

Deutsche Gesellschaft für
Geschichte und Theorie der Biologie

Annals of the History and Philosophy of Biology

Volume 19 (2014)

formerly Jahrbuch für
Geschichte und Theorie der Biologie

Elizabeth Watts

Analysis of Creationism in the United States
from Scopes (1925) to Kitzmiller (2005) and its
Effect on the Nation's Science Education System



Universitätsverlag Göttingen



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Deutsche Gesellschaft für Geschichte und
Theorie der Biologie (Ed.)
Annals of the History and Philosophy of Biology Vol. 19 (2014)

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Annals of the History and Philosophy of Biology; Volume 19 (2014)
Universitätsverlag Göttingen 2018

Deutsche Gesellschaft für
Geschichte und Theorie der
Biologie (Ed.)

Annals of the History and
Philosophy of Biology
Vol. 19 (2014)

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Universitätsverlag Göttingen
2018

Bibliographic information published by the Deutsche Nationalbibliothek

The Deutsche Nationalbibliothek lists this publication in the Deutsche Nationalbibliografie; detailed bibliographic data are available on the Internet at <http://dnb.dnb.de>.

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This is a revised version of Watts' doctoral dissertation that was submitted to the Faculty of Biological Sciences at the Friedrich Schiller University Jena in 2016 to fulfill the requirements for the degree of doctor rerum naturalium (Dr. rer. nat.).

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Cover Picture: Friedrich Besemann: Leinekanal mit akademischem Museum und Graetzelhaus. Aquarellierte Federzeichnung 1860. Graphische Sammlung des Städtischen Museums Göttingen

Layout: Elizabeth Watts

Cover Design: Kilian Klapp, Maren Büttner

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<https://univerlag.uni-goettingen.de>

ISBN: 978-3-86395-339-3

DOI: <https://doi.org/10.17875/gup2018-1065>

eISSN: 2512-5923

For Zoey – my thunder & joy

Acknowledgements

If a student is lucky, they may be fortunate enough to receive one good advisor. In my case, I was doubly blessed. My sincerest thanks goes to my exceptional “Doktorvater”, Prof. Dr. Uwe Hoßfeld, and my gifted secondary advisor, Dr. Georgy Levit, for supporting me with their endless wealth of knowledge on the subject and for fortifying my interest in the subject throughout my studies. It was a true pleasure and honor to work with the both of them.

I would also like to thank my parents, who blazed the trail, instilling in me a love for science from a very early age and for later providing me with encouragement and jubilation along the path to my own dissertation.

Last, a heartfelt thank you to David – my best friend & the ultimate yin to my yang.

Abstract

Creationism is based on a fundamental belief in the inerrancy of the bible and negatively affects science education because creationist proponents insist on the inclusion of supernatural explanations for the appearance of species, in particular the origin of humans. This detrimental effect on education is particularly relevant in the United States, where almost 70% of the population rejects the idea of naturalistic evolution and the majority of American students struggle to meet the college-readiness benchmarks in science and math. This dissertation provides a comprehensive look at the issue from historical, judicial and educational perspectives. Twenty-four legal cases in the United States regarding anti-evolutionary strategies were analyzed in detail. Strategic trends were identified ranging from the statewide banning of evolution in public schools to the required teaching of Creation Science. The exact effect of creationist political activity was discerned through the analysis of state science standards and textbook adoption processes, which illustrated the creationists' ability to lobby for a diminished coverage of evolution in science standards and textbooks. It was found that despite attempts made by scientific and educational agencies to provide guidelines such as the Next Generation Science Standards, the majority of American state science standards continue to be sub-par and one of the major flaws of these standards is the overall attempt to weaken the coverage of evolution throughout the standards. A similar loss of quality occurs in textbooks

since publishers engage in self-censorship in order to avoid controversial topics such as evolution in order to prevent their books from being rejected. An examination of the free-choice learning materials revealed that creationist proponents are very active and successful in producing books, films and museums for the sole purpose of promoting creationism. Moreover, a brief look at the creationist movement in Germany provided a powerful comparison to the United States and elucidated the key components necessary for a creationist movement to exist and flourish, namely the presence of fundamentalist willing to fight to get anti-evolutionary materials introduced into science classrooms. This study provides new insights into the creationist phenomenon, present not only in the United States but also increasingly present in European countries such as Germany. Understanding the detrimental link between creationism and science education will help the science community realize that this topic needs to be continually readdressed and that it is imperative that these creationist trends are not dismissed as inconsequential.

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Foreword

It may strike some as odd that a biologist would commit herself to writing a doctoral dissertation about the history, development and effects of creationism – a topic that seems much more religious than scientific. And in truth the process of writing this thesis required a lot of research outside of the normal realms of a biological study. No time was spent in a laboratory or observing animals in the wild. Instead, the majority of time was spent on activities very distanced from the realms of biological study such as combing through judicial rulings, analyzing governmental policy descriptions, dissecting biblical passages and watching documentaries. For most, this does not sound like a particularly scientific endeavor and in fact, some of the most useful books on this topic were not found in the library branch for biological sciences but instead in the theological branch in the section on dogmatism. Thus for many, the study of creationism may seem like an irrelevant topic for a scientist to pick up – one possibly left best to the humanities. So why would a biologist want to devote so much time to studying an evangelical ideology – when there are so many more important issues a biologist can address such as endangered species, cancer, climate change, shrinking bee populations, etc.? However, when one truly understands how scientific progress occurs, it becomes apparent that this may be one of the most important topics for a scientist to examine.

It is important to understand that for each successful geneticist, ecologist, microbiologist, zoologist, etc. to be able to make their contribution to society and

human history, they first had to first invest years into the study of biology, of which evolution is one of the most key components. The geneticist of today did not need to discover the concept of genes, chromosomes or heredity – no instead, they were the beneficiaries of decades of knowledge gathered around the world since Mendel's discovery became public in the early 1900s. This passage of knowledge, discovery and understanding of the natural world from one generation to the next occurs through systematic science education that begins before an individual even chooses a major at university.

This foundation of science education is concentrated during the years a student is in high school. While quality science education during this time can provide all students and thus the upcoming general populous with a thorough understanding of how science works and what the most important discoveries have been – possibly even encouraging some students to become a part of the global scientific endeavor – poor science education serves not only to discourage students from pursuing the sciences at university but can also leave students with a complete misunderstanding of what science is and unable to recognize true scientific progress from pseudo-scientific claims. This is particularly true when creationist ideas are presented in the science classrooms as alternative theories to evolution.

Once one understands how all scientific progress and success relies wholeheartedly upon the education of future scientists – it becomes clear why the analysis creationism is completely necessary as it poses a direct threat to the foundation of science education. The inclusion of these ideas in science classrooms, especially when presented as equally valid alternatives to evolution, is the most efficient way to confuse young minds about the true nature of science. Because these concepts fundamentally invoke supernatural powers to describe processes that occur in the natural world, it leads to an immediate loss of science literacy and a diminishment of the overall quality of science education.

This thesis focuses specifically on this topic, science education, without any intention or motivation of discussing the validity of religion in society, the presence or lack of God in the universe or any other metaphysical issue. The main point is to illustrate the history, development and pervasiveness of creationism in all of its forms since the introduction of this type of fundamentalist propaganda could impair science literacy in a radical and long-term manner.

Introduction

In the simplest of terms creationism is the belief that God was responsible for the creation of all life present on the Earth in the basic form that it has at present. Creationists in general oppose the idea that natural processes could be solely responsible for the production of new life forms – though many creationists concede to the notion of microevolution that would lead to minor changes within a species such as different dog breeds. Creationism has been popular among evangelicals in the United States for over one hundred years and continues to gain acceptance and popularity outside of America. This thesis will analyze the creationist movement in order to illustrate how the spread of this fundamental belief system affects not only science education, but also the general science literacy of future generations.

The analysis of creationism in this thesis was approached in a way that could be likened to the manner in which an anthropologist studies another culture. At first, one acquaints oneself with the literature available on the culture, identifying the experts in the field. In terms of creationism, there are many experts who have published great masses on the subject. Some authors such as Scott and Numbers have written books covering the vastness of the development of creationism in the United States, such as *Creationism vs. Evolution* (Scott, 2009), *The Creationists* (Numbers, 1992). Other authors have written books that delve into certain aspects of creationism such as Forrest who focused on Intelligent Design in her book, *Creationism's Trojan Horse: The Wedge of Intelligent Design*, or Larson

who has focused on the historical legal history in books such as, *Trial and Error: The American Controversy over Creationism and Evolution*. Meanwhile European authors such as Kutschera, Hoßfeld, and Levit shed light on creationism beyond the border of America through multiple papers and books, such as *Creationism in Europe* (Blancke ed., 2014). Authors such as Gould, Ruse and Mayr as well as Junker and Hoßfeld have also provided a wealth of materials regarding the history of Darwin, evolution and biology in books such as *Die Entdeckung der Evolution* (Junker & Hoßfeld, 2009), *The Structure of Evolutionary Theory* (Gould, 2002), *What Evolution Is* (Mayr, 2003), *The Evolution Wars* (Ruse, 2002). Many authors who are relatively new to the Darwin arena such as Humes and Shermer also provided valuable insights into the creationist phenomenon with their comprehensive books such as *Why Darwin Matters* (Shermer, 2009). Through the work provided by these authors, it was possible to become acquainted with the overall history and dynamic of the creationist movement. The National Center for Science Education (NCSE), in general, also provides a massive amount material on the subject, which was extremely useful, in particular for keeping up-to-date on current developments and understanding the timeline of legal cases.

Yet, while all of the information from these creationists experts was very useful, it was all written by individuals outside of the creationist movement, making observations about the creationists, providing a wealth of facts about the existence of creationists and different creationist groups, their goals, their leaders, their books, their strategies to oppose evolution, but almost always from the perspective of a scientist. In order to take the study of creationism one step further, much effort was given to understand the creationist movement from the inside-out by learning about creationism from the creationist themselves and thus after a general orientation using literature from scientist about creationism, the second step of research was a complete immersion in the creationist culture. This immersion meant reading books about creationism from leading creationists such as Johnson, Morris, Behe, Meyer, Dembski, Wells, etc. It meant scouring creationist websites such as Institute for Creation Research, Answers in Genesis, Discovery Institute, etc. and then reading and rereading Genesis and other Scriptures and books by bible experts such as Bart Ehrman. It meant listening to podcasts produced by the Discovery Institute and watching creationist movies to hear about their beliefs from their mouth.

This immersion allowed an insight into the creationist phenomenon, that would not have otherwise been possible. Instead of just reading about them from authors such as Dawkins, who immediately dismiss all creationists as imbeciles or are baffled by the existence of creationism, the immersion in the creationist culture allowed insight into why they have these beliefs and why they oppose evolution and what is it exactly that they want to accomplish.

Once this general understanding of the creationism was established, it became clearer what parts of creationism are truly noxious. Thus, the second approach of the study developed into an examination that could be compared to the analysis of a mutating infectious organism or a super bug. This comparison is made not to vilify a belief in special creation but to make the clear distinction of what aspects of this movement are dangerous. It would be wrong to say that all bacteria are bad, just as it would be wrong to say that all religious belief is dangerous. Thus, creationism can be thought of as a super bug in that a certain belief in special creation or God may serve certain emotional and psychological needs for an individual or even provide whole populations with a sense of purpose, yet it becomes very harmful when it mutates to an extreme form of fundamentalist belief that is entirely resistant to scientific discovery and is aimed at degrading the standards of science education.

So in order to limit the amount of harm that this mutated species could cause to an organism, one would want to study an infectious species or super bugs to understand where it came from, how it develops, how it reproduces, what it feeds upon, what type of conditions it needs to survive, what kind of damage it causes, what can be done to limit damage, in the same way, this thesis aims to provide a thorough overview of the origins, developments and specific dangers of this movement in terms of science education and will accomplish this by examining the movement from multiple perspectives.

