of these 9 were determined to be relevant and copied for later use. Five of these dealt with the concept of separation of church and state and four dealt directly with the creation/evolution question (Freiler v. Tangipahoa Parish Board of Education, 1999;

A search for cases, that contained the words creation and evolution in the same paragraph, was conducted for the federal district courts. The search yielded 66 results. Of these, seven were determined to be relevant and copied for later use. Two of these cases dealt specifically with the creation/evolution question (Wright v. Houston Independent School District, 1972; Webster v. New Lenox School District, 1990) while the other seven dealt with the concept of separation between church and state.

The researcher re-read all of the cases that were deemed relevant and copied them. During this second reading close attention was paid to the citing of other cases. After researching the citings the researcher determined that all the federal cases that dealt with the creation/evolution controversy had already been copied. Table 2 shows the federal court cases which were found to be relevant to the creation/evolution debate.

Table: 3 - Federal Court Cases that Address the Creation/Evolution Question.

<table>
<thead>
<tr>
<th>Cases</th>
<th>Teachers and the Law</th>
<th>Public School Law</th>
<th>Lexis-Nexis Supreme Court cases</th>
<th>Lexis-Nexis appellate court cases</th>
<th>Lexis-Nexis district court cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edwards v Aguillard</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epperson v Arkansas</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>Daniel v Waters</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McLean v Arkansas</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peloza v Capistrano</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freiler v Tangipahoa</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wright v Houston</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>Webster v New Lenox</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

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Coding Units, Categories, and Emergent Categories

The researcher using the database Lexis-Nexis found eight cases, of the 237 that were yielded by the search, that dealt specifically with the creation/evolution question:

The researcher also found eight cases that dealt specifically with the creation/evolution question using the books Teachers and the Law (Fischer, et al. 1999) and Public School Law (McCarthy, et al. 1998). One of these cases was a state rather that a federal case and therefore was not included in the analysis for the legal history (Scopes v. State, 1925). The other seven cases were also found in the Lexis-Nexis search. The only case that the Lexis-Nexis search yielded which was not cited by the legal textbooks was Freiler v. Tangipahoa Parish Board of Education, 1999. Both textbooks were published before the 5th Circuit Court rendered its judgment in this case. No new cases were found in the citations of research material. The eight federal cases that the data base Lexis-Nexis yielded was used for data analysis.
Analysis of Data

Background

Before giving the results of the data the researcher believes it is important to give a brief summary of the United States legal system in order to bring a more clear understanding of the significance of court rulings.

The legal system of the United States of America operates hierarchically with the Constitution being the highest law in the land. Subservient to the Constitution, yet higher than case law, is legislative or statutory law. Statutory law exists when a statute is passed by the legislative branch of state or federal governments and signed into law by the executive branch. Case law is established as the judiciary interprets constitutional or statutory law in individual cases. Case law is subservient to statutory and constitutional law. In understanding the legal system of the United States it is important to keep in mind that federal law trumps state law.

The judicial branch also operates hierarchically on both state and federal levels. The federal court system has 89 district courts, whose decisions may be overturned by the respective circuit court over the region wherein the district court is located. There are 13 circuit courts. The circuit courts decisions may in turn be overturned by the U.S. Supreme Court. State court systems are set up similarly to the federal courts. Federal courts deal with cases that breech federal laws, whereas state courts deal with cases that breech state laws. The federal judiciary trumps the state judiciary.

The cases that are of concern to this study are all federal cases. The chief concern of the courts in their decisions in creation/evolution cases has been maintaining the
separation of church and state which is a federal constitutional issue. As noted in the literature review the courts have recognized that the Everson v. Board of Education (1947) understanding of the separation of Church and State creates a tension between two clauses in the First Amendment (Walz v. Tax Commission of City of New York). The Establishment Clause states “Congress shall make no law respecting an establishment of religion.” The courts have recently understood this to mean that no government (state or federal) may advance religion, so there should be a severing of civil and sectarian affairs (McCarthy, et al. 1998). The Free Exercise Clause states “or prohibiting the free exercise thereof.” Courts have understood this phrase to imply that secular governmental regulations should not impede religious practices. The tension of the courts’ understanding of these phrases is evident. At what point may government practices legally impede religious practices in order to keep civil and sectarian affairs separate?

The courts have also recognized another tension that appears in cases concerning public education and the separation of Church and State. This is the tension between academic freedom and the abrogation of the First Amendment rights. The courts have long held that the public school classroom should be a “free marketplace of ideas” (Seyfried v. Walton, 688 F.2d 214,219, 1981). However, this free marketplace of ideas is not absolute “and must be balanced against competing interests” (Fischer, et al. 1999, p. 160). In other words, one’s freedom of speech (academic freedom) is limited in the classroom by other constitutional concerns.

Some constitutional concerns that limit secondary public school teacher’s academic freedom are: (A) The states (and local school boards) right to set forth a curriculum; and (B) the maintenance of separation between Church and State. The Tenth
Amendment of the Federal Constitution gives individual states freedom to oversee their educational programs. "Legislatures in all states have granted local school boards considerable authority to establish programs of study and prescribe course content, including the scope and sequence of materials" (McCarthy et al., 1998, p. 285).

Therefore, teachers cannot ignore or omit prescribed course content under the guise of academic freedom. Nor may they teach religious beliefs under the guise of academic freedom. Thus, when teaching subject matter (especially controversial issues that may generate discussion) teachers must guard their academic freedom by (A) teaching material appropriate for the age and maturity of students; (B) maintaining a secular curriculum; (C) never proselytizing students; and (D) using teaching strategies that are relevant to the prescribed curriculum.

These concerns should be kept in mind in understanding why courts opined as they did in the following cases and how that might guide the teaching of the ID theory in public schools.

Table 4 - Principles that Guide Courts in Rendering Decisions Concerning Public Schools and Religion.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Academic freedom is encouraged in public schools (Seyfried v. Walton, 1981) however, it is limited by: A) age-appropriate material; B) a secular curriculum; C) no proselytizing by teachers; and D) secular teaching strategies (McCarthy, et al., 1998: p. 285-292).</td>
</tr>
<tr>
<td>2.</td>
<td>School boards have the authority to prescribe curriculum (McCarthy, et al., 1998: p. 285).</td>
</tr>
<tr>
<td>3.</td>
<td>Students have ‘freedom of speech,’ but it is limited by educational purposes (Hazelwood v. Kuhlmeier, 1988).</td>
</tr>
<tr>
<td>4.</td>
<td>Schools may accommodate religion (Freiler v. Tangipahoa, 1999).</td>
</tr>
<tr>
<td>5.</td>
<td>The government can allow indirect, remote, or incidental benefits to religion (Freiler v. Tangipahoa, 1999).</td>
</tr>
<tr>
<td>6.</td>
<td>Teachers should guard against presenting their personal beliefs in class because of the influence they wield (Peloza v. Capistrano, 1994).</td>
</tr>
</tbody>
</table>
In the past, the source of the creation theory has been the Bible. Therefore, it is also important to note the cases that have come before the courts regarding the teaching of the Bible before analyzing the creation/evolution cases. There are three such cases: (A) Abington v Schempp, which was mentioned in the literature review; (B) Meltzer v Board of Public Instruction; and (C) Doe v. Porter

Abington v. Schempp. This case was reviewed in the second chapter. It dealt with the reading of the Holy Bible at the beginning of each public school on each school day in Pennsylvania. The Supreme Court found the reading of the Bible in public schools to be unconstitutional.

Because of the prohibition of the First Amendment against the enactment by Congress of any law “respecting an establishment of religion,” which is made applicable to the States by the Fourteenth Amendment, no state law or school board may require that passages from the Bible be read or that the Lord’s Prayer be recited in the public schools of a State at the beginning of each school day— even if individual students may be excused from attending or participating in such exercises upon written request of their parents. (Abington v. Schempp, 374 U.S. 203, 1963)

Meltzer v. Board of Public Instruction. In 1978 the Fifth Circuit Court of Appeals heard a case concerning the Orange County (Florida) Board of Public Instruction’s resolution requiring daily morning devotionals and Bible reading. Interestingly, the District Court found this practice as constitutional. However, the Fifth Circuit Court
reversed the decision, and found that the school board's resolution requiring devotionals and Bible readings in school is unconstitutional (Meltzer v. Board of Public Instruction, 1978).

*Doe v. Porter.* Doe v. Porter is the most recent case involving teaching the Bible in public schools. Surprisingly, the case was heard almost 40 years after the Supreme Court declared such practice unconstitutional.

In 1925, the Rhea County Courthouse was the site of the well known "Scopes" or "Monkey" trial wherein high school teacher John Scopes was tried for violating a Tennessee statute making it a misdemeanor to teach "evolution theory" in the State's public schools. (*Doe v. Porter,* 188 F. Supp. 2d 906, 2002)

Now in the 21st century Rhea County has again found itself the site of another controversy regarding a dispute concerning the separation of Church and State with regards to public education.

John Doe and Mary Roe, residents of Rhea County and parents of minor children who were attending the public elementary school in Rhea County, brought suit against the school board and superintendent to have a Bible program, which was used by the schools, rendered unconstitutional. For many years, Rhea County Public Schools had allowed a program entitled "Bible Education Ministry" (BEM) to be conducted in the public schools. This program was carried out in grades kindergarten through fifth. The Bible was taught during regular school hours to each grade for 30 minutes every week. Furthermore, the schools did not obtain parental consent for the students to participate.

This program was operated by Bryan College and the teachers of the BEM program were
Bryan College students who volunteered to help the students in the Rhea County schools became “exposed to the Bible” (*Doe v. Porter*, 2002).

The U.S. District Court for the Eastern District of Tennessee found that this practice by the Rhea County public schools was unconstitutional declaring, “since 1948, it has been very clear that the First Amendment does not permit the State to use its public school system to ‘aid any or all religious faiths or sects in the dissemination of their doctrines’” (*Doe v. Porter*, 188 F. Supp. 2d 914, 2002). The school system was enjoined from the BEM program and the Plaintiffs were awarded one dollar for nominal damages.

The above cases make clear that since 1962 the courts have declared the teaching of the Bible as truth in public schools is unconstitutional because it is teaching a religious belief. This is significant because the courts have equated the teaching of the theory of creation with the teaching that the Biblical version of the origin of man is true. This link between the theory of creation and the Bible as truth has allowed the courts to declare the teaching of the theory of creation is unconstitutional because it is a religious belief. The following cases will trace the courts’ journey to their present position (*Epperson v. Arkansas, Edwards v. Aguillard, Webster v. New Lenox, Peloza v. Capistrano*, and *Freiler v. Tangipahoa* were all mentioned in the literature review, however, they are given greater detail in this analysis).

**Analysis**

*Epperson v. Arkansas.* In 1928 the State of Arkansas adopted an “anti-evolution” statute which prohibited in its public schools the teaching of the theory that man evolved
from other species of life. This law not only prohibited teachers in public schools in Arkansas from teaching the theory of evolution but it also prevented a school board from adopting or using a textbook that taught evolution.

In 1965 at Central High School in Little Rock, the biology teachers recommended a textbook which contained a chapter setting forth the theory of evolution. The school administration adopted and prescribed the textbook. Susan Epperson, a 10th grade biology teacher at Central High School was confronted with the dilemma of whether to break the law in Arkansas by teaching the theory of evolution, or whether to refuse to heed the prescription of her employers by refusing to teach from the textbook.

Mrs. Epperson decided to seek a declaration that the Arkansas statute is void and enjoined the State and the Little Rock school system from dismissing her for violation of the statute's provision. In rendering their decision in 1968 the Supreme Court of the United States linked the theory of creation to the book of Genesis.

In the present case, there can be no doubt that Arkansas has sought to prevent its teachers from discussing the theory of evolution because it is contrary to the belief of some that the book of Genesis must be the exclusive source of doctrine as to the origin of man (Epperson v. Arkansas, 393 U.S. 107, 1968).

This connection between the theory of creation and the Bible gave the Court grounds for declaring this Arkansas statute unconstitutional.