The first chapter of the thesis is devoted to looking at the origin of creationist beliefs, the conditions in the United States that provided an environment for these beliefs to flourish and a look at the theory of evolution, which became the focus of creationist attacks. The first chapter provides background necessary to understand all subsequent chapters. The subchapters on religion and American history aim to (1) highlight how creationism is not a general phenomenon of religious belief or Christianity but is a fundamentalist idea centered within the evangelical sect of Protestantism (Ruse, 2001), (2) explain how and why this evangelical belief system is so popular within the United States, and (3) have evangelical Protestantism gained its political influence in the US. The subchapter on science and evolution provides a brief overview of the nature of science and the theory of evolution in order to (1) explain the nature science in order to explain how creationism, creation science and intelligent cannot be considered scientific pursuits, (2) highlight the strength and importance of the theory of evolution to show that many of the later described creationists claims that the theory of evolution is weak and flawed are without merit, and (3) explain how the theory of evolution became associated with moral degradation.

The next chapter is devoted to looking at the development of creationism. The chapter provides an overview of the various strains of creationists and creationist beliefs, whenever possible based on works written by creationists themselves. The chapter also chronicles the mutation of creationists, who began as fundamentalists

who opposed evolution outright but accepted the antiquity of the Earth (Numbers, 2014) and became a movement towards Creation Science, which attempted to find scientific data to support the Genesis account of creation and simultaneously popularized the proposition that the Earth was relatively young and that there was data to support this idea (Blancke, 2014) and finally moved on to Intelligent Design. The final part of the chapter is devoted to a special look at Intelligent Design, which takes a subtler approach to the idea of creation by emphasizing the necessity of a higher being without harking upon the details of the Genesis account. The purpose of the chapter is to (1) provide contextual information about creationism, (2) to illustrate the stark mutations of the movement throughout the 1900s, (3) to highlight the fact that the creationist movement is not only still present and very active in the United States but is in fact stronger and more powerful than ever before (Forrest, 2007), (4) thus providing the reasons why it is important to study this phenomenon.

The ensuing chapter focuses on the legal aspect of the creationist movement and describes not only the cases but also the laws and measures that are in place in the United States to protect students against the introduction of religious doctrine into public science classes. While almost all publications, only focus on only the most prominent cases such as Scopes, Kitzmiller, Epperson, and Edwards, this thesis provides a detailed overview of every single case heard in the US involving creationism from 1925 to 2005. In order to illustrate the weight and influence of each case, a particular effort was made to explain how the American legal system works since many publications about these cases presuppose that the author is familiar with the American judicial system. Again, instead of just reading about these cases from experts such as Larson or central organization such as the NCSE, importance was placed on the reading primary sources such as the actual court rulings, prohibition legislation, etc. This chapter specifically describes (1) the laws that prevent creationism from being taught in public schools, (2) the legal battles that have been fought in the 80 years between the most publicized cases: Scopes and Kitzmiller, (3) the effects that these cases had on education and the creationist movement, (4) the temporal and geographical presence of these types of cases in the United States. All cases are presented using a uniform layout that included the year, location, court level, plaintiffs, defendants, charges, ruling, summary and the cases specific effect on education. This sleek design provides the reader with a thorough overview of the cases in a simplified and organized manner allowing the reader to (1) quickly understand how many of the cases are built upon one another, (2) see how the results of these cases caused creationists to change strategies in order to avoid further legal problems, (3) glimpse at the complexity of the problem for parents, students and teachers, (4) understand why certain cases have larger impacts due to the precedence set by their ruling.

The subsequent chapter focuses specifically on how creationism affects education in the United States. Although many publications talk about the danger of

creationism in terms of science education, many authors, with the exception of Miller, do not go into any specific details about these effects. This thesis thus aims to clearly define what parts of the American education system are effected most through creationist lobbying and grassroots actions in order to provide clear examples of the detrimental effects of this political pressure. Again, a firsthand approach was taken by reviewing the state education board publications and not only publications about the state education board activities. This chapter first describes the structure of the American school system, and the systems of control at the local, state and national level. Once establishing a general knowledge about the American education system, the chapter then (1) describes how curriculum and textbooks are chosen in the United States, (2) clearly explains the detrimental effects that creationists can have on science standards and textbook content through lobbying actions at the state level (Watts et al., 2016), (3) highlights how these deranged science standards and mutilated textbooks lead to a loss of science literacy among students and (4) discusses the various other ways in which creationists attempt to introduce creationism into American schools below the state level.

The last chapter aims to illustrate the immensity of the creationist movement by demonstrating that it is not limited temporally or physically. This chapter thus focuses on legal cases post-2005, free-choice learning materials used to influence public opinion outside of the classroom and creationism outside the United States. Almost all publications that mention the legal aspect of the creationism-evolution conflict only focus on legal battles fought before Kitzmiller giving the impression that all legal conflict ended in 2005. The first subchapter therefore discusses all of the court cases that have occurred since Kitzmiller in order (1) to illustrate that despite the apparent blow to Intelligent Design through the Kitzmiller ruling that the topic of creationism continues to appear in courtrooms around the United States, (2) to show the strategy changes caused by the Kitzmiller ruling and (3) to illustrate the fact that creationism is still very present problem in the United States that needs to be continually addressed. The second subchapter focuses on free-choice learning materials such as books and museums in order (1) to show that the fight for the American minds is not limited to the school classroom, (2) to illustrate the success that the creationist have had in the production of free-choice learning materials and (3) to discuss the potential that such materials have in convincing the general public about the legitimacy of creationist claims about the inadequacy of the theory of evolution. The last subchapter describes the presence of creationism in Germany in order (1) to show how creationist ideas have been exported from the United States to other countries, (2) to provide a comparison between creationist movements in different countries, while highlighting the similarities the necessity of certain elements within a society for a creationist movement to exist such as the presence of evangelical sects.

By the conclusion of this thesis, the reader should be very familiar with the origin, development, and detrimental effects of creationist activities on science education. It should be clear to the reader that (1) creationism is a fundamentalist belief that is localized in evangelical Protestantism, (2) the creationist movement originated in the United States and has since been exported to countries around the world (Watts, et al., in press), (3) creationism did not die in the 1900s but is in fact a very current issue, (4) it is necessary to understand the movement and the potential effects of this movement, (5) despite laws prohibiting the teaching of creationism in public schools that creationist continue to find ways to introduce their ideas into the classroom, (6) the inclusion of creationist beliefs is detrimental to science education, (7) if left unabated, the creationist could cause a major loss of science literacy, and (8) a general loss of scientific literacy could lead to a major societal shift towards fundamentalism. More specifically, by the end of the thesis, the goal is to have provided proof for the following thesis: There is currently an active battle surrounding science education in the United States that is particularly focused on the theory of evolution and specifically aimed at determining the manner in which human origins is taught to American students at public high schools. This battle has been active in the United States since the beginning of the 1900s and has evolved over the last 100 years in response to domestic politics, judicial rulings or social shifts within the country. This creationist movement is a well-organized movement that through generous financial backing and central organizations is well-equipped and prepared to pursue its aim of weakening the teaching and authority of evolutionary theory through grassroots action aimed at school boards, state curriculum standards, textbook adoption as well as the production of and marketing of free-choice educational material and venues and have thus been able to respond and adapt to new social, political and legal situations presented to them as well as flourish in the free market. This trend is an endangerment to science education and if left unabated could lead to a rapid drop in the overall science literacy. A list of sub-theses can be found in the list of appendices.

Understanding the Conflict: science, religion and the United States

This chapter will focus on providing background information regarding science, religion and American history in order to provide the context needed to understand the current conflict regarding the teaching of creationism in public schools in the United States. This chapter will accomplish this by answering the following questions: Is it natural and logical that a conflict would occur organically between religion and science? What causes a person to become an advocate of creationism and supporter of anti-evolution legislation? How and why did fundamentalism and evangelicalism develop in the United States? What is science and why is it important for students to be educated in the sciences and to understand the theory of evolution?

The first section will look at religion and Christianity and how these differ from fundamentalism. The second section will look at American history with a focus on how evangelical Christianity developed in the United States, where an equally passionate part of the population battles for the separation between church and state. Finally, the last section will address the nature of science, the development of the theory of evolution and the importance of educating students about these subjects.

Understanding the difference between religion and fundamentalism

One might question why a chapter about religion and religious text is necessary for a dissertation about science education and evolution. However, once the topic of creationism or intelligent design arises the question of religion, Christianity and the Bible appears almost simultaneously. It is thus important to discern whether this is an organic conflict that logically occurs between religion and science. In other words – is it possible for someone to believe in God and accept the theory of evolution or are they mutually exclusive? The question has already been addressed and answered by science philosophy expert, Michael Ruse who has explicitly stated that this struggle is more legend than truth (2001). Stephen Jay Gould has also vehemently proclaimed that there is an absolute lack of conflict due to the two very different realms of religions and science (1997). Even Pope Benedict XVI and his predecessor Pope John-Paul II have both praised the role of science in the evolution of humanity and acknowledged the strength of the theory of evolution allowing Catholics to avoid any conflict between their belief system and scientific progress (Numbers, 1998).

Yet, despite all of the proclamations and explanations for why there does not need to be a conflict between science and religion, creationists continue to fight against the teaching of evolution claiming that it contradicts the biblical account of special creation and thus leads to a loss of faith (Ham, 2012; Humes, 2007; Morris, 2008). The reasoning behind this fear lies therein, that, if evolution tells a different story than what is in the Bible and if evolution were true then the Bible would be false or allegorical at best. If the Bible is no longer seen as the word of God, then doubt arises to whether or not there is a God, which leads according to creationists' claims could cause moral demise through the loss of faith or Christian values (Ham, 2012; Morris, 2008; Numbers, 1992; Numbers, 2006).

The purpose of this section is to take a detailed look at when religious beliefs lead to antievolution tendencies. In order to address creationist claims about evolution being incompatible with the Bible, Christianity and faith in God in general, this section will take a detailed look at the Bible, its content and how the Bible came into being as well as the traditional stance of religion in terms of science by looking at the historical relationships between the church and science as well as modern statements made by church leaders. Finally, the section will take a specific look at Christian fundamentalism to illustrate how it emerged and how fundamentalism and evangelicalism differ from mainline Protestantism and traditional Christianity in their views on evolution.

Bible Content and History of Bible Translations

The driving force behind the opposition to evolution is that it contradicts the biblical accounts of creation in Genesis (Ham, 2013; Hemminger, 2009, Morris, 1961). This section will look at what is actually contained in the Bible and how the Bible texts have been accumulated, edited and translated over time. Subsequently, the chapter will also illuminate how Bible interpretation has historically caused strife between scientists and the church in the past.

The easiest place to begin is in the beginning, i.e. Genesis. Creationists in general and Young Earth Creationists (YEC) place a great amount of importance on the 7 days of creation, referring to Genesis 1–2:4a, but often do not mention the second creation story from Genesis 2:4b–24 (Ham, 2013). Eugenie Scott, an expert on creationism and former executive director of the National Center for Science Education, laid out the differences between the two stories of creation from Genesis 1–2:4a and Genesis 2:4b–24 in her comprehensive book *Evolution vs. Creationism* (2009, p 273):

Tab. 1: Comparison of Creation Stories in Genesis 1 & 2 (Scott, 2009)

Genesis 1–2:4a	Genesis 2:4b–24
(Water and formless Earth)	(Heavens and Earth presupposed)
Light (day 1)	Water (mist)
Firmament (day 2)	Adam
Earth and vegetation (day 3)	Vegetation
Sun, moon and stars (day 4)	Rivers
Fish and birds (day 5)	Land animals, birds (no fish)
Land animals, humans (day 6)	Eve

Scott continues in her book to describe the symbolism of the Genesis story. She quotes theologian, Conrad Hyers, as she describes the differences between the ancient Hebrews and their surrounding tribes. The main difference between the Hebrews and Egyptians or the Babylonians is that they were monotheistic while the other groups were polytheistic. According to Scott and Hyers Genesis was largely meant as a religious statement that their God of Abraham was the one and only true God. As Hyers states, “Each day [of creation] dismisses an additional cluster of deities, arranged in a cosmological and symmetrical order”. Scott summarized spe-

cifically which deities were dismissed on each of the given days of creation, which is shown in the following table (2009, p 61):

Tab. 2: The Allegorical Interpretation of the Genesis Story (Scott, 2009)

Days of Creation: Genesis Chapter 1	Dismissed deity
Day 1: "And God said 'Let there be light'...And God called the light Day, and the darkness He called Night. "	God vanquishes the pagan gods of light and darkness
Day 2: " 'Let there be firmament in the midst of water...'God made the firmament, and divided the waters...And God called the firmament Heaven. "	God displaces the gods of the sky and the seas
Day 3: "And God said: 'Let the waters under the heaven be gathered together unto one place, and let the dry land appear. ... Let the Earth put forth grass, herb yielding seed, and fruit-tree bearing fruit after its kind'... "	God vanquishes Earth gods and the gods which govern the vegetation
Day 4: "And God made the two great lights: the greater light to rule the day, and the lesser light to rule the night; and the stars "	God establishes superiority over sun, moon and stars
Day 5:"And God created the great sea-monsters, and every living creature that creepeth, wherewith the waters swarmed, after its kind, and every winged fowl after its kind; and God saw that it was good."	God removes divinity of the animal kingdom
Day 6: "And God created man in His own image, in the image of God created He him; male and female created He them."	God removes divinity of kings and pharaohs

The importance of discussing whether the Bible was written in order to be interpreted literally is important because this question has been the major claim made by creationists against the teaching of evolution. According to leading YEC and founder of the Creation Museum, Ken Ham, the Genesis story forms the foundation of Christianity – if Genesis were to be lost – Christianity would tumble (2012). While YEC place a tremendous amount of importance on the literal interpretation of Genesis, historically, the Catholic Church also placed an interest in defending a more literal interpretation of the biblical reference to a stationary Earth with a sun

that moved through the heavens in the Bible¹, which was in obvious conflict with the discoveries made by Copernicus in the 17th century. Copernicus' discovery led Galileo to write a letter of support of Copernicusism in 1609 and later provided further support for heliocentrism for which he was put on trial in 1633 for heresy (Finocchiaro, 2009). During this time, Galileo also wrote another letter in 1615 dealing with natural and revealed knowledge and the principle of accommodation (Dixon, 2008). The principle of accommodation was a view also perpetuated by St. Augustine² more than 1000 years before Galileo's birth. St. Augustine in his time, argued against the literal interpretation of biblical texts explaining that the Bible was written in a language that should be understood by relatively uneducated people since this was the characteristic of the mass population at the time that the Bible was revealed to human kind (Dixon, 2008).

According to the principle of accommodation, Genesis does not need to be read as a literal account of the creation of the Earth for it to provide a foundation of the Judeo-Christian belief system that revolves around the concept of a single, almighty, omniscient God. When Genesis is read in this manner, it poses no problems with evolutionary biology, as can be seen by the theistic evolution individuals who are able to maintain their faith while simultaneously able to embrace science (Scott, 2009).

Yet, although Christian men from the 4th and 17th century were able to understand the allegorical value of biblical texts, current believers in a literal interpretation of Genesis and the Bible in general purport that these texts should be interpreted as a description of God's exact actions in the creation of the universe (Ham, 2012; Ham, 2013; Morris, 1961; Morris, 1974). This insistence on a literal interpretation of biblical accounts is the root of the strife between religious and scientific communities (Ham, 2012; Hemminger, 2009). According to Hemminger, once an individual or society has decided that the Genesis story must be understood literally, there will be a conflict with science because science shows that the Genesis story cannot be interpreted as a literal account, which threatens a literalist believer who then sees that the rest of the Bible can also be seen allegorically instead of literally, ultimately leading a person of faith to question the overall existence of a personal God (2009). As Ruse states, the story of Genesis and the Pentateuch are very relevant for Christians, since the first five books of the Old Testament provide the context to explain the importance of Jesus' crucifixion (2005).

¹ These beliefs were based not only on the Genesis account of creation but also upon verses in the Book of Samuel, Psalms and 1 Chronicles that all make reference to an earth that does not move. Again in each of these books the reference to the stationary earth can be understood metaphorically for the mightiness of God. Example: 1 Chronicles 16:30. Fear before him, all the earth: the world also shall be stable, that it be not moved.

² St. Augustine lived from 354 to 430. Other supporters of the principle of accommodation include John Calvin (1509–1564), John Wesley (1703–1791). Not to be confused with St. Thomas Aquinas (1225–1274) who believed that God did not create things in their final state, but rather created them with a potential to develop as he had intended.

The account of Adam and Eve in the Garden of Eden provides the basis for the sinful nature of humans, and as Jesus was crucified, he became the redeemer of all humans, not for their sinful actions, but their sinful nature as described in the Old Testament (Ruse, 2005). This idea of all Scripture being reliant upon the rest has also been described on the creationist website, Creation Expeditions:

Tab. 3: Reasons for a literal reading of the Scripture

All Scripture Stands or Falls Together
All scripture is inspired by God . . ." (2 Tim. 3:16). God does not lie (Titus 1:2, Rom. 3:4). Because God speaks only truth, and all of Scripture is God's Word, (inspired by Him) all of scripture must be true. This belief is the presupposition upon which a Christian reads the Bible. The Bible is authoritative because it is the Word of God and because God's Word is true. It is therefore a most serious matter to suspect the accuracy of the Genesis creation account. If God is not always truthful, it is impossible to be sure when the Bible is telling the truth, and when it is not (or if it is ever accurate at all). If one part is false, then the rest is likewise called into question. Allowing for the possibility that some passage in Scripture could be inaccurate opens the door for an endless barrage of questions as to the legitimacy of every other passage. Finally, the reader will simply jettison any Scripture he finds inconvenient.

So obviously for bible literalists, questioning Genesis is like pulling on a loose thread that could unravel the entire belief in the Bible and thereby cause the entire tower of Christianity to tumble (Ham, 2012; Ham, 2013). Yet, although these believers in a literalist interpretation of the Bible are concerned with teaching scientific theories that contradict their Bible, they do not seem to be aware of the fact that the Bible contradicts itself – and not in a small way (Ehrman, 2005). Moreover, those who are so inclined to believe that the Bible is the direct word of God, given to Moses upon the top of Mount Sinai, or written from personal accounts by the apostles, have forgotten that even if this were true, we are not reading the original texts. Supporters of a literalist interpretation of the Bible seem to be unaware of the process which took place in order to produce the Bibles now available in local bookstores or online.

Bart Ehrman is a distinguished professor of Religious Studies at the University of North Carolina at Chapel Hill and has published a number of books that outline how the New Testament came into being and about the contradictions contained within the New Testament. In his book, *Misquoting Jesus*, he describes how the modern Bible was shaped by mistakes and intentional alterations by those who performed the early copies of the texts (2005). He discusses some of the unintentional changes that occurred simply in the copies made by hand in the early Roman Empire where the illiteracy rate was approximately 90% and how the mistakes were compounded as copies were made of flawed copies. He also de-

scribes that fact that the first copy of Mark is from 200 A.D, 150 years after Mark wrote it, meaning that neither the original nor the early copies are available. Moreover, he points out that all 27 books of the New Testament suffered the same fate, compounded by the problem that even if a scribe found a mistake and tried to correct it, that is still not reproducing the original (Ehrman, 2005).

According to Ehrman, John Mill spent 30 years in the 1700s studying the differences between many copies of the Greek New Testament (100 manuscripts) and that in his printed copy of the New Testament he noted 30,000 places where the manuscripts differed and he only sited the places that he found significant (2005). Currently there are 5700 copies, complete or portions, of the New Testament in Greek (the original language of the New Testament) and it is estimated that there are more differences in the manuscripts than there are words in the New Testament. Ehrman also discusses the intentional mistakes, which do not look like a slip of the pen such as in Mathew 24:36 when Jesus states that no one knows the day or the hour which the end will come “not even the angels of the heaven, nor the Son, but the Father alone” – this phrase could have caused problems about the omniscient character of Jesus and was therefore omitted from future versions (Ehrman, 2005).

In *Jesus, Interrupted*, Ehrman outlines the contradictions that are apparent in the New Testament. One of the clearest examples he gives is the difference in the dates that Jesus is crucified. The Gospel of Mark tells states that Jesus eats Passover dinner with his disciples and is then arrested; he spends the night in jail and is crucified the next morning at nine. The Gospel of John (written 30 years after the Gospel of Mark) also gives an exact time at which Jesus was killed – it states that Jesus is killed on the afternoon before the Passover meal during preparations. Ehrman believes that this is an important difference since John is the only gospel that states that Jesus is the son of God or the “lamb of God” who takes away the sins of the world and that John specifically chose the afternoon during preparations for the Passover meal to be the time of Jesus’ crucifixion since that is precisely when the Passover lambs is sacrificed. Thus, it is obvious that John has changed the historical data in order to make a theological point (Ehrman, 2009)³.

Ehrman suggests that the best way to recognize the discrepancies in the New Testament is to read it horizontally – for instance, by looking at the different accounts of the resurrection from various gospels. Who goes to the tomb? Whom do they see? What does this person tell the women to do? Do they do what they are told to do? If so what do the disciples do? Each gospel has different answers to these questions. Below is a horizontal comparison of the resurrection according to gospels of Mark, Luke, John and Matthew.

³ For more information about Ehrman’s publications, credentials or speaking appointments see <http://www.bartdehrman.com>

Tab. 4: Horizontal comparison of the New Testament (New International Version)

Different accounts of the resurrection of Jesus Christ in the New Testament			
Mark 16	Luke 24	John 20	Matthew 28
<p>Jesus Has Risen 16 When the Sabbath was over, Mary Magdalene, Mary the mother of James, and Salome bought spices so that they might go to anoint Jesus' body. 2 Very early on the first day of the week, just after sunrise, they were on their way to the tomb 3 and they asked each other, "Who will roll the stone away from the entrance of the tomb?"</p> <p>4 But when they looked up, they saw that the stone, which was very large, had been rolled away. 5 As they entered the tomb, they saw a young man dressed in a white robe sitting on the right side, and they were alarmed. 6 "Don't be alarmed," he said. "You are looking for Jesus the Nazarene, who was crucified. He has</p>	<p>Jesus Has Risen 24 On the first day of the week, very early in the morning, the women took the spices they had prepared and went to the tomb. 2 They found the stone rolled away from the tomb, 3 but when they entered, they did not find the body of the Lord Jesus. 4 While they were wondering about this, suddenly two men in clothes that gleamed like lightning stood beside them. 5 In their fright the women bowed down with their faces to the ground, but the men said to them, "Why do you look for the living among the dead? 6 He is not here; he has risen! Remember how he told you, while he was still with you in Galilee: 7 'The Son of Man must be delivered over</p>	<p>The Empty Tomb 20 Early on the first day of the week, while it was still dark, Mary Magdalene went to the tomb and saw that the stone had been removed from the entrance. 2 So she came running to Simon Peter and the other disciple, the one Jesus loved, and said, "They have taken the Lord out of the tomb, and we don't know where they have put him!"</p> <p>3 So Peter and the other disciple started for the tomb. 4 Both were running, but the other disciple outran Peter and reached the tomb first. 5 He bent over and looked in at the strips of linen lying there but did not go in. 6 Then Simon Peter came along behind him and went straight into the tomb. He saw the</p>	<p>Jesus Has Risen 28 After the Sabbath, at dawn on the first day of the week, Mary Magdalene and the other Mary went to look at the tomb. 2 There was a violent earthquake, for an angel of the Lord came down from heaven and, going to the tomb, rolled back the stone and sat on it. 3 His appearance was like lightning, and his clothes were white as snow. 4 The guards were so afraid of him that they shook and became like dead men. 5 The angel said to the women, "Do not be afraid, for I know that you are looking for Jesus, who was crucified. 6 He is not here; he has risen, just as he said. Come and see the place where he lay. 7 Then go quickly and tell his disci-</p>