There is and can be no doubt that the First Amendment does not permit the State to require that teaching and learning must be tailored to the principles or prohibitions of any religious sect....The States undoubted right to prescribe curriculum for its public schools does not carry with it the right to prohibit....the
teaching of a scientific theory or doctrine where that prohibition is based upon reasons that violate the First Amendment... (the) Arkansas' law cannot be defended as an act of religious neutrality... the law's effort was confined to an attempt to blot out a particular theory because of its supposed conflict with the Biblical account... the law is contrary to the mandate of the First, and in violation of the Fourteenth, Amendments to the Constitution. (Epperson v. Arkansas, 393 U.S. 106-109, 1968)

*Wright v. Houston Independent School District.* Four years after the Supreme Court judgment in Epperson v. Arkansas, the United States District Court for the Southern District of Texas rendered judgment on another case involving the teaching of evolution and creation in public schools. This case came before the Court when students of the Houston Independent School District sought to enjoin the District and the State Board of Education from teaching the theory of evolution as part of the District's academic curriculum and from adopting textbooks which present that theory without critical analysis and to the exclusion of other theories regarding the origins of man. (Wright v. Houston, 366 F.Supp. 1208, 1972)

The students claimed that the teaching of the theory of evolution inhibited their free exercise of their religion and established a religion of secularism which is prohibited by the First Amendment to the United States Constitution. The student's contention rested on the assumption that the presentation of the theory of evolution should be considered an
attack by the state upon their religious beliefs since evolution is in direct contradiction to their belief of the theory of creation as presented in the Bible.

The Court agreed that the State might not establish a "religion of secularism" in the sense of affirmatively opposing or showing hostility to religion and thus preferring those who believe in no religion over those who do believe (Wright v. Houston, 1972). The Court was not convinced, however, that the State had established a "religion of secularism" by requiring evolution to be taught to the exclusion of creation. The Court noted that there was no suggestion that students had been denied the opportunity to challenge the theory of evolution.

The Court further condemned the student's proposal of "equal-time" for all theories concerning human origins.

If the beliefs of fundamentalism were the sole alternative to the Darwinian theory, such a remedy might at least be feasible. But virtually every religion known to man holds its own peculiar view of human origins. Within the scientific community itself, there is much debate over the details of the theory of evolution. This Court is hardly qualified to select from among the available theories those which merit attention in a public school biology class. Nor have Plaintiffs suggested to the Court what standards might be applied in making such a selection... Plaintiffs' case must ultimately fail, then, because the proposal solutions are more onerous than the problem they purport to alleviate. For this Court to require the District to keep silent on the subject of evolution is to do that which the Supreme Court has declared the Arkansas legislative is powerless to do. To insist upon the presentation of all theories of human origins is, on the other
hand, to prescribe a remedy that is impractical, unworkable, and ineffective.


Daniel v. Waters. This 1975 case dealt with the state legislature of Tennessee amending its state code to mandate the teaching of creationism when evolution was taught in public schools. The Amendment did not require evolution to be taught, however, when creationism was.

In 1973 the state of Tennessee amended its Code as follows:

Section 1. Tennessee Code Annotated, Section 49-2008, is amended by adding the following paragraph:

Any biology textbook used for teaching in the public schools, which expresses opinion of, or relates a theory about origins or creation of man and his world should be prohibited from being used as a textbook in such system unless it specifically states that it is a theory as to the origin and creation of man and his world and is not represented to be scientific fact. Any textbook so used in the public education system which expresses an opinion or relates to a theory or theories shall give in the same textbook under the same subject commensurate attention to, and an equal amount of emphasis on, the origins and creation of man and his world as the same as recorded in other theories, including, but not limited to, the Genesis account in the Bible. The provisions of this Act shall not apply to use of any textbook now legally in use, until the beginning of the school year of 1975-76; provided, however, that the textbook requirements
stated above shall in no way diminish the duty of the State Textbook Commission to prepare a list of approved standard editions of textbooks for use in the public schools of the state as provided in this section. Each local school board may use textbooks or supplementary material as approved by the State Board of Education to carry out the provisions of this section. The teaching of all occult or satanical beliefs of human origin is expressly excluded from this Act.

Section 2. Provided, however, that the Holy Bible shall not be defined as a textbook, but is hereby declared to be a reference work and shall not be required to carry the disclaimer above provided for textbooks.

Section 3. The provisions of this Act are hereby declared to be severable; and if any of its sections, provisions, clauses, or parts be held unconstitutional or void, then the remainder of this Act [**4] shall continue in full force and effect, it being the legislative intent now hereby declared that this Act would have been adopted even if such unconstitutional or void matter had not been included herein.

Section 4. This Act shall take effect upon becoming law, the public welfare requiring it. 1973 Tenn. Pub. Acts, Chap. 377 (Daniel v. Waters, 515 F.2d 487, 1975)

Teachers and parents brought suit to have the statute declared unconstitutional. In 1975, the Sixth Circuit Court of Appeals for the United States rendered judgment on this case. The Court declared:

We have previously indicated that the statute complained of does not directly forbid the teaching of evolution. It does, however, prohibit the selection of any
textbook which teaches evolution unless it also contains a disclaimer stating that such doctrine is "a theory as to the origin and creation of man and his world and is not represented to be scientific fact." And the same statute expressly requires the inclusion of the Genesis version of Creation (if any version at all is taught) while permitting that version above to be printed without the above disclaimer. (Daniel v. Waters, 515 F.2d 489, 1975)

Thus, the Court found that this legislature caused a "preferential position for the Biblical version of creation... (and) to seek to enforce such a preference ...is to seek to accomplish the very establishment of religion which the First Amendment...forbids" (Daniel v. Waters, 515 F.2d 489, 1975). The statute was declared unconstitutional.

McLean v. Arkansas Board of Education. In 1982, the state of Arkansas once again found itself in a federal court regarding the creation/evolution controversy in public schools. On March 19, 1981, Frank White, Governor of Arkansas signed into law Act 590, entitled "Balanced Treatment for Creation-Science and Evolution Science Act."

Essentially, this Act required that Arkansas public schools give balanced treatment to creation science and to evolution science. A group of parents, ministers, and teachers brought suit to have the Act declared unconstitutional on First Amendment grounds. The case came before the Honorable William R. Overton in the United States District Court for the Eastern District of Arkansas. The Court used the Lemon test to determine whether this Act was unconstitutional. After giving a brief description of the Court's understanding of "fundamentalism," the Court stated that the State of Arkansas, like a number of states whose citizens have relatively homogeneous religious beliefs, had a
long history of official oppositions to evolution which was motivated by adherence to
fundamentalist beliefs in the inerrancy of the Book of Genesis (McLean v. Arkansas,
1982). The Court also declared, “that the definition of ‘creation science’ contained in
(the Act) has as its unmentioned reference the first 11 chapters of the Book of Genesis”
(McLean v. Arkansas, 529 F.Supp 1264-1265, 1982). The Court’s interpretation that
creation science is inspired by the Book of Genesis leaves “no doubt that a major effect
of the Act is the advancement of particular religious beliefs” (McLean v. Arkansas, 529
F.Supp 1266, 1982). The Court found that the Act was unconstitutional.

In its decision, the Court felt inclined to define science. This was unusual since
other courts felt that to provide such a definition was outside their scope of expertise
(Wright v. Houston, 1972). Nevertheless the court described science as:

1. Guided by natural law
2. Explained by reference to natural law
3. Testable against the empirical world
4. Having tentative conclusions

One year later the 8th Circuit Court of Appeals affirmed the District Court finding that the
Balanced Treatment Act was unconstitutional (McLean v. Arkansas, 1983).

*Edwards v. Aguillard.* While the Arkansas legislative was busy passing the
Balanced Treatment Act, the Louisiana legislature was busy passing similar legislation
known as the “Creationism Act,” which was signed into law in 1981. This act forbade
the “teaching of the theory of evolution in public elementary and secondary schools

The Act did not require the teaching of either theory unless the other was taught. Parents, teachers, and religious leaders challenged the Act’s constitutionality. The District Court held that the Act did violate the Establishment Clause of the First Amendment and was thus unconstitutional. The Court of Appeals affirmed the District Court, as did the Supreme Court of the United States.

The Supreme Court in rendering its decision found the “Act impermissibly endorses religion by advancing the religious belief that a supernatural being created humankind” (*Edwards v. Aguillard*, 482 U.S. 576, 1987). In declaring the Act unconstitutional the Court used the Lemon test. The first prong of the Lemon test asks whether the government’s actual purpose in a statute is to endorse or disapprove of religion. The Act’s stated purpose was to protect academic freedom. However, the Court found this purpose to be a “sham” because “any scientific concept that’s based on established fact can be included in (the Louisiana) curriculum already, and no legislation allowing this (was) necessary” (*Edwards v. Aguillard*, 482 U.S. 587, 1987). Regarding the first prong of the Lemon test, the Court concluded that “the preeminent purpose of the Louisiana legislature was clearly to advance the religious viewpoint that a supernatural being created humankind” (*Edwards v. Aguillard*, 482 U.S. 587, 1987). Therefore, the Act was unconstitutional. The Court in its decision also opined on two important concepts regarding the creation/evolution debate in public schools:

1. Families entrust public schools with the education of their children, but condition their trust on the understanding that the classroom will not
purposely be used to advance religious views that may conflict with the private beliefs of the student and his or her family. (*Edwards v. Aguillard*, 482 U.S. 584, 1987)

2. Teaching a variety of scientific theories about the origins of humankind to schoolchildren might be validly done with the clear secular intent of enhancing the effectiveness of science instruction. (*Edwards v. Aguillard*, 482 U.S. 594, 1987)

*Webster v. New Lenox School District.* Three years after the Edward's decision, the debate concerning the teaching of creation/evolution shifted from state legislative action to actions by individual teachers. One such case came before the 7th Circuit Court of Appeals. This case involved Ray Webster who was a social studies teacher at Oster-Oakview Junior High School in New Lenox, Illinois. Mr. Webster taught non-evolutionary theories of creation in his social studies class to "rebut a statement in the social studies textbook indicating that the world is over four billion years old" (*Webster v. New Lenox*, 917 F.2d 1006, 1990). In the spring of 1987, a student complained that Mr. Webster's teaching violated the principles of separation between Church and State. The superintendent instructed Mr. Webster to "restrict his classroom instruction to the curriculum and refrain from advocating a particular religious viewpoint...and not to teach creation science" (*Webster v. New Lenox*, 917 F.2d 1005, 1990). Mr. Webster sued claiming that the school board's prohibitions constituted censorship in violation of the First and Fourteenth Amendments.
"The district court noted that a school board generally has wide latitude in setting the curriculum provided the school board remains within the boundaries established by the constitution" (Webster v. New Lenox, 917 F.2d 1006, 1990). The Appellate Court added that a curriculum "cannot be left to individual teachers to teach what they please" (Webster v. New Lenox, 917 F.2d 1007, 1990).

Furthermore, the Appellate Court found that a "junior high school student's immature stage of intellectual development imposes a heightened responsibility upon the school board to control curriculum" (Webster v. New Lenox, 917 F.2d 1007, 1990). Therefore, the school board and the superintendent have a mandate to monitor the content of its teacher's curricula to ensure that the establishment clause is not violated. The Appellate Court affirmed the District Court's finding that the superintendent did not violate Mr. Webster's rights under the First and Fourteenth Amendments and had correctly instructed him to cease teaching creation science because the teaching of the creation theory in a public school violates the First Amendment (Webster v. New Lenox, 1990).

*Peloza v. Capistrano Unified School District.* John Peloza, a high school biology teacher at Capistrano Unified School District in California brought suit against the school district claiming that the school district's requirement of him to teach evolution violated (1) the Free Speech Clause of the First Amendment; (2) the Establishment Clause of the First Amendment; (3) the Due Process Clause of the Fourteenth Amendment; and (4) the Equal Protection Clause of the Fourteenth Amendment. This claim was based on Peloza's contention that evolution is a religious belief system.
Peloza alleged that evolutionism is one of "two world views on the subject of the origins of life and of the universe." The other is 'creationism' which also is a "religion belief system. The belief system of evolutionism is based on the assumption that life and the universe evolved randomly and by chance and with no creator involved in the process. The world view and belief system of creation is based on the assumption that a creator created all life and the entire universe." (Peloza v. Capistrano, 37 F.3d 519, 1994)

Peloza did not want to "promote either philosophy or belief system in teaching his biology class" (Peloza v. Capistrano, 37 F.3d 519, 1994).

The Ninth Circuit Court of Appeals found that the school district did not violate Peloza's First or Fourteenth Amendment rights by requiring him to teach the theory of evolution because

The evolutionist theory is not a religion...Evolution is a scientific theory based on the gathering and studying of data, and modification of new data. It is an established scientific theory which is used as the basis for many areas of science. As scientific methods advance and become more accurate, the scientific community will revise the accepted theory to a more accurate explanation of life's origins. (Peloza v. Capistrano, 37 F.3d 521-522, 1994)

In rendering its decision, the Court again made clear that a teacher is "not just any ordinary citizen." A teacher "is clothed with the mantle of one who imparts knowledge and wisdom...The likelihood of high school students equating his views with those of the school is substantial." Therefore, "to permit him to discuss his religious beliefs with
students during school time on school grounds would violate the Establishment Clause of the First Amendment" (Peloza v. Capistrano, 37 F.3d 522, 1994).