<p>risen! He is not here. See the place where they laid him. 7 But go, tell his disciples and Peter, 'He is going ahead of you into Galilee. There you will see him, just as he told you.'"</p> <p>8 Trembling and bewildered, the women went out and fled from the tomb. They said nothing to anyone, because they were afraid.</p> <p>Alternate ending: Then they quickly reported all these instructions to those around Peter. After this, Jesus himself also sent out through them from east to west the sacred and imperishable proclamation of eternal salvation. Amen.</p> <p>Mark 16</p>	<p>to the hands of sinners, be crucified and on the third day be raised again.' " 8 Then they remembered his words.</p> <p>9 When they came back from the tomb, they told all these things to the Eleven and to all the others. 10 It was Mary Magdalene, Joanna, Mary the mother of James, and the others with them who told this to the apostles. 11 But they did not believe the women, because their words seemed to them like nonsense. 12 Peter, however, got up and ran to the tomb. Bending over, he saw the strips of linen lying by themselves, and he went away, wondering to himself what had happened.</p> <p>Luke 24</p>	<p>strips of linen lying there, 7 as well as the cloth that had been wrapped around Jesus' head. The cloth was still lying in its place, separate from the linen. 8 Finally the other disciple, who had reached the tomb first, also went inside. He saw and believed. 9 (They still did not understand from Scripture that Jesus had to rise from the dead.) 10 Then the disciples went back to where they were staying.</p> <p>John 20</p>	<p>ples: 'He has risen from the dead and is going ahead of you into Galilee. There you will see him.' Now I have told you."</p> <p>8 So the women hurried away from the tomb, afraid yet filled with joy, and ran to tell his disciples. 9 Suddenly Jesus met them. "Greetings," he said. They came to him, clasped his feet and worshiped him. 10 Then Jesus said to them, "Do not be afraid. Go and tell my brothers to go to Galilee; there they will see me."</p> <p>Matthew 28</p>
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It becomes obvious by comparing these four different account of arguably the most important incidence in Christian belief that there are very large discrepancies within the Bible. This may be not be very surprising for those who do not believe in the literal truth of the Bible – yet it is a main point that could unravel some of the main

accusations made by fundamentalist who are worried that evolution is in contradiction of the Bible, when the Bible severely contradicts itself.

The importance of these differences of course will not directly improve science education in the United States, but in order to increase scientific literacy, one must be able to show that the Bible is not a science textbook. The New Testament was written much more recently than the Old Testament and seeing the discrepancies and contradictions in the New Testament should allow students who believe in the literal meaning of the Bible to begin understand the allegorical nature of the Bible and allow not only students, but teachers and parents to see the danger in such attempts and the illogical claim that scientific education should be based on a creation story from the Old Testament.

Moreover, it should be stressed that an allegorical interpretation does not cause a loss of faith, as many religious leaders and researchers have already discussed the compatibility of religion, faith and science (Gould, 1997; Numbers, 1998; Ruse, 2001; Scott, 2009). And Pope John Paul II clearly stated that the essence of the biblical account of creation lies not in the details of the literal interpretation of the creation of the universe but instead in the understanding of the relationship between man, God and the universe as he said, “The Bible itself speaks to us of the origin of the universe and its makeup, not in order to provide us with a scientific treatise but in order to state the correct relationships of man with God and with the universe. Sacred Scripture wishes simply to declare that the world was created by God, and in order to reach this truth it expresses itself in the terms of the cosmology in use at the time of the writer⁴”.

Historical stances of the church to science and literal reading of the scriptures

As soon as one begins to speak about the conflict between science and religion, many are most aware of the legendary conflicts of the past and the most current debates involving creationism. The most well known historical conflict is the Catholic Church’s condemnation of Galileo Galilei in the 17th century for his support of the heretical Copernican view of heliocentrism (Numbers, 2010). Yet despite accusations of heresy, Galileo still belonged to a category of believers who sought to find harmony between the Bible and knowledge of nature and upheld the importance of the Scripture (Dixon, 2008; Numbers, 2010; Finocchiaro, 2009). In the time since Galileo’s plight almost 400 years ago, the Catholic Church’s view on the matter has changed as Pope John Paul II stated in 1992, “The error of the theologians of the time, when they maintained the centrality of the Earth, was to think that our understanding of the physical world’s structure was, in some way, imposed by the literal

⁴ Scripture and Science: The Path of Scientific Discovery. An Address to the Pontifical Academy of Science, by Pope John Paul II (1981)

sense of Sacred Scripture...⁵”. Yet while the former Pope was able to see the necessity of moving away from a literal interpretation of the Bible and towards an acceptance of scientific discovery, the same questions and issues which were at hand in 1633 in Rome are still on the table today in the United States, namely: how should the bible be interpreted and who is authorized to produce and disseminate knowledge (Dixon, 2008).

What has changed since 1633 is that the battle in Rome was between the Catholic Church and Galileo and current conflict regarding creationism vs. science is perpetuated by conservative Protestants, more specifically evangelical Protestants (Ruse, 2006; Watts, et al., in press). Why this shift has happened, has its roots in the Protestant Reformation, which placed an enormous importance on the scripture and the right for every individual to read the Bible in their own language (Dixon, 2008).

The Ontario Consultants on Religious Tolerance⁶ has provided an overview of the different views taken by the various Christian denominations. Here is a brief summary of that overview:

“Most conservative Protestants believe in the literal truth of the stories of creation found in the book of Genesis in the Hebrew Scriptures (Old Testament). They interpret the Hebrew word ‘Yom’ as implying that creation took six actual 24-hour days. This implies an earth that is less than ten thousand years old. A minority of conservative Protestants, most liberal Protestants, the Roman Catholic Church, and most scientists accept either theistic evolution or naturalistic evolution. Both accept that evolution of the species has happened and that the earth is over 4 billion years of age – some 500,000 times older than young-earth creationists believe. Supporters of theistic evolution believe that God used evolution as a tool to guide the development of the species; supporters of naturalistic evolution believe that evolution was caused by unguided natural processes⁷.”

While the Protestant Reformation placed the importance on the ability of every individual to read the scripture for himself, the Counter-Reformation by the Catholic Church deemed that “no one, relying on his own judgment and distorting the Sacred Scriptures according to his own conceptions, shall dare to interpret them contrary to that sense which Holy Mother Church, to whom it belongs to judge their true sense and meaning, has held and does hold, or even contrary to the unanimous agreement of the Fathers” (Dixon, 2008).

While this statement may seem oppressive, this stance from the Catholic Church may have possibly averted the conflict between the Church and evolution since the stance from the Holy Mother Church has been fairly responsive to evolution within the past decades as largely thanks to Pope John Paul II who stated,

⁵ Faith Can Never Conflict with Reason. An Address to the Pontifical Academy of Sciences, by Pope John Paul II (1992)

⁶ www.religioustolerance.org (Accessed 14 April 2013)

⁷ http://www.religioustolerance.org/ev_school.htm (Accessed 7 April 2013)

“Today, almost half a century after publication of the encyclical, new knowledge has led to the recognition of the theory of evolution as more than a hypothesis. It is indeed remarkable that this theory has been progressively accepted by researchers, following a series of discoveries in various fields of knowledge. The convergence, neither sought nor fabricated, of the results of work that was conducted independently is in itself a significant argument in favor of the theory” (Swanson, 1996). In addition, as H.L. Mencken stated “[The advantage of Catholics] lies in the simple fact that they do not have to decide either for Evolution or against it. Authority has spoken on the subject; hence it puts no burden upon conscience, and may be discussed realistically and without prejudice” (Mencken, 1925).

As will be discussed in the chapter on Creationism and Intelligent Design, many of the motivations behind creationist strategies is to preserve religious belief and the integrity of the Genesis story (Morris, 1974). Yet ironically, it has already been enumerated multiple times that there is no necessary conflict between religious belief and science. As Stephen Jay Gould repeatedly stated, “The lack of conflict between science and religion arises from a lack of overlap between their respective domains of professional expertise – science in the empirical constitution of the universe, and religion in the search for proper ethical values and the spiritual meaning of our lives” (1997, p. 18). Moreover, religious leaders have also specifically said that there does not need to a conflict between religious convictions and the acceptance of scientific discovery, such as Pope Benedict XVI and his predecessor Pope John-Paul II, who have both praised the role of science in the evolution of humanity and acknowledged the strength of the theory of evolution. In fact, Pope Benedict XVI made a very similar statement to Gould when he went so far to declare that evolution a “reality” that is complementary to the Genesis account as he stated, “The story of the dust of the earth and the breath of God, which we just heard, does not in fact explain how human persons come to be but rather what they are. ... And vice versa, the theory of evolution seeks to understand and describe biological developments. ... To that extent we are faced here with two complementary – rather than mutually exclusive – realities” (Ratzinger, 1995).

Now clergymen across America have also banded together to help spread this pro-science message. The result of this national cooperation is an open letter (sometimes referred to as the Clergy Letter), which has already been signed by over 10,000 clergymen from different Christian denominations across America affirming the compatibility of Christian faith and the teaching of evolution (Dixon, 2008). Currently (6 May 2016) there are 13,162 signatures on the Christian clergy letter⁸, which states:

⁸ For more information regarding the Clergy Letter Project, or to find the current status of signatures see <http://www.theclergyletterproject.org/>

**The Clergy Letter – from American Christian Clergy
An Open Letter Concerning Religion and Science**

Within the community of Christian believers there are areas of dispute and disagreement, including the proper way to interpret Holy Scripture. While virtually all Christians take the Bible seriously and hold it to be authoritative in matters of faith and practice, the overwhelming majority do not read the Bible literally, as they would a science textbook. Many of the beloved stories found in the Bible – the Creation, Adam and Eve, Noah and the ark – convey timeless truths about God, human beings, and the proper relationship between Creator and creation expressed in the only form capable of transmitting these truths from generation to generation. Religious truth is of a different order from scientific truth. Its purpose is not to convey scientific information but to transform hearts.

We the undersigned, Christian clergy from many different traditions, believe that the timeless truths of the Bible and the discoveries of modern science may comfortably coexist. We believe that the theory of evolution is a foundational scientific truth, one that has stood up to rigorous scrutiny and upon which much of human knowledge and achievement rests. To reject this truth or to treat it as “one theory among others” is to deliberately embrace scientific ignorance and transmit such ignorance to our children. We believe that among God’s good gifts are human minds capable of critical thought and that the failure to fully employ this gift is a rejection of the will of our Creator. To argue that God’s loving plan of salvation for humanity precludes the full employment of the God-given faculty of reason is to attempt to limit God, an act of hubris. We urge school board members to preserve the integrity of the science curriculum by affirming the teaching of the theory of evolution as a core component of human knowledge. We ask that science remain science and that religion remain religion, two very different, but complementary, forms of truth.

Fig. 1: Clergy Letter – from American Christian Clergy

The clergy letter project (<http://www.theclergyletterproject.org>) now also includes a Rabbi letter, which has been signed by 516 Rabbis as of today (6 May 2016). The Rabbi letter reads as follows:

**The Clergy Letter – from American Rabbis
An Open Letter Concerning Religion and Science**

As rabbis from various branches of Judaism, we the undersigned, urge public school boards to affirm their commitment to the teaching of the science of evolution. Fundamentalists of various traditions, who perceive the science of evolution to be in conflict with their personal religious beliefs, are seeking to influence public school boards to authorize the teaching of creationism. We see this as a breach in the separation of church and state. Those who believe in a literal interpretation of the Biblical account of creation are free to teach their perspective in their homes, religious institutions and parochial schools. To teach it in the public schools would be to assert a particular religious perspective in an environment which is supposed to be free of such indoctrination.

The Bible is the primary source of spiritual inspiration and of values for us and for many others, though not everyone, in our society. It is, however, open to interpretation, with some taking the creation account and other content literally and some preferring a figurative understanding. It is possible to be inspired by the religious teachings of the Bible while not taking a

literalist approach and while accepting the validity of science including the foundational concept of evolution. It is not the role of public schools to indoctrinate students with specific religious beliefs but rather to educate them in the established principles of science and in other subjects of general knowledge.

Fig. 2: The Clergy Letter – from American Rabbis

In reading the letters from both the Christian clergy and the Jewish rabbis, it is obvious that scientists are not the only ones who are concerned about the creationist/intelligent design movement. It is not the Pope or the clergy or the rabbis that are leading the fight against evolution – but instead making an active attempt to support science education free of creationism⁹. Furthermore, the clergy letters in themselves and the fact that they have been willingly signed by so many priests and rabbis highlight the fact that this problem is not a broad problem between religion and science. It is clear that the main goal of the religious leaders is to teach their followers about the nature of their chosen God, while the primary goal of scientist is to understand the natural world around them.

So where did the impetus for battles originate if it has not been instigated by the church or the clergy? Why is there so much motivation to have a science class be taught according to principles found in a book, which was so clearly not meant to be read in such a manner? As mentioned above, the Bible was meant to teach fairly illiterate individuals about the character of the Judeo-Christian God. It was copied several thousand times by hand and is wrought with mistakes through transcription and translation. The various scriptures contain conflicting descriptions of one of the most crucial points in Christianity, i.e. Jesus' crucifixion and resurrection. So why, if the Bible was obviously not meant to be read literally are there individuals in the 20th and 21st century in one of the most industrialized nations in the world claiming that it should be used as the basis for an alternative theory to evolution in science classrooms?

The answer can be found in the second line of the Clergy Letter by the American Rabbis, as they state, "Fundamentalists of various traditions, who perceive the science of evolution to be in conflict with their personal religious beliefs, are seeking to influence public school boards to authorize the teaching of creationism". Here the rabbis make the clear distinction that this is not a general religious pursuit or a Christian or a Protestant pursuit, but instead, a goal clearly perpetuated by a group of fundamentalist. So what are fundamentalists exactly? And how do they differ from those who are very pious or have strong religious beliefs?

⁹ For more information about the clergy letter project, please visit their website at <http://www.theclergyletterproject.org>

Fundamentalism

By understanding the difference between religion and fundamentalism it is possible to understand how the creationist movement began and gained momentum. As will be discussed in the chapter, Creationism and Intelligent Design, these movements have been phenomena of the 20th and 21st century.

There was not an immediate reaction to the theory of evolution, which would have been expected if it were a universal and organic conflict between religion and science or Christianity and evolution (Scott, 2009). Yet the thinking in the 50 years after Darwin's publication was marked with much more flexibility than what is seen today (Hemminger, 2009; Ruse, 2003). Over 100 years ago, in 1893, the evangelical theologian, Henry Drummond, showed an enormous amount of flexibility of thought when he addressed the question of the proper Christian attitude towards evolution and stated that a miracle was not necessarily something that happened quickly, but rather God's miraculous work could be seen in the slow process of evolution and that the final result of evolution was Love" (Dixon, 2008).

So to begin, it is important to establish a working definition of the difference between religion and fundamentalism. The terms religion, faith and fundamentalism, are defined by the Oxford dictionary as follows

Religion: (noun) 1. The belief in and worship of a superhuman controlling power, especially a personal God or gods. 2. A particular system of faith and worship. 3. A pursuit or interest followed with great devotion.

Faith: (noun) 1. Complete trust or confidence in someone or something. 2. Strong belief in the doctrines of a religion, based on spiritual conviction rather than proof.

Fundamentalism: (noun) 1. A form of a religion, especially Islam or Protestant Christianity, that upholds belief in the strict, literal interpretation of scripture: Modern Christian fundamentalism arose from American millenarian sects of the 19th century, and has become associated with reaction against social and political liberalism and rejection of the theory of evolution.

From these definitions, it is obvious that religion and faith alone could not cause a "war" against science or evolution. In fact, Ronald Numbers has stated that the greatest myth is that science and religion have been in a constant state of struggle (2009). The struggle can, therefore, not be understood as a conflict between science and religion but instead caused by a specific belief in the strict and literal interpretation of the Bible that causes the conflict with evolution (Ruse, 2000; Ruse, 2006). As Eugenie Scott described it, fundamentalism¹⁰ "formed the basis in the United States for the antievolutionism of the 1920s Scopes era as well as the present day" (2009).

¹⁰ Scott also uses the definition fundamentalism to be "a Protestant view that stresses the inerrancy of the Bible." page 94

So where did this concept of Bible literalism originate? Trawling the internet and skimming through stacks of books, one will come across multiple theories and explanations of the origin of Christian fundamentalism. Here is a brief overview in reverse chronological order.

Origins of Christian Fundamentalism

Eugenie Scott marks the beginning of fundamentalism within American Protestantism with the organized movement in the early 1900s, which was responsible for the publication of a series of small series of booklets called (very fittingly) *The Fundamentals* (Scott, 2009). Christian Fundamentalism can thus be said to have begun as a systematic theology by the 1920s within the Protestant churches. As Scott states, the Fundamentalists stressed: (1) the inerrancy of Scripture (2) the Virgin Birth of Christ (3) Christ's atonement for our sins on the cross (4) his bodily resurrection and (5) the objective reality of his miracles¹¹ (2009). But if one looks at an essay from these booklets, like the one entitled *A Testimony to the Truth*, it is aimed at defending Protestant orthodoxy while attacking such topics as higher criticism, liberal theology, socialism, modern philosophy, atheism, Catholicism and evolutionism, which means that although the American Protestant fundamentalism had its official beginning in the early 20th century the roots go much farther back in time, often as a reaction to progress. It is important to look at how and why this American Protestant fundamentalism developed because its enlargement is fueled mostly in a reaction-based manner against intellectual progress. Thus, by understanding what fundamentalism is trying to defend against, it is possible to see the implications of what would occur if the fundamentals were ever successful in reaching their goals.

In the chapter, *American History*, much of the conditions in the United States are explained that would allow or encourage the growth of a fundamentalist movement. This section will look more generally at the movements and concepts that caused the fundamentalist reaction, namely enlightenment, higher criticism and liberal theology.

The Age of Enlightenment is said to have started at around 1650, sparked by publications from intellectuals like Rene Descartes, John Locke, Isaac Newton, Voltaire and Baruch Spinoza. The purpose of this cultural movement was to renovate the fabric of society using reason and to increase knowledge using the scientific method. It was a time where skepticism was supported and superstition and beliefs based on tradition or faith alone were confronted (Ruse, 2015). It was also a time in which the abuses by the state and the church were to be overturned. For this reason, the Age of Enlightenment is often held in high esteem and seen as a positive trend in human history. Yet for the religious right, the Age of Enlighten-

¹¹ Eugenie Scott used this as part of a quote from Armstrong, Karen. 2000. *The battle for God: A history of fundamentalism*. New York: Ballantine Books. Page 171

ment threatened to sink the Christian faith as it spawned ideas such as higher criticism and liberal theology (Orr, 1910).

Higher criticism is a branch of literary criticism which analyzes ancient texts in order to understand “the world behind the text” (Ehrman, 2009; Soulen, 2001) and it is based on the idea of rationalism – a belief or theory that opinions and actions should be based on reason and knowledge rather than on religious belief or emotional response. Modern rationalism was brought about by the some of the same men who drove the Age of Enlightenment, namely Descartes and Spinoza. Spinoza himself is credited with being one of the first to apply this type of rational literary criticism to the Bible (Durant, 1926). Yet, the term higher criticism is most often linked to the German scholars like Schleiermacher and Feuerbach, who in the mid-19th century analyzed the historical records of the Middle East from Christian and Old Testament eras in an attempt to find independent confirmation of events stated in the Bible (Everett, 1988). The fact that higher criticism was associated with German scholars helped fuel the fundamentalist movement in America in the 1920s since the Germans had become equated with evil (Wacker, 2000) . As Grant Wacker describes it:

Social changes of the early twentieth century also fed the flames of protest. Drawn primarily from ranks of “old stock whites”, Fundamentalists felt displaced by the waves of non-Protestant immigrants from southern and eastern Europe flooding America’s cities. They believed they had been betrayed by American statesmen who led the nation into an unresolved war with Germany, the cradle of destructive biblical criticism. They deplored the teaching of evolution in public schools, which they paid for with their taxes, and resented the elitism of professional educators who seemed often to scorn the values of traditional Christian families (Wacker, 2000).

Higher criticism in itself probably would not have been a problem for fundamentalists or provided fuel for their movement if the scholars had found data that had in fact corroborated the events described in the Bible. Yet, they instead found data that threatened the inerrancy of the biblical accounts and for that reason higher criticism is seen as an attack on Christian faith as described by creationism.org:

In keeping with this skeptical view, secular and liberal Bible scholars have developed a highly inferential, analytic approach to the biblical text that is called “higher criticism”. Among the fruits of this line of inquiry is a long list of textual difficulties and alleged discrepancies along with suggestions as to the motives, lack of information, education etc. which led the writer to err. Often the above analysis is followed by plausible hypotheses as to what really occurred historically. Many a Christian believer has been troubled by such analyses, and not a few have abandoned their faith commitment to the inerrancy of Scripture as a result thereof. (Ackerman, 1983)

Higher criticism is strongly linked to liberal theology in that it begins to look at the Bible as a historical document and not a direct message from an almighty God. Friedrich Schleiermacher, for instance, was one of the German scholars responsible for developing higher criticism and he is also seen as the “Father of Modern Liberal Theology”. Liberal theology or sometimes known as liberal¹² Christianity is an important and interesting concept. Liberal theology, like higher criticism, was another by-product of enlightenment, meaning “liberalism” embraced the methodologies of enlightenment science as the basis for interpreting the Bible, life, faith and theology, which leads liberal interpretation of the Bible to see Jesus’ miracles as metaphorical narratives (Brandom, 2000). The Catholic Encyclopedia describes liberalism as such:

“Since the end of the eighteenth century, however, [liberalism] has been applied more and more to certain tendencies in the intellectual, religious, political, and economical life, which implied a partial or total emancipation of man from the supernatural, moral, and Divine order. Usually, the principles of 1789, that is of the French Revolution, are considered as the Magna Charta of this new form of Liberalism. The most fundamental principle asserts an absolute and unrestrained freedom of thought, religion, conscience, creed, speech, press, and politics. The necessary consequences of this are, on the one hand, the abolition of the Divine right and of every kind of authority derived from God...” (Gruber, 1910)

The Catholic Encyclopedia goes on to state that the danger of liberalism lies therein that: “By proclaiming man’s absolute autonomy in the intellectual, moral and social order, Liberalism denies, at least practically, God and supernatural religion. If carried out logically, it leads even to a theoretical denial of God, by putting deified mankind in place of” (Gruber, 1910). According to historian John Buescher, liberalism is what truly initiated the fundamentalist movement in the United States. As he states:

Fundamentalism, in the narrowest meaning of the term, was a movement that began in the late 19th- and early 20th-century within American Protestant circles to defend the “fundamentals of belief” against the corrosive effects of liberalism that had grown within the ranks of Protestantism itself. Liberalism, manifested in critical approaches to the Bible that relied on purely natural assumptions, or that framed Christianity as a purely natural or human phenomenon that could be explained scientifically, presented a challenge to traditional belief...A multi-volume group of essays edited by Reuben Torrey, and published in 1910 under the title, *The Fundamentals*, was financed and distributed by Presbyterian laymen Lyman and Milton Stewart and was an attempt to arrest the drift of Protestant belief¹³.