*Freiler v. Tangipahoa Parish Board of Education.* On April 19, 1994, the Tangipahoa Parish Board of Education (Louisiana) passed the following resolution:

Whenever, in classes of elementary or high school, the scientific theory of evolution is to be presented whether from textbook, workbook, pamphlet, other written material, or oral presentation, the following statement shall be quoted immediately before the unit of study begins as a disclaimer from endorsement of such theory.

It is hereby recognized by the Tangipahoa Board of Education, that the lesson to be presented, regarding the origin of life and matter, is known as the Scientific Theory of Evolution and should be presented to inform students of the scientific concept and not intended to influence or dissuade the Biblical version of creation or any other concept.

It is further recognized by the Board of Education that it is the basic right and privilege of each student to form his/her own opinion and maintain beliefs taught by parents on this very important matter of the origin of life and matter. Students are urged to exercise critical thinking and gather all information possible and closely examine each alternative toward forming an opinion (*Freiler v. Tangipahoa Parish Board of Education*, 185 F.3d 341, 1999).
In August of 1999, the Fifth Circuit Court of Appeals affirmed a district court's ruling that the above disclaimer constituted an establishment of religion in violation of the First Amendment.

In rendering its decision, the Court noted three tests that the Supreme Court has used to determine whether a government action may be considered a violation of the concept of separation of church and state: (A) the Lemon test; (B) the Endorsement test; and (C) the Coercion test. In Lemon v. Kurtzman (1972) the Supreme Court developed the Lemon test, under "which a state practice is unconstitutional if (1) it lacks secular purpose; (2) its primary effect either advances or inhibits religion; or (3) it excessively entangles government with religion" (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 343, 1999). In the County of Allegheny v. ACLU, 1989, the Court developed the Endorsement test, which seeks to determine whether the government unconstitutionally endorses religion by conveying "a message that religion is 'favored,' 'preferred,' or 'promoted' over other beliefs" (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 343, 1999). In Jones, v. Clear Creek Independent School District, 1992, the Court defined the Coercion test, which seeks to test if government unconstitutionally coerces students to participate in a religious activity. "Under this test, school-sponsored activity contravenes the First Amendment when (1) the government directs (2) a formal religious exercise (3) in such way as to oblige the participation of objectors" (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 343, 1999).
Table 5 — Tests used by the Supreme Court to Determine if an Action by the State is Unconstitutional Because of the Wall of Separation Between Church and State.

<table>
<thead>
<tr>
<th>Legal test</th>
<th>Cases from which tests were developed</th>
<th>An act is unconstitutional if:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lemon</td>
<td>Engel v. Vitale; Waltz v. Tax Commission; Lemon v. Kurtzman</td>
<td>It fails one of the following prongs: 1) it has a predominately secular purpose; 2) it neither inhibits nor advances religion; 3) it creates no 'excessive entanglement' between government and religion.</td>
</tr>
<tr>
<td>Endorsement</td>
<td>County of Allegheny v. ACLU</td>
<td>It &quot;conveys a message that religion is 'favored,' 'preferred,' or 'promoted' over other beliefs.&quot;</td>
</tr>
<tr>
<td>Coercion</td>
<td>Lee v. Weisman; Jones v. Clear Creek Independent School District</td>
<td>It meets all three of the following conditions: (1) the government directs (2) a formal religious exercise (3) in such a way as to oblige the participation of objectors.</td>
</tr>
</tbody>
</table>

The Fifth Circuit Court of Appeals chose to use the Lemon test to determine if the Tangipahoa school disclaimer was unconstitutional. The Court found the disclaimer "as a whole furthers...the protection and maintenance of a particular religious viewpoint" (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 344, 1999) and thus fails the first prong of the Lemon test, and is therefore unconstitutional. Although a government action is determined to be unconstitutional if it fails just one prong of the Lemon test, the Fifth Circuit Court continued to look at the second prong. It decided that the Act impermissibly advances religion and thus also violates the second prong of the Lemon test.

In rendering its decision, the Court did note, however, two concepts that should be kept in mind when determining whether a state action is unconstitutional. First, the Court made clear that the Constitution "affirmatively mandates accommodation, not merely tolerance, of all religions...anything less would require the 'callous indifference' we have said was never intended" (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 345, 1999). Second, the Court noted that
where the benefit to religion or to a church is no more than indirect, remote, or incidental, the Supreme Court has advised no realistic danger [exists] that the community would think that the contested government practice was endorsing religion or any particular creed. Lambs Chapel v. Center Moriches Union Free School District, 508 U.S. 384, 395, 113 S. Ct. 2141, 2148 (1993) (Freiler v. Tangipahoa Parish Board of Education, 185 F.3d 346, 1999).

<table>
<thead>
<tr>
<th>Case</th>
<th>Summary of case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epperson v. Aguillard</td>
<td>State boards of education cannot prescribe that evolution not be taught</td>
</tr>
<tr>
<td>Wright v. Houston</td>
<td>Boards of education may mandate the teaching of evolution and do not have to teach creation with evolution</td>
</tr>
<tr>
<td>Daniel v. Waters</td>
<td>States cannot mandate that textbooks must present creation if evolution is presented.</td>
</tr>
<tr>
<td>McLean v. Arkansas</td>
<td>States cannot mandate that textbooks must present creation if evolution is presented.</td>
</tr>
<tr>
<td>Edwards v. Aguillard</td>
<td>States cannot require equal time for the teaching of creation if evolution is taught</td>
</tr>
<tr>
<td>Webster v. New Lenox</td>
<td>School boards may prohibit teachers from teaching a theory of creation</td>
</tr>
<tr>
<td>Peloza v. Capistrano</td>
<td>Schools boards may prescribe that teachers teach a theory of evolution</td>
</tr>
<tr>
<td>Freiler v. Tangipahoa</td>
<td>Evolution disclaimers which are designed to protect a theory of creation are unconstitutional</td>
</tr>
</tbody>
</table>
Table 7 – Framework that Will Guide Educators Concerning the Legality of Teaching Alternate Theories of Origins (Creationism or ID) in Biology Classes of Public Schools.

<table>
<thead>
<tr>
<th>Key legal principles that guide the teaching of origins in public schools</th>
<th>Cases from which principles were derived</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The theory of creation is a religious concept</td>
<td>Epperson v. Arkansas; Edwards v. Aguillard; McLean v. Arkansas; Webster v. New Lenox</td>
</tr>
<tr>
<td>2. The theory of evolution is not a religious concept</td>
<td>Wright v. Houston; McLean v. Arkansas; Edwards v. Aguillard; Peloza v. Capistrano</td>
</tr>
<tr>
<td>3. Disclaimers concerning evolution must be carefully constructed in order to pass the Lemon-test</td>
<td>Freiler v. Tangipahoa</td>
</tr>
<tr>
<td>4. School boards may prevent teachers from teaching creation</td>
<td>Webster v. New Lenox</td>
</tr>
<tr>
<td>5. School boards may prescribe that teachers teach evolution</td>
<td>Peloza v. Capistrano</td>
</tr>
<tr>
<td>6. State boards of education may not prescribe the teaching of creation</td>
<td>McLean v. Arkansas; Edwards v. Aguillard</td>
</tr>
<tr>
<td>7. State boards of education can not discourage the teaching of evolution</td>
<td>Epperson v. Arkansas</td>
</tr>
<tr>
<td>8. Curriculums may include a variety of scientific theories about the origins of life provided the intent of the curriculum enhances the effectiveness of science instruction</td>
<td>Wright v. Houston; Edwards v. Aguillard</td>
</tr>
</tbody>
</table>

Issues of Reliability

Stability was checked one month after the initial coding by the researcher. Five cases were re-coded to determine the stability of the initial coding. These were Everson v. Board of Education, 1947; Stone v. Graham, 1985; Epperson v. Arkansas, 1968; Lemon v. Kurtzman, 1971; Edwards v. Aguillard, 1987. The researcher found that Epperson v. Arkansas and Edwards v. Aguillard were the only cases that dealt with the creation/evolution controversy. The other cases dealt with the concept of separation of Church and State. This was also how the researcher had initially coded these cases.
Reproducibility was checked by a second coder who coded the same five cases that were checked for stability. The second coder found that Epperson v. Arkansas and Edwards v. Aguillard were the only two cases that dealt with the creation/evolution concept. This is synonymous to the coding of the primary researcher.

2. What are the Dimensions of the Creation/Evolution Controversy as Reflected in American Popular Press?

Results of the Data Collection

The researcher performed a keyword search via Lexis-Nexis for 'creationism and public schools' between 1996 and present. The data search yielded 424 articles. The researcher then narrowed the search to a select group of newspapers chosen for their amount of coverage given to the subject, their circulation, or their geographic location. This search yielded seventy-seven articles. Lexis-Nexis has four regional news source searches. Care was given to make sure that at least one newspaper from each regional area was included in this study. The newspapers selected were The San Francisco Chronicle; The Washington Times; The Washington Post; The New York Times; The Denver Post; The Atlanta Journal-Constitution; and The Topeka-Capital Journal. The researcher read every article. Twenty-two articles were deemed irrelevant to this topic because they did not address the creation/evolution debate. The remaining fifty-five articles were printed for re-reading and classification. Five of these articles were copied for the second coder. Table 8 reveals how many articles were used from each newspaper.
Table 8 – Number of Articles and Percentage from Each Newspaper.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of articles</td>
<td>1</td>
<td>3</td>
<td>7</td>
<td>16</td>
<td>4</td>
<td>14</td>
<td>10</td>
<td>55</td>
</tr>
<tr>
<td>Percentage of articles</td>
<td>1.8%</td>
<td>5.4%</td>
<td>12.7%</td>
<td>29.1%</td>
<td>7.3%</td>
<td>25.5%</td>
<td>18.2%</td>
<td>100%</td>
</tr>
</tbody>
</table>

N = Total Number of Articles = 55

**Coding Units, Categories, and Emergent Categories**

As expected the theme categories of evolution, intelligent design, and conflict were prevalent in the articles. Two emergent theme categories, however, also were noticed in the re-reading of the articles: The theme of *creation* and the theme of *religion*. The researcher was not surprised by these emergent themes. The researcher’s exposure to the issue of the creation/evolution debate prior to this study was primarily debates on college campuses and books written by experts on both sides of the debate. Although the debates involved the merits of ID there were times during these debates that the themes of creation and religion were raised.

During the second reading, the researcher coded the themes throughout the articles. All data pertinent to a particular theme was categorized accordingly. The researcher then re-read each piece of data within each individual theme and classified the data into categories and, at times, sub-categories. Within each category and sub-category the data was classified into the basic premise and outlying statements that may or may not have appeared. Table 9 quantifies the data found in each theme category.

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Table 9 – Number and Percentage of Newspaper Articles that Mention each Theme

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of Articles</th>
<th>Percentage of Articles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Evolution</td>
<td>50</td>
<td>90.9%</td>
</tr>
<tr>
<td>Intelligent Design</td>
<td>24</td>
<td>43.6%</td>
</tr>
<tr>
<td>Conflict</td>
<td>44</td>
<td>80%</td>
</tr>
<tr>
<td>Religion</td>
<td>48</td>
<td>87.3%</td>
</tr>
<tr>
<td>Creation</td>
<td>54</td>
<td>98.2%</td>
</tr>
</tbody>
</table>

N = Total Number of Articles = 55 (Items across various categories reflect duplicated count.)

Analysis of Data

Since this is a content analysis of newspaper articles care was given to quote directly from the articles as much as possible. Five themes were noticed in the analysis. Each theme is explained in detail.

Evolution

In the research of the theme of evolution three basic categories emerged. It was noticed that all of the statements regarding evolution in the articles were either pro-evolution, con-evolution, or a description about evolution. Therefore the data was placed into these three categories.

Pro-evolution statements. In the category of pro-evolution statements two sub-categories emerged as the study progressed in detail. These sub-categories were (A) statements concerning the validity of the theory of evolution; and (B) statements concerning the challenges of evolution without questioning the validity of the theory.

Statements concerning the validity of the theory of evolution. In the sub-category of statements concerning the validity of the theory of evolution the researcher found
fourteen statements which were homogenous. There were no outliers. The statements typically addressed the overwhelming scientific evidence which supported the theory of evolution. The following statements are similar in content to the data found in this sub-category:

Quotation 1: The voluminous published evidence from geology, paleontology, paleoanthropology, paleobotany, paleoecology, anthropology, microbiology, genetics, DNA studies, developmental biology, biochemistry and other interdisciplinary fields gives overwhelming support for evolution. The June 25, 1999 issue of *Science*, the premier U.S. science journal, is devoted to evolution, and among its many articles are some devoted to exploratory studies of evolution that is occurring today. (Selbin, 1999, October 7, p. B-11)

Quotation 2: “Evolution is the fundamental basis for biological research,” says Emory pathology professor Carlos Moreno, who launched a campaign among Georgia’s scientific community to petition the school board.

Trying to educate a science-illiterate public about the use of the word “theory,” the petition, signed by more than 100 scientists, states: “Evolutionary theory is a theory in the same sense that Einstein’s theory of relativity is a theory. To suggest to middle and high school students that there is any type of debate within the scientific community on the validity of evolution would be completely untrue and a disservice to those children.” (No Room, 2002, Sept. 25, p. 18A)

Statements concerning the challenges of evolution. Within the category of pro-evolution statements a second sub-category emerged which admitted that the theory of evolution had some challenges; the theory as a whole, however, was unquestionable.
There were eleven statements found to fit this sub-category. Again, these statements were homogeneous without any outliers. The following statements were typical of those in this sub-category.

Quotation 1: Evolution has become one of the best established of all scientific theories. The central concept of biological evolution—that all organisms have evolved from common ancestry through a process of "natural selection" in which those best able to reproduce themselves survived—is even more firmly supported today than in the time of Charles Darwin. The revolution in modern genetics has only deepened our understanding of how evolution works by providing a mechanism by which species can change. Yes, there are still arguments and controversies. Critics rightly note that scientists have not been able to explain how natural selection could produce the enormously complex machinery inside a human cell, for example. But that may be a matter of time. (Willful Ignorance, 1999, August 13, p. 20A)

Quotation 2: Scientists acknowledge that evolution cannot be witnessed or even re-created in a lab. But they note that this is true of many accepted scientific phenomena, such as atoms or electrons (Rosin, 1999, August 8, p. A01).

Con-evolution statements. Thirty-seven statements were categorized as con-evolution statements. While analyzing these statements two sub-categories emerged: (A) teachers refusing to teach evolution; and (B) evidence that question the validity of the theory of evolution.
Teachers refusing to teach evolution. The debate about whether to teach evolution and/or creation is not a debate in some classrooms, according to the American press. While analyzing the category of statements that were con-evolution, the researcher found ten statements which spoke of teachers refusing to teach the theory of evolution in biology classes. The statements were homogenous without any outliers. The following statements are examples of what was found:

Quotation 1: Much to my amazement, a lot of science teachers do not teach the section in the science book on evolution (Cumming, 1996, Feb. 23, pp. D03-D04).


Statements questioning the validity of the theory of evolution. Twenty-seven statements were found that question the validity of the theory of evolution. Therefore, a sub-category emerged for this topic. The statements were homogenous and similar. There were no outliers. Typically, these statements emphasize that the theory of evolution is a theory not a fact, and it is a theory that has difficulties because of the latest scientific developments. The following illustrate these ideas:

Quotation 1: One of the key aspects of Darwinian evolution is the concept that a less complex species evolved over time to a totally different species over a long period of time. There is absolutely no evidence for that. In fact, genetic biology is showing through DNA models that it is almost impossible for this to have happened. (Dixon, 1996, Feb. 25, p. J07)
Quotation 2: Evolution is a controversial theory some scientists present as scientific explanation for the origin of living things, such as plants, animals and humans. No one was present when life first appeared on earth. Therefore, any statement about life’s origins should be considered as theory, not fact. (Christensen, 1998, Nov. 24, p. F3)

Descriptive statements about evolution. While analyzing the data in the category of descriptive statements about evolution three sub-categories emerged: (A) statements describing state board of education decisions; (B) statements describing the theory of evolution; and (C) miscellaneous statements.

Decisions by state boards of education. The largest sub-category that emerged from the descriptive statements about evolution category was decisions by state boards of education. Twenty homogenous statements fit this sub-category, describing actions of state boards of education on decisions made about the teaching of evolution and other theories of origins. There were no outliers. The following statements are similar to what emerged in the data analysis:

Quotation 1: The Kansas Board of Education voted yesterday to delete virtually any mention of evolution from the state’s science curriculum...while the move does not prevent the teaching of evolution, it will not be included in the state assessment tests that evaluate student’s performance in various grades. (Belluck, 1999, August 12, p. A1)
Quotation 2: Kansas did not ban the teaching of evolution, leaving that option to local school districts. But its decision meant that evolution would not be included in the state assessment tests that evaluate student performance (Belluck, 2000, July 29, p. A1).

**Descriptions of evolution.** A second sub-category emerged while analyzing the data for descriptive statements about evolution. This sub-category contains eight statements which describe the theory of evolution as a theory that life arose from non-living matter and evolved into the different forms of life we now see. The following are typical of the statements found in the data:

Quotation 1: Evolutionists say scientific evidence shows that life began almost four billion years ago with simple organisms, from which humans and all other forms of life evolved (Janofsky, 1999, Oct. 9, p. A10).

Quotation 2: Evolution: All life on earth developed from non-living matter by natural processes. One or a few simple life forms gave rise to new kinds of life to produce life as we see it today (Asimov, 2002, Jan. 21, p. A1).

**Miscellaneous statements.** There were ten statements that were outliers from the other twenty-eight statements in the ‘descriptive statements about evolution’ category. Six of these ten statements were heterogeneous; each one had little in common with any other statements. Since each of the statements was so dissimilar from any others the category was labeled ‘miscellaneous’ and no effort was made to summarize the findings. There were, however, four statements about the percentage of Americans who believe in evolution. Three of these statements were similar, pointing out that 40% of Americans believe that evolution occurred and God guided the process. The fourth statement
indicated that 86% of Americans believe that evolution should be taught in public schools.

**Intelligent Design**

In researching the intelligent design theme three categories emerged. There were thirty-four strands of data from the articles researched that fell into the theme of intelligent design. These strands of data were categorized into the emergent categories of 1) Teaching ID alongside evolution; 2) Supporting evidence for the theory of Intelligent Design; and 3) Equating the theory of Intelligent Design to the theory of creation.

*Teaching Intelligent Design alongside evolution.* There were six statements in the theme of intelligent design that dealt with teaching ID alongside evolution in public schools. These statements were homogenous without any outliers. The statements urged the teaching of the controversy of origins in biology classes of public schools by including the theory of ID alongside the theory of evolution. The following statements were similar to what was found in this category:

Quotation 1: Proponents of the intelligent-design movement, which challenges Darwin’s primacy in the science classroom, argued for equal footing in the state’s new teaching curriculum today (Clines, 2002, March 12, p. A16).

Quotation 2: “Every theory of origins is either a chance-based theory or a design-based theory,” said Ernie Richardson, a Pratt lawyer who supports the intelligent design theory. “I think people are generally against censorship and in favor of opening up the curriculum, as opposed to restricting it.” (Eakins, 2000, June 30, p. A12)
Supporting evidence for the theory of Intelligent Design. The category of ‘supporting evidence for the theory of Intelligent Design’ emerged when ten statements were noticed while analyzing the data in the theme of intelligent design. These ten statements were homogenous without any outliers and typically pointed out that design inferences are made by empirical evidence all the time, and ID is therefore supported by science. For instance:

Quotation 1: It is legitimate to have, as part of the tool kit for science education, the option to say that the things we see in nature may be designed or could have been designed (Steinberg, 1999, August 25, p. A1).

Quotation 2: Science regularly makes ‘design inferences’...such as that the hieroglyphics on the Rosetta stone are evidence of intelligence rather than the random work of wind and erosion (Clines, 2002, March 12, p. A16).

Equating the theory of Intelligent Design to the theory of creation. By far the largest category that emerged within the theme of intelligent design was ‘equating the theory of ID to the theory of creation.’ There was almost twice as much data in this category as in any other category within the theme of intelligent design. This is interesting since proponents of ID have made massive public relations efforts to distance their theory from the theory of creation in the last ten years. All eighteen statements in this category were homogenous without any outliers. These statements related the concept that the theory of ID is, in reality, the theory of creation repackaged to meet constitutional requirements. The statements in this category were akin to the following:
Quotation 1: Evolutionary theory is at work in efforts to change how public schools, in Cobb County and elsewhere, teach the origin of life. After religious groups tried and failed to push creationism on the schools, the approach was repackaged and retitled as creation science. After that too failed, it has come back again, this time as intelligent design. (Cobb Schools, 2002, September 20, p. A22)

Quotation 2: Dr. John R. Stover of Kansas State University, chairman of the board appointed commission that recommend the science standards that the board rejected, quietly explained that the theory of intelligent design is an alleged supernatural phenomenon that can't be studied by scientific methods. (Roy, 1999, November 9, page number not available)

Conflict

The third and final theme which was expected to be found during data analysis is the theme of conflict. Seventy-five statements fit into this theme. While analyzing the statements two categories emerged. Of these statements, twenty-five were categorized into the emergent category of 'the effect that the creation/evolution debate has had,' while fifty statements were categorized into the emergent category of 'opinions concerning schools teaching the evolution/creation controversy.'
these statements addressed the changes that state boards of education have made because of the conflict. Changes made by the textbook publishers and educators were also mentioned. Statements similar to the following exemplify those in this category:

Quotation 1: Kansas is the latest state to face a battle over evolution and creationism in recent years. Alabama, New Mexico and Nebraska have made changes that to varying degrees challenge the pre-eminence of evolution in the scientific curriculum, generally labeling it as a theory that is merely one possible explanation. Others, like Texas, Ohio, Washington, New Hampshire, and Tennessee, have considered, but ultimately defeated, similar bills, including some that would have required those who teach evolution also to present evidence contradicting it. At the local level, dozens of school boards are trying to make similar changes. (Belluck, 2000, July 29, p. A1)

Quotation 2: In recent years, some scientists have complained that publishers of science textbooks have softened sections on evolution to avoid loss of sales in large states such as Texas and California, where religious parents have political clout (Witham, 1996, January 1, p. A3).

Opinions concerning schools teaching the creation/evolution controversy. Fifty statements regarding the opinions that are presented in the American public press concerning public schools teaching the creation/evolution controversy were noticed and categorized. The general tenor of these statements was that public schools should teach the controversy and allow students the freedom to decide what they want to believe. In other words, present both sides of the debate in class and let students think for
themselves. There were however, outliers found. These outliers were diametrically opposed to the vast majority of statements in this category. The general thesis of these outlying statements was that public schools should not teach the creation/evolution controversy in science classes because it really is not a scientific controversy. Two statements which were for the teaching of the controversy will be given as well as one of the outlying statements against the teaching of the controversy.

Teach the controversy, quotation 1: Sadly, people such as Campbell prevent the provocative debate within the scientific community over the validity of evolution from existing in our educational system. It is irresponsible for evolution to be unchallenged and treated as fact by our schools, and it is misguided to prevent the plausibility of other explanations for life’s existence from being examined in the classroom. (Turner, 1996, Feb. 26, p. A08)

Teach the controversy, quotation 2: A group of twenty-eight pro-creationist academics, calling themselves Georgia Scientists for Academic Freedom...argues, “By allowing students to wrestle with conflicting data and theoretical interpretations the board will not be guilty of fostering religion, but rather the seeds of critical thinking that will enable students in whatever career they choose.” (No Room, 2002, Sept. 25, p. 18A)

Don’t teach the controversy, quotation: The most persuasive creationist argument is the appeal to fair play. “Shouldn’t we present both sides of the argument?” The answer is no. Scientists have studied and tested evolution for 150 years...Until “scientific” creationists formulate a scientific theory and submit it for testing, they
have no right to demand equal time in science class to present their ideas. (Dixon, 1996, Feb. 25, P. J07)

Religion

While analyzing the data that was collected concerning the dimensions of the creation/evolution controversy as reflected in American popular press, a fourth theme of religion emerged. Within the theme of religion three basic categories emerged. These were: (A) Creation is a religious belief which cannot be taught in public schools; (B) Concern that evolution undermines the faith of some students; and (C) Science and religion are compatible.

Creation is a religious belief which cannot be taught in public schools. Thirty statements from the data collected were found to discuss creation as a religious belief and challenged its constitutionality of being taught in biology classes in public schools. Twenty-five of these statements portrayed the theory of creation as a religious belief, and was therefore a theory which, according to the current Supreme Court could not be taught in public schools. However, there were five outlying statements which concluded that the theory of creation was not a religious belief system and should therefore be taught in public schools. Two statements which view creation as a religious belief are presented as well as one of the outlying statements which concluded that the theory of creation was not a religious belief.