¹² Liberal here is not to be confused with “Progressive Christianity” or any particular political direction.

¹³ Buescher, John. “A History of Fundamentalism”. Teaching History <http://teachinghistory.org/history-content/ask-a-historian/24092> (Accessed 22 July 2014).

So it can be conferred that fundamentalism began as a reaction to enlightened thought and methods, in particular higher criticism and liberal theology. Yet if one goes back to the definitions of fundamentalism, there is a mention of the adherence to strict doctrines, a literalist view of biblical accounts and a belief in the inerrancy of the Bible itself. These points are necessary for fundamentalism and necessary ingredients in anti-evolution sentiments. Yet the first part of this section has already shown that these concepts are not propagated by the authors of the Bible nor by the leaders of the Church. So where did these concepts of Bible inerrancy originate from?

The Inerrant Bible

The ideas of an inerrant and infallible Bible appeared after the concepts of liberal theology, during the late 19th century as a part of the fundamentalist reaction to liberalism and rationalist thought. Benjamin B. Warfield, one of the authors of *The Fundamentals*, is credited with the advancement of Bible inerrancy (Orr et al., 1910). So much so that the blurb on the 2008 reprint of Warfield's essays reads: "B. B. Warfield's volume on divine revelation and biblical inspiration defined the parameters of the twentieth century understanding of biblical infallibility, inerrancy, and the trustworthiness and authority of Scripture. He pioneered a view of biblical inspiration and authority which remains widely held today by many Reformed and evangelical Christians" (Warfield, 1927). Ironically although Warfield advanced the concepts of Bible inerrancy and infallibility, prerequisites for the fundamentalism at the root of the creationism/evolution debate, Warfield actually wrote about Darwin and evolution his 1889 review of *The Life and Letters of Charles Darwin* and stated "There have been many evolutionists who have been and have remained theists and Christians" (Noll, 1983).

Thus one can say that not only did the true fundamentalist group have its original beginnings in the United States in the 1920s, and that the origin and advancement of the concept of Bible inerrancy was also home grown in the United States and is not inherent to Christianity itself (Ruse, 2006). The concept of an inerrant and infallible Bible not only originated in the United States but also continues to flourish there, as it is perpetuated by influential authors such as Henry Morris (Morris, 1961; Morris, 1974). The centrality of this idea in the United States, especially during the 1970s and 1980s is also apparent in the fact that The International Council on Biblical Inerrancy (ICBI) was established in the United States 1977 "to clarify and defend the doctrine of biblical inerrancy" (ICBI, 1986). In addition, in 1978 they published the Chicago Statement on Bible Inerrancy in which they stated:

"The authority of Scripture is a key issue for the Christian Church in this and every age. Those who profess faith in Jesus Christ as Lord and Savior are called to show the reality of their discipleship by humbly and faithfully obeying God's written Word. To stray from Scripture in faith or conduct is disloyalty to our Master.

Recognition of the total truth and trustworthiness of Holy Scripture is essential to a full grasp and adequate confession of its authority. The following Statement affirms this inerrancy of Scripture afresh, making clear our understanding of it and warning against its denial.”

Therefore, it is apparent that fundamentalism is in essence as a backlash of enlightenment: Enlightenment brought about rational thinking, this rational manner of analysis was applied to the Bible and the theological community revolted. As George M. Marsden, describes it, fundamentalism demands a strict adherence to orthodox theological doctrines and is usually understood as a reaction to modernist theology (1980). This revolt included the development of strict adherence to the principles of an inerrant Bible that is to be read as the literal word of God. It is also clear that although the fundamentalists base their beliefs on the same religious texts as traditional religious groups, they can truly be seen as independent from any traditional religious group due to their views regarding the infallibility and inerrancy of the Bible.

Summary

In this section, evidence was found to corroborate the statements made by Gould and Ruse, that there is not a universal conflict between religion and science or Christianity and evolution. It could be shown that the anti-evolution movement is not led by the church or the clergy, but in fact that the leaders of the organized churches support the teaching of evolution and are concerned about the trend towards fundamentalism within Christianity. Moreover, it could be shown that the Bible was not intended to be used as a literal handbook to understand how the world was created and that this fact has been acknowledged by Christian leaders since the 4th century.

Furthermore, it could be shown that religious belief does not necessarily lead to creationist views but rather that creationist views require the presence of evangelical fundamentalist beliefs in the literal interpretation of the Bible. By illustrating that fundamentalism is a reactionary movement, moving away from ideas of enlightenment and rationalism and towards biblical authority, this section provided the reader with a clearer picture of where society would be headed if the fundamentalists were allowed to take the steering wheel when it comes to deciding the direction of the American education system, i.e. away from rational and individual thought, away from enlightened thinking and scientific methodology.

The next section on American History will explain why American soil was the perfect garden to grow this strain evangelical fundamentalism and why there are so many supporters of this fundamentalist movement in the US. Subsequent chapters will then show the effects of this evangelical population, especially in *Examining the Legal Conflict*, which will describe the many battles that have been fought in an attempt to get evolution out of the science classroom and replace it with “science” according to the Bible as an attempt made by evangelical fundamentalism to discredit evolution.

American History: understanding the growth of evangelicalism in the United States

Creationism is a homegrown phenomenon of American sociocultural history— Stephen Jay Gould (1997)

Creationism and Intelligent Design are particularly popular in America (Humes, 2007; Gould, 1997; Numbers, 1998). In fact, roughly half of the general population harbors significant sympathy for creationism, while 25% is actually fundamentally opposed to evolution (Matzke, 2010). When Stephen Jay Gould was interviewed by the New York Times about creationism, he was asked: “Is creationism a uniquely American phenomenon?” And Gould answered, “That’s not hard to see. It just doesn’t happen any place else in the Western world. Europeans just don’t get why we have it. There are two things that European intellectuals don’t understand about Americans, I find. One was Bill and Monica, or, our obsession with it. The second is how you can possibly have an anti-evolution movement in a modern scientific country” (Dreifus, 1999).

This chapter will illustrate that the appearance and success of this creationist movement in the United States is a logical consequence of the country’s history, culture and particularly their perspective on their role as a country. This country and the American people have hundreds of years of identity passed on generation for generation saying that America is a holy land, as Stephen Prothero explains, “This is this great conversation we’ve had from the very beginning of American life. We’ve had this notion that this is a special place, and what makes it special is that we have some kind of special relationship with God” (Prothero, 2012d). This belief in America as a holy land provided the basis for fundamentalist and evangelicals to rise to power in the United States in order to protect this idea of America’s special relationship to God. Evolution questioned the role of God in the creation of humans and this is a particularly bitter pill for the large population of evangelicals in the United States who place a large amount of importance on their personal relationship to God (Diner, 2012).

So this chapter will not focus on the general history of the United States but will particularly examine how evangelical Protestantism became so rampant in America. It will also take a detailed look at the creation of the Constitution and the legal framework that was created to protect the separation of church and state. These are the two most important aspects of American history for this thesis, since it is the evangelical Protestantism that is the driving force behind creationist actions and it is the Constitution that is used as a basis for all judgments concerning the teaching of Creationism in public school classrooms.

This chapter will follow the chronological order in which the colonies were formed and which ideas were brought to America by European settlers. Furthermore, a particular focus will be placed on the religious zeal of the American citi-

zens and the rational framework of a democratic republic that emphasizes freedom of religion has contributed to a dichotomy of beliefs still present today in American society.

The Colonization of America 1492 to 1776: Puritans, Quakers and the Great Awakening

The polarity of the American society may have its earliest roots in the ideas that were brought over by the very different settlers who came to live in the colonies and their motivations for wanting to come to “The New World”. There were many driving forces that brought the settlers to North America in the 15th, 16th, 17th and 18th centuries. This was a time of change all around the globe – not only was the world changing geographically with the newly discovered Americas (1492) but it was also a time of many revolutions in the intellectual, cultural and religious planes. And as humankind began to rediscover itself, a new country was being formed based on these new discoveries. The period of colonization and settlement of what is now the United States was also the time of the Protestant Reformation (16th century), the Scientific Revolution (mid-16th century to the end of the 18th century), and the Age of Enlightenment (17th and 18th century).

Each of these movements also led to new trends in the same way that the emphasis on rationalism from the Age of Enlightenment gave birth to concepts like Bible criticism. During these centuries, there was also an increase in literacy and access to information, which was bolstered by the invention of the printing press and greater availability of printed materials meaning that new ideas could be disseminated and shared much easier than before. Unfortunately, it was also a time scarred by war and conflict. These conflicts gave the incentive for Europeans to set out across the Atlantic to the Americas and to bring with them a great desire for liberty.

To begin, this section will look at how the events in Europe eventually led many Europeans to leave the Old World and how this movement of large masses of individuals with common belief systems affected the growth of America. To begin: a look at the Protestant Reformation. The Protestant Reformation had broken up the unity of the Christian world beginning in 1517 with Martin Luther’s ninety-five theses and created the beginning of new national Protestant churches. The Reformation, according to Max Weber, had a great effect not only on religious beliefs but also upon work ethic and general views about one’s role in society as he describes that even the most mundane professions gained meaning as they added to the common good and thus blessed by God (Weber, 1905).

The Reformation also led to the Puritan movement as many people in England began to question the organization of the Church of England and believed that the King was not doing enough to cleanse the Church of England of Catholicism (Miller, 1966). It was during this time, America became a beacon for the Puritans in Europe and many Puritans began to try to escape the repression from

England as they flocked to the US in great numbers hoping of being able to practice their beliefs there freely (Prothero, 2012a). As part of the great migration, 21,000 Puritans migrated and established colonies between 1628 and 1640 (Miller, 1966).

“In the eyes of the Puritan leaders the settlement of New England appeared to be the most significant act of human history since Christ bade farewell to His disciples...An entire community living as God had directed men to live – this was the vision that impelled thousands of people to cross the Atlantic” (Miller, 1966). According to Stephen Prothero,¹⁴ the Puritans brought with them a story that told them that they had left Europe in order to remake Christianity and to remake the world (2012a). It gave them a sense that they were the chosen people with a special purpose. Max Weber further argues that the Puritans, in particular, affected the work ethic and economic system through their religious views in the United States (1905).

In 1630, the Winthrop Fleet brought 11 ships with over 1000 Puritans to Massachusetts. It was during this voyage that Winthrop led a sermon upon his ship entitled “A Model of Christian Charity”. This sermon contained the idea that they were en route to create a new society, “a city on a hill” (Belton, 2012a). The concept of a city on a hill comes from Jesus’ Sermon on the Mount in Matthew 5:14, “You are the light of the world. A city that is set on a hill cannot be hidden”. This phrase, “city on a hill” has been repeated throughout the rest of American history and this idea would later feed the idea of American exceptionalism (Prothero, 2012a).