Creation is a religious belief, quotation 1: But when the courts ban such frank teachings from public school science classes, creationists of a pugnacious and political
stripe often reword the message without mentioning God or the Bible - and call it ‘science.’ And when ‘creation science’ gets declared unconstitutional - as it has been, since it’s plainly religion in disguise - some creationists resort to poking holes in evolution. (Campbell, 1996, Feb. 18, p. D01)

Creation is a religious belief, quotation 2: The Court ruled the (balanced-treatment) act endorsed the religious belief that a supernatural being created humankind... ‘Government in our democracy state and nation, must be neutral in matters of religious theory, doctrine and practice’ (Hollingsworth, 1999, August 29, page number not available).

Creation is not a religious belief, quotation: I understand the law, that you don’t teach religion at school... but basically, evolution is unproven. So we teach it as a theory, and we teach creationism as a theory. Like with all theories we say ‘examine the evidence and decide.’ I don’t consider that a religious preference. (Wyatt, 2000, Feb. 18, p. B1)

*Evolution undermines the faith of some students.* During the analysis of the theme of religion it was noticed that fourteen statements dealt with the concern that the theory of evolution, when taught in public schools, undermines the faith of students and parents. These statements were all similar in content and there were no outliers. The following are examples of typical statements found:

Quotation 1: The Rev. Earl Dekat, priest at Immaculate Conception Catholic Church in St. Mary’s, said that schools should be honest that they don’t know for sure how the world came to be. He said evolution may have been the vehicle God used to create humans, but God can’t be left out. “They don’t give God credit for
creating the world," he said of those who teach strictly evolution. "We don't have any problem with good science. We have a problem when people leave out religion and leave God out of the picture. I don't think anyone that's religious would like that." (Grenz, 1999, August 13, page number not available)

Quotation 2: Naturally, I believe God created everything...if they're going to teach (evolution), then they should teach the other also and let a child make up its own mind (Grenz, 1999, August 13, page number not available).

Science and religion are compatible. The final category that emerged when analyzing the statements in the theme of religion was the concept that science and religion are compatible. There were seven similar statements in this category with no outliers. The following are examples of statements in this category:

Quotation 1: Faith and reason are not incompatible. The most rigorous scientist is thus free to believe in God, while the most devout follower of any of the world's many religions can also pursue science (You're Back, 2000, August 3, p. B10).

Quotation 2: When a local resident steps up before the microphone at a public hearing, says he is a faithful Christian and also believes in evolution, people are mightily impressed. According to several polls, including one reported recently in Scientific American, about 40% of scientists believe in God. (Blakeslee, 1999, August 29, Section 1 p. 20)
The theme of creation emerged during the analysis of the data collected. Three basic categories emerged within this theme. Similar to the theme of evolution, the categories that emerged within the theme of creation were: pro-creation statements, con-creation statements and descriptive statements about creation.

**Pro-creation statements.** Within the category of pro-creation statements two sub-categories emerged as the study progressed. These were: (A) creation victories; and (B) validity of the theory of creation.

**Creation victories.** There were nine statements that fit into the sub-category of creation victories. These statements were homogenous and without any outliers. Typically, these statements hailed victories for creationists. For example, after speaking of changes that the different states made one article said, “Creationists hailed each of those changes as major victories” (Janofsky, 1999, Oct. 9, p. A10). Another article stated, “Creationists are more powerful than ever. They’re winning, not in terms of court cases, but what happens in classrooms” (Christensen, 1998, Nov. 24, p. F3).

**Validity of the theory of creation.** Nineteen statements within the category of pro-creation statements dealt with the scientific validity of the theory of creation. Therefore, a sub-category (validity of the theory of creationism) was created for these statements. These statements were all similar without any outliers. These statements claimed that the theory of creation is a valid scientific theory. The following statements are similar to those that were in this sub-category.
Quotation 1: The scientific facts point to the impossibility of life evolving by chance without an outside force of incredible power - in other words, God (Campbell, 1996, March 7, p. B01).

Quotation 2: We present creation as well as evolution from an open-minded standpoint...we believe students need to know both (Asimov, 2002, Jan. 21, p. A1).

*Con-creation statements.* There were thirty-seven statements that fell into the category of con-creation statements. Of these twenty-seven dealt with creation being a religious belief, whereas the other ten statements dealt with the lack of scientific evidence for the theory of creation. These two sub-categories were developed for the statements that were found during the analysis.

*Creation is a religious belief.* The statements that fit into this sub-category were fairly homogenous without any outliers. The statements equated the theory of creation with a particular religious viewpoint rather than a scientific theory. For example, one article stated "creationism is clearly based on religious principles and should not be presented as a school subject. 'Public schools serve a diverse student population and may not promote religious doctrine thinly disguised as science'" (Whaley, 2002, April 9, p. A01). Another article addressed the issue, stating "But dressing up a particular religious viewpoint - and one rejected by the great majority of Christians at that - in a cloak of pseudoscience is an offense against both science and true religion" (You're Back, 2000, August 3, p. B10).

*Lack of scientific evidence for the theory of creation.* The ten statements within this sub-category emphasized that the theory of creation lacks scientific evidence and
should not be taught in biology classes. These statements were homogenous without any outliers. The following statements are similar to those in this sub-category:

Quotation 1: There is absolutely no supportable, independently, reproducible, experimental or observational evidence from any scientific field for creationism. Creationism may have a place in religious institutions but certainly not in science class (Selbin, 1999, October 7, p. B-11).

Quotation 2: The theory of creation works in the exact opposite way. With creationism, the theory came first, and, thousands of years later, the search for facts to support the theory began. The difference between the two methods can be illustrated in a classroom about my choice of breakfast foods. Scientists would send a scope down my throat to examine the contents of my stomach, scrape the residue off my teeth, take blood samples and conduct other medical tests. After the facts were collected, a theory would emerge: Reggie had Cheerios for breakfast. Religious theorist would do no examinations, but would produce the theory that I had bacon and eggs for breakfast based on the Bible’s teachings. (Rivers, 2002, April 11, p. B07)

Descriptive statements about creation. Three sub-categories emerged in the category of ‘descriptive statements about creation.’ These were: (A) percentages of people who believe creation should be taught; (B) court cases involving creation; and (C) description of the theory of creation.

Percentages of people who believe creation should be taught. There were seven statements in the data that dealt with the percentage of Americans who believe that the
Court cases involving creation. Ten statements were found to deal with court cases concerning creation. These statements typically emphasized either the 1968 Epperson v. Arkansas case, the 1987 Edwards v. Aguillard case, or both. For instance, one article stated, "The U.S. Supreme Court in 1968 and 1987 ruled it was unconstitutional for states to prohibit the teaching of evolution or require the teaching of creationism as a scientific fact" (Hollingsworth, 1999, August 29, page number not available). Another article pointed out, "Epperson v. Arkansas outlawed state laws on teaching evolution in 1968, and in Edwards v. Aguillard, the Court ruled in 1987 that states could not require that 'creation science' be taught along with evolution" (Christensen, 1998, Nov. 24, p. F3).

Description of the theory of creation. There were eleven statements that dealt with the description of the theory of creation. These statements were homogenous without any outliers and described the theory of creation as one in which basic life forms are created by God. The following were typical of statements in this sub-category:

Quotation 1: Creation - Basic kinds of life forms were created by the direct act of God. These forms have continued to reproduce their kinds within limits of variation to produce life as we see it today (Asimov, 2002, Jan. 21, p. A1).

Quotation 2: The strictest creationists believe in a literal reading of Genesis: that the Universe, Earth, and all the planets’ species were created a few thousand years ago in essentially their present form (Glanz, 2000, March 11, Section A1).
Table 10 - Framework Expressing the Status for Teaching Creation/Evolution as Reflected in American Popular Press.

<table>
<thead>
<tr>
<th>Themes</th>
<th>Results of data analysis</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Evolution</strong></td>
<td>1. Pro-evolution statements: a) maintaining that the theory of evolution is supported by overwhelming scientific evidence; and b) maintaining that the theory of evolution does have some challenges, yet the theory as a whole in not questioned.</td>
<td>25</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>2. Con-evolution statements: a) revealing that there are public school biology teachers who refuse to teach the theory of evolution; and b) maintaining that the theory of evolution is a theory, not fact, and it has numerous weaknesses.</td>
<td>37</td>
<td>11.8</td>
</tr>
<tr>
<td></td>
<td>3. Descriptive statements about evolution: a) reveal that 40% of Americans believe evolution occurred and God guided the process; b) describe the theory of evolution as life arising from non-living matter and evolving into the different forms of life we now see; and c) describe actions that state boards of education have made concerning the creation/evolution debate.</td>
<td>38</td>
<td>12.1</td>
</tr>
<tr>
<td><strong>Intelligent Design</strong></td>
<td>1. Statements encouraging educators to teach ID alongside evolution when teaching about origins in biology classes.</td>
<td>6</td>
<td>1.9</td>
</tr>
<tr>
<td></td>
<td>2. Statements that maintain that design inferences are made by empirical evidence all the time and thus ID is valid for scientific inquiry.</td>
<td>10</td>
<td>3.2</td>
</tr>
<tr>
<td></td>
<td>3. Statements maintaining that ID is creationism repackaged to meet constitutional requirements.</td>
<td>18</td>
<td>5.8</td>
</tr>
<tr>
<td><strong>Conflict</strong></td>
<td>1. Statements emphasizing that the creation/evolution controversy has affected decisions made by state boards of education.</td>
<td>25</td>
<td>8.0</td>
</tr>
<tr>
<td></td>
<td>2. Statements maintaining that schools should teach the controversy and allow students to think for themselves.</td>
<td>50</td>
<td>16.0</td>
</tr>
<tr>
<td><strong>Religion</strong></td>
<td>1. Statements maintaining that the teaching of creation is unconstitutional.</td>
<td>30</td>
<td>9.6</td>
</tr>
<tr>
<td></td>
<td>2. Statements maintaining that evolution undermines the faith of some students.</td>
<td>14</td>
<td>4.5</td>
</tr>
<tr>
<td></td>
<td>3. Statements maintaining that science and religion are compatible.</td>
<td>7</td>
<td>2.2</td>
</tr>
</tbody>
</table>

F = Number of statements that dealt with this theme  
% = Percentage of statements from a particular theme in relation to the total number of statements for all themes  
N = Total number of statements for all themes = 313 (There was some overlap)
Table 10 continued – Framework Expressing the Status for Teaching Creation/Evolution as Reflected in American Popular Press.

<table>
<thead>
<tr>
<th>Themes</th>
<th>Results of data analysis</th>
<th>F</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creation</td>
<td>1. Pro-creation statements: a) maintaining that creationists have won many battles in the creation/evolution debate; and b) claiming that the theory of creation is a valid scientific theory;</td>
<td>28</td>
<td>9.0</td>
</tr>
<tr>
<td></td>
<td>2. Con-creation statements: a) maintaining that the theory of creation is not a scientific theory but rather a particular religious viewpoint; and b) claiming that the theory of creation is void of scientific evidence and therefore should not be taught in biology classes.</td>
<td>37</td>
<td>11.8</td>
</tr>
<tr>
<td></td>
<td>3. Descriptive statements about creation: a) reveal that 75-80 percent of Americans believe that the theory of creation should be taught in public schools; b) concerning court cases, emphasize the Supreme Court decisions in Epperson v. Arkansas (1968) and Edwards v. Aguillard (1987); and c) describe the theory of creation as God creating the basic life forms.</td>
<td>28</td>
<td>9.0</td>
</tr>
</tbody>
</table>

F = Number of statements that dealt with this theme  
% = Percentage of statements from a particular theme in relation to the total number of statements for all themes  
N = Total number of statements for all themes = 313 (There was some overlap)

Issues of Reliability

Stability was checked one month after the initial coding by the researcher. Five articles were re-coded to determine the stability of the initial coding. These articles were: (A) “Creationism vs. Evolution” by R. L. Graves, (1999, September 5); (B) “Evolution & Kansas,” The Washington Post, (1999, August 16); (C) “Schools and Creationism” by J. Baum, (2000, February 25); (D) “Darwinian Struggle in Ohio,” The New York Times, (2002, March 17); and (E) “No Place for Creationism” by B. Witmar, (1999, October 23).

The researcher compared the re-coding of the articles with the original coding. The researcher coded the articles during the re-coding exactly as he had coded them originally. Stability was verified.
Reproducibility was checked by a second coder who coded the same five articles that were checked for stability. The second coder was given these articles and asked to code them according to five themes: creation; evolution; intelligent design; controversy; and religion. The second coder was not asked to notice categories or sub-categories since the data were limited to five articles. The second coder coded the articles exactly as the researcher. Reproducibility was verified in the second question.