Quakerism is a sect of Christianity that came into being during the English Civil War (1642–1651) also as part of the Protestant Reformation. Although they, too, were greatly influenced by the Reformation, they are very different from Puritans in their belief about the Bible. While the Puritans wanted to bring Christianity back to its purist form based on the Bible, the Quakers attempted to remove all intermediaries between God and his people (Miller, 1966). They were important members of the establishment of eight English colonies in North America and William Penn was one of their strongest leaders as he established West Jersey, Delaware and Pennsylvania with the plight of the Quakers in mind and hoped that he would be able to “reproduce true primitive Christianity” (Miller, 1966). For the Quakers these establishments were like a “Holy Experiment” much like the concept of a “city on a hill” in New England (Barbour and Frost, 1988).

Not only did the Puritans and the Quakers play a major role in the colonization of the United States, but they also introduced ideas into American society that would become increasingly important in the movement towards evangelical fundamentalism in the United States. The Puritans on the one hand brought this strong belief of the importance of the strict adherence to the Bible which can later

¹⁴ Stephen Prothero is a professor of Religion at Boston College. This statement was taken from an interview by PBS.

be seen in the attachment to the literal interpretation of the Bible and the Quakers were some of the first who really promoted this idea of a direct relationship between God and man without the necessity of intermediaries such as the church.

During this same period of time, approximately 1650, the Age of Enlightenment blossomed. The purpose of this cultural movement was to renovate the fabric of society using reason and to increase knowledge using the scientific method and this movement was closely related to the Scientific Revolution (Ruse, 2015). It was a time where skepticism was supported and superstition and beliefs based on tradition or faith alone were confronted (Ruse, 2015). In fact, it can be said that ruling out the supernatural and as a causal agent was the cornerstone of the Age of Enlightenment (Humes, 2007).

How did Enlightenment affect American history? During the Age of Enlightenment, there was great emphasis on rationality, liberty, democracy, republicanism¹⁵, freedom of speech and religious tolerance that was greatly popular in the United States. In fact, the effects of the Age of Enlightenment were so profound on the thinking of the American leaders, that the term “American Enlightenment” is generally used to describe the political evolution in American history that led to the revolt against Great Britain and the creation of a modern republic (Sage, 2012). The official Declaration of Independence was adopted in 1776 and is most well known by its second sentence: “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights that among these are Life, Liberty and the pursuit of Happiness.” If one looks more closely at the less known portions, the influence of enlightened ideas is clear: the representatives used a long list of grievances to rationally explain why they have the right to declare their independence from the British Empire. A full transcription of the Declaration of Independence can be found in the list of appendices.

While the Age of Enlightenment was in full bloom and the popularity of reason was high, there was another movement present in the United States in the 1730s and 40s that was known as the Great Awakening. The Great Awakening was an evangelical movement that resulted from powerful sermons that gave the listeners a sense of a deep and personal relationship to their Lord Jesus Christ and emphasized the need for personal salvation and it fostered a deep sense of spiritual conviction and a commitment to personal morality (Kidd, 2007). For instance, it was during this time (1739) that Reverend George Whitefield began his preaching tour of the American colonies. According to Christianity Today, Whitefield was “probably the most famous religious figure of the eighteenth century”¹⁶. Accord-

¹⁵ Republicanism is the political values system that stresses liberty and “unalienable rights”.

¹⁶ Christianity Today regarding Whitefield:

<http://www.christianitytoday.com/ch/131christians/evangelistsandapologists/whitefield.html>
(Accessed 6 August 2013).

ing to Stephen Marini¹⁷, Whitefield had experienced a spiritual rebirth as he liked to call it, which was a transformation of the soul by the Holy Spirit of God, which brought back “this perennial radical Protestant idea of immediate connection between God and the individual human soul” (2012). Whitefield ignored denominational lines and preached to anyone who would hear his message and there were many Americans interested in this message (Belton, 2012a). According to the God in America series Whitefield traveled 5000 miles in 1740, gave 350 sermons and within 15 months, a quarter of the country had heard him speak¹⁸. Moreover, according to Christianity Today, in his lifetime he gave 18000 sermons and spoke to over 10 million people¹⁹.

Although the idea of rebirth was popular among the people, it was a challenge to the authority of the established churches and this wide spread concept of “re-birth” changed face of religion in America (Belton, 2012a). People began to resist the authority of organized churches, insisting that it is their right to worship in the manner that they choose, as Marini describes, “If I’m being presented with multiple options, surely I must have the right to choose among them. It’s not self-evident which one of these is true. And if God’s spirit speaks to me through one of them, the state has no standing in telling me I shouldn’t or I couldn’t. The spirit is the absolute empowerment of my individuality. So my individual choice is not just an option, it is a divinely mandated course of action” (2012).

This period of religious liberty and zeal in America occurred during the period of American Enlightenment which as discussed earlier led to the Declaration of Independence of America and ultimately to the Revolutionary War against England. The combination, though, of these enlightened political ideas about liberty, combined with the religious zeal among the American’s gave way to the idea that the war against England was not only inevitable and logical but now it was also righteous crusade according to Prothero and Marini (2012a). This movement towards religious zeal and the belief in the righteousness of American liberty became a foundation for an American culture that would provide fertile grounds for fundamentalist developments.

Turn of the 18th Century: The Creation of the United States of America as an Independent Country (1776) and the Second Great Awakening

The United States of America declared independence from British Empire on July 4 1776 and became recognized as an independent country in 1783 after the conclusion of the American Revolutionary War. Once the United States of America had received its freedom from England, the Founding Fathers had a unique opportunity

¹⁷ Stephen Marini is a professor of Christian Studies and a professor of Religion. He is also an academic and public interpreter of religion in American history in the Colonial, Revolutionary, and Early National periods.

¹⁸ PBS’ God in America series can be viewed online at <http://www.pbs.org/godinamerica>

¹⁹ Christianity Today regarding Whitefield: Ibid

to create a new nation in a manner that could rectify all of the problems that they had seen in the Old World and along with in a new identity and story for this nation (Winner, 2012). This concept of creating a new nation had already existed since the first ships landed in the New World as discussed in the previous section about the period of colonization, but now, the Founding Fathers had a chance to create documents and frameworks that would shape the government and determine how laws would be enacted for many centuries to come (Belton, 2012b). These documents that they created are particularly important for the legal battle between evolution and Creationism since the legal decisions are based on the constitutionality of actions taken by the state, school board, teacher etc. and the wording of these documents have upheld science education in all of the Supreme Court cases.

The Founding Fathers created the Constitution of the United States to establish the manner in which the new nation should be governed. It established the separation of powers: executive, legislative and judiciary and also framed the doctrines of federalism. The Constitution was adopted in 1787 and went into effect in 1789. The preamble of the Constitution allows readers to quickly recognize the intentions of the Founding Fathers:

We the People of the United States, in Order to form a more perfect Union, establish Justice, insure domestic Tranquility, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our Posterity, do ordain and establish this Constitution for the United States of America.

Yet while the Constitution created a strong central government, the original document did not include any protection of individual rights. Thomas Jefferson believed that individual rights should be protected and part of the Constitution. Moreover, in 1789 a Bill of Rights, which is the name given to the first ten amendments to the Constitution, was proposed by Congress. The purpose of these amendments was intended to prevent Congress from abusing its given legislative power. The first amendment was ratified in 1791. The first amendment protects American citizens' right of freedom of religion, freedom of speech, freedom of press and freedom of assembly. This is the amendment most quoted and pivotal in all of the creationism/evolution court cases. It states:

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances.

This simple statement was one of the earliest official proclamations of full religious freedom in the world (Belton, 2012b). Yet although it guaranteed that Congress would not establish any laws in favor of or in repression of a certain religion, it was not until Jefferson's presidency that he described the first amendment as being a "wall of separation" between church and state. This description originates from a letter he wrote in 1802 regarding the First Amendment and it is wording from this

letter that is often quoted when the vagueness of the First Amendment causes issue in legal cases. In his letter, Jefferson²⁰ stated:

Believing with you that religion is a matter which lies solely between Man & his God, that he owes account to none other for his faith or his worship, that the legitimate powers of government reach actions only, & not opinions, I contemplate with sovereign reverence that act of the whole American people which declared that their legislature should 'make no law respecting an establishment of religion, or prohibiting the free exercise thereof,' thus building a wall of separation between Church and State. — Thomas Jefferson to Danbury Baptist Association 1802.

The understanding of this separation of church and state and the extent of this separation is crucial for the evolution/creationist conflict and the wording of the Constitution will therefore be discussed in more detail in the chapter Examining the Legal Conflict. As will be discussed in the following chapters the wording of this amendment is a crucial basis for the rulings made in all of the legal disputes involving the teaching of Creationism or creationist agendas in public schools. The first part of the amendment about religious freedom is often broken down into two different clauses known as the Establishment Clause and the Free Exercise Clause in order to clearly distinguish the two sides of religious freedom. This two-prong nature of the freedom of religion clause will be discussed in detail in the chapter on Examining the Legal Conflict.

Just after the conclusion of the American Revolution, there was a new Awakening within America. The Second Great Awakening began around 1790 as a revival movement within the Protestant population of the United States. The Second Great Awakening was characterized by enthusiasm, emotion and appeal to the supernatural while rejecting the rationalism of the Age of Enlightenment (Smith, 1957). The movement focused on establishing social reforms that would rid society of evils before the anticipated Second Coming of Jesus Christ and was led by Baptist and Methodist preachers and as membership rose within these congregations, the movement began to gain momentum as the 1800s began (Smith, 1957).

19th Century: New Frontiers, Revivals, Darwin and the Civil War

By the end of the 1700s, the basic framework for the governing laws for the United States had been created. This framework, which was based on groundbreaking ideas for its time, was created in a relatively small country. The first national census was dictated by Article 1, Section 2 of the Constitution and enumerated the American population to be only 3,929,214 in 1790. After this point the country's population

²⁰ Interestingly, Thomas Jefferson even went on to amend the New Testament and create the Jefferson Bible which omitted all of the miracles and mention of the supernatural. He kept the passages describing the teaching of Jesus Christ but removed passages such as the Resurrection.

would continue to grow rapidly and all growth that would take place upon this canvas of laws that the Founding Fathers had created. What was once new, would become the standard for every immigrant and child born in the United States after this point. The 1800s were an interesting century in regard of the political development in the United States. It was a period of growth and change. At the beginning of the 1800s, the United States consisted of only 16 states and an entire population of 5,308,483. By the end of the 1800s, there would be 45 states and a population of 76,212,168. Simultaneously, the first half of the century was marked by the Second Great Awakening that emphasized the Second Coming of Christ and revival culture. This century was a time of great expansion, discovery, new orientation and upheaval.

According to *A New Eden*, by the turn of the century, the western frontier offered American colonist so many new opportunities that hundreds of wagons were leaving every day for the new western colonies (2012). The frontier offered new opportunities but also great isolation and thus the new nation was seen as being in mortal danger as fewer Americans were attending church than before the Revolution (PBS, 2012). In the absence of religious authority, the Bible was being read at face value by fairly uneducated individuals (Matzke, 2010). There were very few churches and instead revivals began to dominate as the religious gatherings of the west (Belton, 2012b).

These revivals, which simply took place in clearings in the woods, were part of the Second Great Awakening and drew great crowds (Smith, 1957). The revival in Cane Ridge, for example, drew masses of 20,000 people in 1801 (*A New Eden*, 2012). Charismatic ministers warned the crowds of the new nation's spiritual crisis, as Lyerly describes it, "They have a sense of urgency in trying to bring people to Christ because they're not just saving them, they're saving the nation, as well" (2012). Revivals became increased exponentially all over the union and by 1811 more than 1,000,000 Americans were visiting at least one religious revival per year (*A New Eden*, 2012). The Methodists, who led the way through the Second Great Awakening, also organized circuits with traveling ministers, known as circuit riders, which was a perfect solution for the frontier lifestyle and these preachers had access to many more people than a traditional preacher who stayed at one local church leading to rapid conversions (Smith, 1957; Lyerly, 2012).