3. What is the Status of Content for Teaching Creation/Evolution as Reflected in Selected High School Biology Textbooks?

Results of the Data Collection

The educational departments for Texas, Ohio, Kansas, Georgia, and Utah were contacted for a list of recommended high school biology textbooks. A representative for the educational department for the state of Kansas informed the researcher that the state of Kansas does not have recommended textbooks. The individual school districts recommend and select their own textbooks. Since there are 304 school districts in Kansas, no effort was made to determine which biology textbooks were used in Kansas.

Since the state of Ohio recommends publishers rather than individual textbooks, Table 11 presents approved publishers for the states of Ohio, Texas, Georgia, and Utah.

<table>
<thead>
<tr>
<th>Publisher</th>
<th>Georgia</th>
<th>Ohio</th>
<th>Texas</th>
<th>Utah</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prentice Hall</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Glencoe/McGraw Hill</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>American Guidance</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Holt, Rinehart, &amp; Winston</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td>McDougal</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kendall Hunt</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Prentice Hall and Glencoe/McGraw Hill publishers were recommended by all four state boards of educations. From these publishers two recommended textbooks were chosen respectively: *Biology* by Miller & Levine, (2002) and *Biology: The Dynamics of Life* by Biggs, Gregg, Hagins, Kapicka, Lundgren, & Rillero, (2000). Holt, Rinehart & Winston and Kendall Hunt were recommended by three of the four states and were conveniently chosen as the final two publishers. The two recommended textbooks selected from these publishers were *Modern Biology* by Towle (1999) and *Biological Science: An Ecological Approach* by BSCS (1992).

**Coding Units, Categories, and Emergent Categories**

Chapters, from selected textbooks, concerning the origin of life and the process of evolution were copied and read. The themes of punctuated equilibrium, natural selection, and beneficial mutations were used to categorize data from the chapters. During the initial reading the researcher noticed that the chapters on evolution in each of the four textbooks had more similarities than just the original three themes. In fact, four other themes emerged: (A) Charles Darwin; (B) gene pool; (C) genetic drift; and (D) isolation. The chapters were re-read and material was classified. There were no significant differences in how the textbooks presented the themes. Similarities were present and are described. There was one outlier that emerged during the analysis: one textbook dealt with religion and evolution. Table 12 quantifies the data found in each theme category.
Table 12 - Number of Paragraphs Devoted to Each Theme in the Textbooks and the Percentage of the Total of the Paragraphs from the Text that Dealt with the Themes

<table>
<thead>
<tr>
<th></th>
<th>Punctuated Equilibrium</th>
<th>Natural Selection</th>
<th>Beneficial Mutations</th>
<th>Charles Darwin</th>
<th>Gene Pool</th>
<th>Genetic Drift</th>
<th>Isolation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of paragraphs</td>
<td>8</td>
<td>45</td>
<td>8</td>
<td>34</td>
<td>7</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Percentage of all paragraphs</td>
<td>7%</td>
<td>39.5%</td>
<td>7%</td>
<td>29.8%</td>
<td>6.1%</td>
<td>7.9%</td>
<td>10.5%</td>
</tr>
</tbody>
</table>

N = Total number of paragraphs that dealt with the themes = 114 (There was some overlap)

Analysis of Data

Punctuated Equilibrium

The theme of punctuated equilibrium was present in all four textbooks used in this study. There was an average of two paragraphs per textbook devoted to punctuated equilibrium. All four textbooks presented this theme in a similar manner, pointing out that punctuated equilibrium theorizes that speciation occurs quickly rather than gradually as Darwinian evolution predicts. The following is an example of how the textbooks dealt with punctuated equilibrium:

Divergence of organisms and thus speciation may not occur smoothly and gradually. Indeed the fossil record suggests that rapid speciation may be the norm rather than the exception. The fossil record seems to indicate that many species existed without change for long periods of time. The periods of stability were separated by an 'instant' change in terms of geologic time. That is, a change occurred in a few thousand, rather than a few million, years. Scientists call this pattern of species formation punctuated equilibrium. The punctuated part of this
term, refers to the sudden shift in form that is often seen in the fossil record.

(Towle, 1999, p. 312)

Natural Selection

As expected, each textbook covered the theme of natural selection extensively. There was an average of eleven paragraphs per textbook devoted to this theme. The textbooks were homogeneous in their presentation of natural selection. There were no outlying statements. Typically, natural selection was described as a process that occurred when an individual was more physically adapted to an environment than other individuals in the population. The one more physically adapted tended to leave more offspring. Nature selected these offspring to survive at a higher rate than it selected other offspring. Thus the population changed. The textbooks also pointed out that there were four types of natural selection: stabilizing selection; directional selection; disruptive selection; and sexual selection. The following is a typical presentation of natural selection from the textbooks researched.

Darwin proposed that the environment may affect the individual organisms in a population in different ways because individuals of a species are not identical. Some organisms have traits that make them better able to cope with their environment. Organisms that have a greater number of these favorable traits tend to leave more offspring than organisms with fewer beneficial traits. Darwin called the different degrees of successful reproduction among organisms in a population natural selection....Any of several broad types of natural selection - including stabilizing, directional, disruptive, and sexual - can cause evolution.
In stabilizing selection, individuals with the average form of a trait have
the highest fitness. The average represents the optimum for most traits; extreme
forms of most traits confer lower fitness on the individuals that have them...

In directional selection, individuals that display a more extreme form of a
trait have greater fitness than individuals with an average form of the trait...

In disruptive selection, individuals with either extreme variation of a trait
have greater fitness than individuals with the average form of the trait...

In many species of birds, the males are brightly colored and often heavily
plumed...Females tend to choose the males they mate with based on certain traits.
This is referred to as sexual selection. Extreme traits, such as heavy, brightly
colored plumage, may give the female an indication of the quality of the male's
genes. While survival to reproductive maturity is necessary, survival alone is not
enough to further evolution. The genes of successful reproducers, rather than
those of merely successful survivors, are amplified through natural selection.
(Towle, 1999, p. 288, 306-308)

Beneficial Mutations

The theme of beneficial mutations was found in each textbook with an average of
two paragraphs per textbook devoted to this theme. The theme was treated similarly in all
four textbooks, presenting the concept that mutations cause genetic change and beneficial
mutations may cause speciation. The following is an example of how the textbooks
presented this theme:
One mechanism for genetic change is mutation. Environmental factors, such as radiation or chemicals, cause many mutations, but other mutations occur by chance. Of the mutations that affect organisms, many are lethal, and the organisms do not survive. Thus, lethal mutations are quickly eliminated. However, occasionally, a mutation results in a useful variation, and the new gene becomes part of the population’s gene pool by the process of natural selection. (Biggs, et al., 2000, p. 413-414)

Charles Darwin

In reading and coding the chapters from the selected textbooks it was noted that much attention was given to Charles Darwin. This did not surprise the researcher since the theory of evolution through natural selection originated from him. The researcher should have defined this as a theme at the beginning of the study but since he did not it is an emergent theme. The theme of Charles Darwin is the only theme which had more than one category. In fact three categories arose while analyzing the data for the theme of Darwin. These are: (A) The presentation of Darwin’s theory; (B) The development of Darwin’s theory; and (C) Darwin’s travels.

Presentation of Darwin’s theory. For the category ‘Presentation of Darwin’s theory’ the textbooks devoted an average of one paragraph each. All four textbooks dealt with this category in a fairly homogenous way with no outlying statements noticed. The concept presented concerning this category was that Charles Darwin and Alfred Russell Wallace presented their theory of natural selection jointly to the scientific world. One
year later Darwin published his book *On the Origin of Species by Natural Selection*. A typical presentation for this category is:

After Wallace wrote Darwin to share his ideas about natural selection, Darwin and Wallace had their similar ideas jointly presented to the scientific community. However, it was Darwin who published the first book about evolution called *On the Origin of Species by Natural Selection* in 1859. (Biggs, et al., 2000, p. 404).

*Development of Darwin's theory.* All four textbooks addressed the 'development of Darwin's theory' yielding an average of three paragraphs each to this category. There were no outlying statements noticed during the data analysis. The textbooks pointed out that Darwin theorized that the different species of finches he found on the Galapagos Islands could have come from one original species. In other words, they could have evolved from a parent species. Yet he wasn't sure how. Upon reading Thomas Malthus' theory that species produce more offspring than can survive, Darwin theorized that the finches evolved into new species through natural selection. He further theorized, based upon the fossil record, that all species evolved from simpler life forms. Albert Towle explains the development of Darwin's theory:

When Darwin returned to England...his collections from the voyage were praised by experts from the scientific community. A bird specialist...reported that Darwin had collected thirteen similar but separate species of finches. Each finch species has a distinctive bill that is specialized for a particular food source. Despite the bill differences, the overwhelming similarities of the Galapagos finches implied that the finches shared a recent common ancestor, meaning they
descended from a single species. Over a period of years after returning to
England, Darwin analyzed his data. Darwin considered the possibility that all the
islands' finches had descended from a few birds or even a single female that had
been blown off course from South America...Because the Galapagos are
geologically young islands...Darwin assumed that the offspring of the original
finches has been adapting to different environments and food sources for a
relatively short time. Darwin reasoned, therefore, that over many millions of
years, many large differences could accumulate between species...

Darwin was heavily influenced by the English clergyman Thomas Malthus
(1766-1834), who had published a thesis pointing out that populations...have the
potential of doubling and redoubling their numbers. Malthus proposed that the
growth of human populations was limited by adverse conditions, such as war,
disease, or a limited supply of resources.

Agreeing with Malthus' views, Darwin noted that although populations of
all organisms have the potential to grow unchecked, most do not. He reasoned
that the environment limits the growth of populations by increasing the rate of
death or decreasing the rate of reproduction, or both.

Darwin proposed that the environment may affect individual organisms in
a population in different ways because individuals of a species are not identical.
Some organisms have traits that make them better able to cope with their
environment. Organisms that have a greater number of these favorable traits tend
to leave more offspring than organisms with fewer beneficial traits. Darwin
called the different degrees of successful reproduction of organisms in a population ‘natural selection.’ (Towle, 1999, p. 285-288)

**Darwin’s travels.** Charles Darwin’s travels were dealt with extensively in all four textbooks. The chapters on evolution devoted an average of four and one-half paragraphs to Darwin’s travels. They dealt with his travels in a similar manner explaining that Darwin set sail as a naturalist on the H.M.S. Beagle in 1836. After five years of travel Darwin had collected and studied numerous species which led to his developing the theory of natural selection. The following is a typical depiction of Darwin’s travel:

It took Darwin years to develop his theory of evolution. He began in 1831 at age 21 when he took a job as a naturalist on the English ship H.M.S. Beagle, which sailed to South America and then South Pacific on a five-year scientific journey.

As the ship’s naturalist, Darwin studied and collected biological specimens at every port along the route... The observations that Darwin made and the specimens that he collected (at the Galapagos Islands) were especially important to him.

On the Galapagos Islands, Darwin studied many species of animals and plants that are unique to the islands, but similar to species elsewhere. These observations led Darwin to consider the possibility that species can change over time. (Biggs, et al., 2000, p. 401-402)
*Gene Pool*

Another theme that emerged during the data analysis was the theme concerning gene pools. The researcher did not expect to find this theme because gene pools are not usually discussed when creation and evolution are debated. However, since gene pools are very basic to the theory of Darwinian evolution it was not surprising that this emerged. All four textbooks were very congruent in their presentation of gene pools. An average of two paragraphs per textbook were devoted to this theme. Gene pools were defined as all the genetic information of all the members of a particular population. The following is a typical example of how the textbooks present this theme:

Recall that a population is a collection of individuals of the same species in a given area. Because all members of a population can inter-breed, they share a common group of genes, called a gene pool. A gene pool is the combined genetic information of all the members of a particular population. (Miller & Levine, 2002, p. 394)

*Genetic Drift*

The theme genetic drift also emerged as the study progressed. Each textbook devoted an average of two paragraphs to this concept. Once again, since this concept is usually not debated the researcher did not plan for it. Like gene pools, however, genetic drift is a basic tenet to the evolutionary theory and therefore it was not surprising that it emerged as a theme. The textbooks were similar in the way they described genetic drift. The basic concept of this theme is that in small populations an individual may carry a particular allele significantly different from the other members of the population.
Further, this individual may leave more descendants than the other individuals of the population. Over time, a majority of the population evolves this allele and the population drifts genetically from its parent population. Miller and Levine describe it like this:

In small populations, an allele can become more or less common simply by chance...this kind of random change in allele frequency is called genetic drift.

How does genetic drift take place? In small populations, individuals that carry a particular allele may leave more descendents than other individuals, just by chance. Over time, a series of chance occurrences of this type can cause an allele to become common in a population. (Miller & Levine, 2002, p. 400)

Isolation

The final theme that emerged during the data analysis was the theme of isolation. The concept of isolation is central to the theory of evolution and it is therefore not surprising that this theme emerged. The researcher, however, did not predict that this theory would be found. The textbooks were similar in their presentation of this theme and devoted an average of three paragraphs to it. Typically, the textbooks presented the concept of isolation by explaining that species evolve when populations become reproducibly isolated from each other. There are at least two types of reproducible isolation: (A) behavioral isolation; and (B) geographic isolation. The following is an example of how the textbooks presented this theme:

As populations become increasingly distinct, reproductive isolation can arise.

Reproductive isolation occurs when formerly interbreeding organisms can no longer mate and produce fertile offspring.
There are different types of reproductive isolation... (one) type of reproductive isolation is behavioral. For example, if one population of tree frogs mates in the fall, and another mates in the summer, these two populations will not mate with each other and are reproductively isolated...

In nature, physical barriers can break large populations into smaller ones. Lava from volcanic eruptions can isolate populations... Geographic isolation occurs whenever a physical barrier divides a population. (Biggs, et al., 2000, p. 417-418)

Outlying Theme - Conflict Between Faith and Evolution

The purpose of this study has been to provide descriptive data and content analysis of the current setting of the creation/evolution debate in American public schools. Three of the four textbooks used in researching the third question that drove this study did not even address that some individuals did not agree with the theory of evolution. However, one textbook did address this issue. Since only one addressed this issue of conflict between some religious beliefs and the theory of evolution this is an outlying theme. Biggs, et al. stated “For some people the theory of evolution is contradictory to their faith, and they offer other interpretations of the data” (Biggs, et al., 2000, p. 404).
Table 13 - Framework Expressing What is taught in Public Schools with Regard to Origins.

<table>
<thead>
<tr>
<th>Themes</th>
<th>Results of data analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punctuated Equilibrium</td>
<td>The theory that speciation occurs quickly rather than gradually.</td>
</tr>
<tr>
<td>Natural Selection</td>
<td>A process that occurs when an individual is more physically adapted to an environment than other individuals in the population. The individual which is more physically adapted to the environment tends to leave more offspring. Nature selects these offspring to survive at a higher rate than the other offspring. Thus, the population changes. There are four types of natural selection: directional selection; disruptive selection; stabilizing selection; and sexual selection.</td>
</tr>
<tr>
<td>Beneficial Mutations</td>
<td>Mutations which result in useful variation and cause genetic change which may cause speciation.</td>
</tr>
<tr>
<td>Charles Darwin</td>
<td>1. Darwin presented his theory to the scientific community with Alfred Russell Wallace and one year later published his book <em>On the Origin of Species by Natural Selection</em>.</td>
</tr>
<tr>
<td></td>
<td>2. Darwin theorized that the different species of finches he found on the Galapagos Islands could have evolved from one original species through natural selection.</td>
</tr>
<tr>
<td></td>
<td>3. Darwin traveled for five years as the ‘naturalist’ on the HMS Beagle collecting and studying numerous species along the way.</td>
</tr>
<tr>
<td>Gene Pools</td>
<td>All the genetic information of all the members of a particular population.</td>
</tr>
<tr>
<td>Genetic Drift</td>
<td>The concept that in small populations an individual may carry a particular allele significantly different from the other members of the population. This individual leaves more descendants than the other individuals of the population. Over time the majority of the population evolves this allele and the population drifts genetically from its parent population.</td>
</tr>
<tr>
<td>Isolation</td>
<td>The concept that species evolve when populations become reproducibly isolated from each other either geographically, or behaviorally.</td>
</tr>
</tbody>
</table>

**Issues of Reliability**

Stability was checked one month after the initial coding by the researcher.

*Biological Science: An Ecological Approach* was chosen to check stability and reproducibility. The chapter dealing with evolution and the origins of life was copied and re-coded by the researcher one month after the initial coding. The researcher compared...
the re-coding with the original coding and found that stability was maintained as the codings were synonymous.

Reproducibility was checked by a second coder who coded the copied chapter. The second coder was not privy to all four textbooks and thus unable to consider the emergence of themes from all the data. Therefore, the second coder was not asked to look for categories but was asked to code the chapter according to the seven themes that the researcher found in the data analysis (natural selection, Darwin, genetic drift, gene pool, isolation, punctuated equilibrium, and beneficial mutations). The second coder coded the chapter in the same way as the researcher. Reproducibility was verified for the third question that drove this study.
CHAPTER 5: CONCLUSIONS

We live in an extraordinary age. These are times of stunning changes in social organizations, economic well-being, moral and ethical precepts, philosophical and religious perspectives, and human self-knowledge, as well as in our understanding of that vast universe in which we are embedded like a grain of sand in a cosmic ocean. As long as there have been human beings, we have posed the deep and fundamental questions, which evoke wonder and stir us into at least a tentative and trembling awareness, questions on the origins of consciousness; life on our planet; the beginnings of the Earth; the formation of the Sun; the possibility of intelligent beings somewhere up there in the depths of the sky; as well as, the grandest inquiry of all - on the advent, nature and ultimate destiny of the universe. (Carl Sagan, 1974, from the introduction)

Conclusions

Humans have always and may forever debate concerning the ultimate meanings and origins of life. The debate over origins is not new but it has taken on a new dimension in the last ten years. The theory of Intelligent Design has resurrected the debate on teaching alternate theories of origins in the public school. The Intelligent Design theory purports to be both scientific and constitutional (unlike the theory of creation) and may, for the first time in sixteen years bring the debate over origins back to the classroom. Kansas and Ohio have seriously considered the teaching of ID alongside the theory of evolution in biology classes, and it appears this is just the beginning.

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It is incumbent upon educators to be aware of the context of this debate in order to be sensitive to their students and the social/cultural environment wherein they teach.

Changes may occur at any moment. In one school district in Kansas the school board recently considered having teachers teach from both the biology textbook they had been using and another textbook called *Of Pandas and People* which presented the theory of Intelligent Design (Steinburg, 1999).

This study has given a legal, political, and philosophical context for the debate on whether to teach alternate theories of origins. This context provides educators with:

(A) an awareness of the legalities surrounding the teaching of origins; (B) an understanding of political and philosophical pressures included in the debate; and (C) a comprehension of how different textbooks handle the debate.

**Research Question 1**

The content-analysis process revealed that there have been eight federal court cases which have dealt with the creation/evolution debate in public schools. The analysis of these cases provided a legal framework for educators. This framework reveals that the theory of creation is a religious concept. Therefore, state boards of education and/or school boards may not prescribe that such a theory be taught in the biology classes of American public schools; to do so would breech the First Amendment. Moreover, the theory of evolution is not a religious concept. Therefore, state boards of education and/or school boards cannot discourage the teaching of the theory of evolution; to do so would breech the freedom of speech and academic freedom of teachers. School boards can, however, prevent individual teachers from teaching a theory of creation and prescribe
that teachers teach the theory of evolution. The framework further revealed that any
disclaimers concerning evolution should avoid mentioning other theories that are
religious concepts (like creation). Yet, curricula may include a variety of scientific
theories about the origins of humankind provided the intent of the curriculum enhances
the effectiveness of science instruction.

There are some situations that have yet to be addressed by the courts concerning
the teaching of creation and other alternate theories of origins. Although school boards
may not prescribe that teachers teach the theory of creation, it is possible that teachers
may choose to do so on their own, provided the school board chooses not to prohibit the
teacher from doing so. This is a very gray area, however. The courts have allowed
teachers latitude in pursuing inquiries of students related to subject content, yet they have
also declared the theory of creation a religious concept.

It is clear that teachers may question the validity of evolution and point out its
weaknesses. Furthermore, the Supreme Court’s declaration in Edwards v. Aguillard
(1987) that, “teaching a variety of scientific theories about the origins of humankind to
school children might be validly done,” (Edwards v. Aguillard, 482 U.S. 594, 1987) has
opened the door for teachers to present other theories of origins (such as ID). However,
opponents of the teaching of ID claim that it is too similar to creation (Atlanta

This study revealed that the teaching of evolution does not “prohibit the free
exercise” of one’s religion nor is it an attack on one’s religion because one may believe
that a Supreme Being guided the process of evolution (Blakeslee, 1999). This concept,
however, is a double-edged sword. If one accommodates student’s religious beliefs by
silent acknowledgement that it is possible for a Supreme Being to exist, then how can a theory of Intelligent Design be unscientific? In other words, if it is possible that a Supreme Being guided the process of evolution then it is possible that a Supreme Being created life. To rule out intelligent design without first looking at the evidence would be tantamount to saying a Supreme Being exists only if He or She created life through evolution.

The theory of origins is a sticky issue legally. Yet, it becomes a quagmire in society, as reflected in the press.

**Research Question 2**

The content analysis revealed five themes that the American popular press mentioned constantly: (A) evolution; (B) intelligent design; (C) conflict; (D) religion; and (E) creation.

The American popular press presented a balanced treatment of the theme of evolution. Statements included: (A) pro-evolution sentiments regarding the overwhelming scientific evidence for evolution and its validity as a theory despite some challenges; (B) con-evolution statements regarding the weaknesses of the theory of evolution and teachers' refusal to teach the theory; and (C) descriptions of: 1) the theory of evolution; 2) polls regarding the teaching of evolution; and 3) actions of state boards of education.

The theme of intelligent design was presented by including statements that: (A) encouraged educators to teach ID alongside evolution when theories of origins were taught in biology classes; (B) maintained that design inferences are made by empirical
evidence all the time, and therefore ID is a valid scientific theory; and (C) maintained that ID is creationism repackaged to meet constitutional requirements.

Newspaper articles revealed that the theme of conflict included statements: (A) emphasizing the effect that the creation/evolution controversy has had on decisions made by state boards of education; and (B) maintaining that schools should teach the controversy and allow students to think for themselves.

The theme of religion emerged in the content analysis of press articles. This theme was characterized by statements that: (A) maintain that creation is a religious belief and is therefore, an unconstitutional theory of origins; (B) maintain that evolution undermines the faith of some students; and (C) maintain that science and religion are compatible.

The emergent theme of creation was presented in newspaper articles in a similar fashion to the theme of evolution. There were statements which claimed that the theory of creation is a valid scientific theory as well as articles indicating that creationists have won recent battles in the creation/evolution debate. There were also statements which maintained that the theory of creation is not a scientific theory, but rather a religious viewpoint, and therefore should not be taught in biology classes. Further, there were statements describing the theory of creation as a theory: 1) that the overwhelming majority of Americans believe should be taught in public schools; 2) which was declared unconstitutional by the Supreme Court; and 3) in which God created all basic life forms.

Typically, the articles written in newspapers were in response to decisions that state boards of education were considering or had made. The researcher observed that the press presented the theories of evolution, creation, and ID very similar to the way
proponents for each theory would present them. Thus, the press seemed fair in their coverage of the evolution/creation debate. However, the general tenor of the vast majority of the articles was that creation is a religious theory, as is ID. Although the articles presented both sides of the debate fairly, they tended to conclude by maintaining that schools should not teach the controversy. Furthermore, the equating of the theory of ID with creation in the articles is a stark contrast to the premise of the ID theory. In fact, those who developed the theory of ID have made clear that ID is a totally different theory than the Biblical theory of creation.

Research Question 3

The content analysis of textbooks revealed seven themes that were present in all four textbooks. The largest theme which appeared in the biology textbooks was the theme of natural selection. The textbooks described this as a process which occurs when an individual is more physically adapted to an environment than other individuals in the population. This one individual tends to leave more offspring. Nature selects these offspring to survive at a higher rate than the offspring from the rest of the population. Thus, the population evolves. Natural selection may occur in a directional, disruptive, sexual, or stable manner.

Another theme that was presented extensively in the textbooks was Charles Darwin. All four textbooks emphasized Darwin’s travels, where he collected and studied numerous species. They also mentioned how Darwin developed his theory while contemplating the numerous finch species he found on the Galápagos Islands, how he
presented his theory to the scientific community with Alfred Russell Wallace, and how he then published his book *On the Origin of Species by Natural Selection*.

The five remaining themes which the content analysis revealed were not dealt with nearly to the degree of natural selection or Charles Darwin. However, all four textbooks did address these themes: (A) punctuated equilibrium was presented as the theory that speciation occurs quickly rather than gradually; (B) beneficial mutations were presented as mutations which result in useful variation, and cause genetic change which may cause speciation; (C) gene pools were presented as the collection of all the genetic information of all the members of a particular population; (D) genetic drift was presented as the concept that in small populations an individual may carry a particular allele significantly different from the other members of the population; if this individual leaves more descendents than the rest of the population, then the population will drift genetically away from its parent population; and (E) isolation was presented as the concept that species evolve when populations become reproducibly isolated from each other.

Noticeably absent from three of the four textbooks was any mention of the debate about origins. Furthermore, the one textbook that did mention something of the controversy just stated, “For some people the theory of evolution is contradictory to their faith, and they offer other interpretations of the data.” (Biggs et al., 2000, p. 404). Apparently, what is debated on college campuses, in courtrooms, and in newspapers across the country is not even mentioned in most textbooks. Moreover, the theory of evolution is presented just as factual as the theory of gravity. The debate of the weaknesses of evolution is not mentioned.
Discussion

The creation/evolution controversy is unique to controversial scientific theories. Usually, with other controversial scientific areas all theories are taught alongside each other. For example, in the area of evolutionary development, Darwinian evolution and Punctuated Equilibrium are both taught, thus, giving students both theories. Concerning origins, however, the educational history is one in which either creation is taught (anti-evolution laws) or evolution is taught (McLean v. Arkansas). The researcher believes that this is the case because of the metaphysical implications of the theory of origins. Evolution implies that a Supreme Being either does not exist or is not immanently involved in His/Her creation. These implications carry huge cultural and political messages at a time when the liberal left and the religious right are at war for the minds of all Americans.

While one might assume which side of the debate the left and right might take, it is important to keep in mind that politics makes for strange bedfellows. The Discovery Institute and the Access Research Network are organizations that would like to see ID taught in public schools, while the National Center for Science Education fights to keep ID from being taught in public schools. However, the assumption that liberals do not want ID taught and conservatives do may be too broad of a stroke to make in a culture where strange political alliances are constantly made (See, for example, the alliances formed to support or oppose Pierce v. Society of Sisters, 1925).

The uniqueness of American politics can be seen in the judicial branch of this government. Although judges are to be politically neutral, it is interesting to note the different, and at times, contradictory decisions rendered by the U. S. federal courts. The
1948 McCollum Court found it unconstitutional for public schools to educate children in elective courses on religion, yet, in 1952 the Zorach Court found this practice constitutional if it occurs off school grounds. Perhaps Chief Justice William Rehnquist summed up the contradictory decisions by the Courts best:

The results from our school services cases show the difficulty we have encountered...For example, a State may lend parochial school children geography textbooks that contain maps of the United States, but the State may not lend maps of the United States for use in geography class. A State may lend textbooks on American colonial history, but it may not lend a film on George Washington, or a film projector to show it in history class. A State may lend classroom workbooks, but may not lend workbooks in which the parochial school children write, thus rendering them nonreusable. A State may pay for bus transportation to religious schools but may not pay for bus transportation from the parochial school to the public zoo or natural history museum for a field trip. A State may pay for diagnostic services conducted in the parochial school but therapeutic services must be given in a different building; speech and hearing "services" conducted by the State inside the sectarian school are forbidden but the State may conduct speech and hearing diagnostic testing inside the sectarian school. Exceptional parochial school students may receive counseling, but it must take place outside of the parochial school, such as in a trailer parked down the street. (Wallace v. Jaffree, 472. U. S., 38, 1985)

The political, as well as the social, and cultural contexts influence whether one supports the teaching of ID as an alternate theory of origins in public schools. Yet, in the Utah...
Law Review, DeWolf, Meyer and DeForrest (2000) revealed that the teaching of ID in public school biology classrooms is constitutional. Their opinion is based on the fact that courts usually refuse to define religion, but even when they have they speak to religion as: 1) addressing fundamental and ultimate questions having to do with deep and imponderable matters; 2) consisting of a belief system; and 3) being recognized by the presence of formal and external signs (Alvarado v. City of San Jose, 94 F.3d, 1129; 9th Cir. 1996). Dewolf, et al. claim that the Intelligent Design theory meets none of these requirements of ‘religion’ (Dewolf, et al. 2000). Furthermore, Dewolf, et al. note that Edwards v. Aguillard affirmed the right of teachers to discuss alternative scientific theories of origin in their classrooms…and subsequent cases such as Rosenberger have made it more difficult to use the Establishment Clause to limit academic freedom and the rights of free expression. (Dewolf, et. al., 2000 p.109)

Therefore, teaching ID as an alternate theory of origins in the public school is legal and should even be encouraged.

The theory of Intelligent Design does carry metaphysical implications of the existence of a higher being, yet this does not make a theory ‘religious’; for even evolution carries metaphysical implications. The metaphysical implications of ID are not detrimental to the education of youth. In fact, the classroom, which is the “free marketplace of ideas,” is a most appropriate place for students to consider why they exist and what the essence of life is. Plato even taught his students to ponder such ultimate questions of life (Irwin, 1990).

Although press articles and opponents of “teaching the controversy” claim that the ID theory is nothing more than the theory of creation repackaged to meet
constitutional requirements, in reality they are wrong. The theory of ID is unlike the theory of creation. It does not begin with a sacred religious text nor does it claim who or what created life on earth. Rather, this theory empirically looks at life and notices that there appears to be so much design that it is impossible for life to have arisen by chance. Therefore, an Intelligent Designer must have designed or created life.

In this study it was revealed that the controversy over origins has been debated in courtrooms across the country, it has also been debated in legislative halls, in public debates on college campuses, and in newspapers. However, teachers are admonished not to debate this in the classrooms of public schools and textbooks do not even address the issue. It seems ironic that this controversy is presented everywhere in this democracy except in textbooks used in the “free marketplace of ideas.”

Biology teachers should stay educated on this topic and should be honest about the weaknesses of the theory of evolution. Academic integrity demands nothing less. The late Stephen Jay Gould’s book, *The Structure of Evolutionary Theory*, is a good read concerning the weaknesses of the theory of evolution. Dr. Gould was a staunch evolutionist, and yet had enough academic integrity to admit that the evolutionary theory had some major cracks (Gould, 2000). Students deserve a fair presentation. Educators who are less than honest in their presentation of the evolutionary theory are, in essence, practicing what they don’t want creationists to do: present unsupported hypothesis as scientific discoveries.

It is disappointing anytime one learns that scientists have doctored discoveries to fool the public in order to promote a theory. This type of academic fraud injures their own reputations, the theory they are promoting, and most importantly, the students. The
researcher experienced such deception in his own high school biology class as he was taught the evidence of "Haeckel's Embryos," the peppered moths, and the Miller-Urey experiment. Haeckel's Embryos are now known to be falsified drawings, and the peppered moths and the Miller-Urey experiment are seriously misleading (Wells, 2000). The researcher was pleased to see that the textbooks used in this study admit Haeckel's falsified drawings. This type of academic honesty should be encouraged in the teaching of origins.

Educators should also be aware of the cultural and social environment wherein they teach. To teach that the evolutionary theory is factual and that life arose from non-living matter is a materialistic assumption. In reality, life arising from non-living material has never been observed and is a biological and geological theory based upon an interpretation of what is observed. The presentation of the evolution theory as fact also assumes that an intelligent being could not have created life. This also is an assumption that may strike some as an attack upon their faith. The question of whether to teach intelligent design as an alternate theory of origins alongside evolution in biology class may be a question left to boards of education and courts. However, biology teachers, in their presentation of the evolutionary theory, should be both intellectually honest and sensitive to their students.

Implications

Some of the most heated wars in human history have involved religious motivations (such as the Crusades). One's religious beliefs can be so intrinsically woven into one's being that a perceived attack upon them may provoke passionate emotions. In
a pluralistic society one can understand educators' desires to keep such emotions from the classroom. However, this must be balanced with academic freedom and the pursuit of cultural values and beliefs.

The impact that the creation/evolution debate has on policy depends in large part upon the culture. Many boards of education may be pressured by their culture to include alternate theories of origins in the curricula. There are, however, legal implications for educational leaders in regard to policy making. When writing a curriculum for biology classes educators must keep in mind the parameters which the courts have placed around this issue. First and Fourteenth Amendment concerns regarding the separation of Church and State are of critical importance. The teaching in public schools of any alternate theory of origins which has metaphysical implications of a Supreme Being will, in all likelihood, invite lawsuits. Boards of education should keep this in mind when developing curricula. This is not to imply that boards of education should not write curricula which encourage the teaching of alternate theories of origins with such implications, but rather that they should be aware that they may be sued and would be wise to ensure their curricula is within legal guidelines.

Local school boards would be better protected from suits if state boards of education adopted ID as a legitimate alternate theory of origins to be taught in public schools. Yet, states also, should be prepared for lawsuits with such action.

Concerning classroom implications, the legal precedents which were revealed in this study imply that teachers must be especially sensitive when teaching about origins. Their teaching should be guided by: (A) the curriculum; and (B) academic freedom. By doing so, teachers would bring forth a balance between (A) the teaching of the
evolutionary theory; and (B) the allowance of students and teachers alike to think differently and the encouraging of the expression of those thoughts without proselytizing.

The debate has made very clear that the theory of evolution is not as grounded as the theory of gravity. There are some weaknesses. Whether one sees these weaknesses as minor hurdles or major chasms, they still exist. Academic integrity implies, nay, demands that these weaknesses are taught to students.

The press articles which were analyzed in the content analysis revealed that the majority of Americans believe that the theory of creation should be taught alongside the theory of evolution in public school biology class. This implies that the debate concerning origins is not going away any time soon. Educators must stay alert concerning this issue.

The analysis of textbooks revealed that three of the four textbooks did not even address the controversy concerning origins. And the one that did, did so with a one-sentence comment about people's faith rather than the controversy. Since, the controversy is real and active as revealed in court cases and press articles, there is an implication that textbook publishers are either unaware of what's happening in the world (which is unlikely) or they purposely refuse to admit either the controversy or its legitimacy. In either case, this sheltering of students may not in the end benefit the student.

**Recommendations**

This study revealed that the debate about whether to teach intelligent design alongside evolution in public schools is a current topic in boards of education across the
nation. It is incumbent upon educators to know about both the controversy and the legal parameters which surround it.

Furthermore, educators should teach the controversy. Choosing not to present the ID theory for fear of legal or educational ramifications is most legitimate. However, refusing to admit the problems that the theory of evolution encounters is irresponsible. Educators must be academically honest. Moreover, the No Child Left Behind Act of 2002 requires by federal statutory law that when teaching biological evolution the "curriculum should help students to understand the full range of scientific views that exist, (and) why such topics may generate controversy" (No Child Left Behind Act, 2002).

Sensitivity to alternate opinions must also characterize good educators. This concept extends far beyond the boundaries of the origins controversy. However, it is most applicable to this controversy. The expression, in classrooms, of differing opinions concerning origins should not just be allowed but encouraged, and without ridicule.

Finally, educators should guard against presenting their personal views in class if it keeps them from teaching the controversial theory of evolution. The researcher was appalled to read that many teachers avoid teaching the theory of evolution (Cumming, 1996). This type of academic thievery robs high school students of a good education. Furthermore, it injures their performance on state standards tests and collegiate entrance exams. It is one thing to present the evolutionary theory as a valid scientific theory with major questions that still need to be answered; and even to say one does not agree with this theory. It is quite another, however, to refuse even to present the theory.
Future Research

This study has provided a glimpse into the creation/evolution controversy and its surrounding legal, political and philosophical context. This context will help educators better understand how to handle the controversy when it erupts in their domain. Furthermore, it will help educators in the presentation of the evolutionary theory of origins. Yet, further study should be done concerning how the theory of origins is taught. Biology teachers do not always follow textbooks. Although this study showed how four current biology textbooks present the theory of origins, it did not reveal how the theory is actually presented in classrooms. Perhaps a survey instrument could be used to determine how many classrooms actually present the theory of evolution and how it is presented. Geographical, social-economic, and other demographic data may be used as variables to understand teaching differences.

Some charter schools and many private schools are teaching alternate theories of origins. A study to research the differences in performance on state standard testing between those who were taught alternate theories of origins and those who were taught just the theory of evolution, may provide benefits also. Pre-experiment differences would have to be controlled. This type of study may provide interesting results. The theory of evolution may be comprehended much better with an understanding of its weaknesses.

This study did not examine how one would present both theories in public schools. Some charter schools are doing so (Asimov, 2002). Educators would benefit from a case study on how to present both theories in such a way as to ensure the highest quality of education while at the same time remaining within constitutional guidelines.
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