According to *A New Eden*, the religious landscape of the United States had been transformed by the mid-1800s. While there had been 15,000 Methodist at the time of the Revolution, there were now more than 1 million (2012). More Americans were attending sermons than ever before and two-thirds of them were evangelical Protestants (*New Eden*, 2012). It was during this same time that multiple religious sects began popping up in the United States such as the Shakers, the Mormons, the Jehovah Witnesses and the Seventh-Day Adventists. Baptist preacher William Miller announced the Second Coming of Christ would occur on October 22, 1844, further adding to the religious fervor of the United States dur-

ing this time. The northeastern part of America during this time was such a hot-bed of revival that upstate New York was dubbed the “burned-over district,” referring to the fact that evangelists had exhausted the region’s supply of unconverted people²¹. As the evangelical revival hit its peak in 1850, Darwin was on the opposite side of the world getting ready to publish his book *On the Origin of Species*.

In 1859, the year that Darwin published his *Origin of Species*, the United States was still an incomplete nation. 1859 marked the year that Oregon would be made the 33rd state of the union. Suddenly in a country that was still forming, the newly reborn Protestants were confronted by scientific facts and discoveries that challenged the core concept of the perspicacity of Scripture. Only four months after the publication of Darwin’s *Origin, Essays and Reviews* appeared on the shelves, *Essays and Reviews* was written by seven theologians who incorporated the historical criticism of Christian doctrine into seven essays providing another blow to evangelical beliefs. *Essays* sold over 22,000 copies in its first two years, more than *Origin* sold in its first twenty years (Desmond & Moore, 1991). The authors of the book were threatened with ecclesiastical courts. Charles Darwin and Charles Lyell joined other intellects in the signing of a letter supporting *Essays* for trying to “establish religious teaching on a firmer and broader foundation” (Desmond & Moore, 1991). Two years later the idea of a 6000-year-old Earth was crushed by Lord Kelvin who estimated the Earth to be between 20 and 40 million years old.

However, while the men of Great Britain were busy publishing books that affected the intellectual and religious landscapes of the American mind, the political landscape was crumbling in the United States as they entered the Civil War. Prior to the actual war the Baptist, Methodist and Presbyterian churches had already divided into northern and southern denominations over the question of slavery and marked early signs of a split within American evangelicalism concerning literalist vs. liberal interpretation of the Bible: while the Northerners felt the Bible’s main message was against slavery (liberal interpretation), the Southerners pointed out that the actual pages about slavery did not condemn it (literal interpretation) (Matzke, 2010).

The Civil War was fought from 1861 to 1865 and was one of the most important battles in American history since it was the war in which the greatest number of Americans died (600,000) and it led to a polarization of the South and North of the United States, which in certain ways can still be felt. The Civil War is also important when understanding some of the American’s sentiment regarding Darwin since Darwin to this day is still given some “credit” in causing the strife (Ham, 2012; Numbers, 1998). This can be seen in the fact that the Discovery

²¹ Elizabeth Lechleitner “Seventh-day Adventist Church emerged from religious fervor of 19th Century” <https://www.adventist.org/en/information/history/article/go/-/seventh-day-adventist-church-emerged-from-religious-fervor-of-19th-century/> (Accessed 8 May 2016)

Institute has promoted the following excerpt on their Evolution and News website²².

Human equality made sense to our Founding Fathers, because they believed that all men are made in the image and likeness of God, because they were yearning for equal treatment under British law, or because they had read John Locke...It did not take long for their paradigm to be challenged by interest and by “science”.

By 1853, when Senator John Pettit of Ohio called “all men are created equal” “a self-evident lie”, much of America’s educated class had already absorbed the “scientific” notion (which Darwin only popularized) that man is the product of chance mutation and natural selection of the fittest. Accordingly, by nature, superior men subdue inferior ones as they subdue lower beings or try to improve them as they please. Hence, while it pleased the abolitionists to believe in freeing Negroes and improving them, it also pleased them to believe that Southerners had to be punished and reconstructed by force. In short, Darwinism corrupted Northern and Southern thinkers equally (Codevilla, 2010).

After the war, the North and South were reunited into a Union, yet the conclusion of the war did not guarantee a unified America and the country was still not far from being united religiously according to Cynthia Lyerly, “Here’s the most important event that Americans have ever experienced, the most significant seismic event, the American Civil War, and its religious people don’t agree on what it meant. They have profoundly different opinions about why it was fought. What does the South’s loss, the North’s win, say about God in America and its nation and its destiny (Lyerly, 2009)?”

This religious polarization would continue as Rev. Charles Augustus Briggs returned to the United States in 1869 after studying in Germany. Although he had converted to evangelical Christianity in 1857 during a series of revivals, he embraced Historicism while studying in Germany in the 1860s, which “postulated that all historical phenomena were the products of the culture – the time and the place in which they were created” (Kugel, 2007). These texts could therefore be subject to critical study and analysis and these methods of critical study also applied to sacred texts, including the Bible. Biblical texts were no longer seen as the immutable word of God but instead the product of the times, places and cultures in which they were composed. Moreover, these texts contained errors and inconsistencies (Kugel, 2007). In 1891, Briggs gave a public speech as part of his inauguration into the Edward Robinson Chair of Biblical Theology in which he stated:

I shall venture to affirm that, so far as I can see, there are errors in the Scriptures, that no one has been able to explain away; and the theory that they were not in the original text is sheer assumption, upon which no mind can rest with certainty. If such errors de-

²² Codevilla: “Darwinism corrupted Northern and Southern thinkers equally” October 3, 2010. www.evolutionnews.org. (Accessed 17 July 2014)

stroy the authority of the Bible, it is already destroyed for historians. Men cannot shut their eyes to truth and fact. But on which authority do these theologians drive men from the Bible by this theory of inerrancy? The Bible itself nowhere makes this claim. The creeds of the Church nowhere sanction it. It is a ghost of modern evangelicalism to frighten children. The Bible has maintained its authority with the best scholars of our time, who with open minds have been willing to recognize any error that might be pointed out by Historical Criticism; for these errors are all in the circumstantial and not in the essentials; they are in the human setting, not in the previous jewel itself; they are found in that section of the Bible that theologians commonly account for from the providential superintendence of the mind of the author, as distinguished from divine revelation itself²³.

Briggs' statement did not sit well with the conservative Protestants, and he was accordingly tried for heresy and by 1893 he had lost his job, but he had started a revolution among American Protestants and as the *New York Times* stated "Probably no man is doing more than Briggs is for the new construction of Christianity" (Colt and Jennings, 2012).

According to Cynthia Lynn Lyerly, there were a number of Christians at the end of the 19th century who were relieved that they could incorporate reason and faith but obviously these proclamations against the inerrancy of the Scriptures would cause a back lash within the conservative Protestant communities since this new interpretation of the Bible threatened the nation's special relationship with God (2012).

Turn of the 20th Century: World Wars and the Dawn of Fundamentalism and Creationism

The turn of the century was a moment of time in which technology seemed to take a huge leap. During the 1800s, there had been inventions like the telephone and the sewing machine, but the inventions that were about to occur would change the face of humanity forever after. At the conclusion of the 1800s Rudolf Diesel had invented the internal combustion engine in 1892 (patented in 1898) and the Wright brothers invented the first gas motored and manned airplane by 1903. The inventions of plastic, the tractor, color photography, the helicopter, the tank, and motion pictures soon followed. Henry Ford started his quest to provide the Americans with a car for the great multitude in 1903 and Albert Einstein published his Theory of Relativity in 1905. It was an era of great progress, invention, change and technology. Yet, by 1925, it would also be the stage upon which the Scopes trial would be enacted. So how in this time of such intelligence and progress did the American society take a turn towards religious fundamentalism?

Christian fundamentalism arose as a reaction to a perceived threat to traditional Protestant beliefs and a concern about the role of Christianity in American cul-

²³ Charles A. Briggs. American Presbyterian Church. <http://www.americanpresbyterianchurch.org/> (Accessed 21 July 2014)

ture (Longfield, 2000; Numbers, 1998; Scott, 2009). This fear may have been aggravated in the US due to the central role of Protestant ethics in American sociology. According to Max Weber, whose 1905 book *The Protestant Ethic and the Spirit of Capitalism* was listed as one of the most important books in the field of sociology in the 20th century²⁴, the Protestant belief system played a central role in the development of modern capitalist economy. Weber explains in his book how Protestant ethics provided the foundation for the emergence of modern capitalism since the Reformation deeply altered how secular work was perceived by dignifying even the most mundane professions as “sacred callings” that added to the common good of society and thus blessed by God (1905). According to Weber, as these Protestant beliefs progressed, individuals were compelled to devote themselves to their work with as much zeal as possible as to please God. Moreover, because these individuals were also encouraged to abstain from luxuries, they readily accumulated wealth, which they invested according to Protestant ethics – thus bolstering the economy (Weber, 1905). In that sense, it is conceivable that a threat to traditional Protestant beliefs could have caused not only emotional responses within the American population but also economic fears since a loss of Protestant faith could lead to an instability of the Protestant work ethics and thus have an adverse effect the economy.

One of the greatest threats to traditional religious beliefs appeared to be the general movement towards modernism as illustrated by E. J. Pace in his illustration entitled “The Descent of the Modernist” which shows how the modernists were taking steps to atheism by questioning the infallibility of the bible and man’s role at the crown of God’s creation (Pace, 1922). This fear of modernism and specific trepidation regarding science and technology were exacerbated by the horrendous losses resulting from World War I as Randall M. Miller describes, “From the traditionalist point of view, this war was a demonstration of all that had gone wrong, and a warning because God, they believed, gives warnings. He visits his wrath upon the unrepentant people. The world seemed to be coming apart. How can we pull these things all back together (2012)?” Technology was responsible for a record loss of human life and Miller points out that the evangelical Protestants could see that they were losing their dominance and their special charge over this chosen nation (2012). Shortly after the end of World War I, a new war would begin on American soil – the war against Darwin and evolution (Ruse, 1996). The connection between WWI and anti-evolution will be discussed in more detail in the chapter *Creationism and Intelligent Design*. It suffices to say that the troubles and atrocities from WWI spawned the new movement in the US. As William Jennings Bryan stated, “The same science that manufactured poisonous gases to suffocate soldiers is preaching that man has a brute ancestry and eliminating the miraculous and the supernatural from the Bible” (Numbers, 1998).

²⁴ “Books of the Century” International Sociological Association. <http://www.isa-sociology.org/books/books10.htm> (Accessed 10 September 2016)

Fighting to defend the American and the evangelical Protestant way of life against science was William Jennings Bryan and the fundamentalists (Kazin, 2006). As Michael Kazin states “More and more conservative Protestants are beginning to call themselves fundamentalists, based themselves on a general sense that if we give away the truth of the Bible, we are giving away what’s most important about being Christian” (2012). Stephen Prothero stated, “Bryan wants to defend traditional Christianity. He wants to defend fundamentalism against the onslaught of modernity because he believes that if the modernists win in the fundamentalist-modernist controversy that Christianity is going to go under, and then American society will go under with it” (Prothero, 2012c). As William Jennings Bryan said, “Man must be brought back to God, to a belief in the Bible as the Word of God, and to a love of Christ as the Son of God” (Colt and Jennings, 2012). Hasia R. Diner poignantly describes the crux of the problem, “A core religious belief was that human beings were the crown of creation. And in very American terms, the American was also the crown of creation. But now, reading these accounts of Darwin, one couldn’t say that any longer. Darwinism undermined the notion of what it means to be an American” (2012).

So Bryan and the fundamentalist began to campaign to have the teaching of evolution removed from American schools. As Bryan stated, “I object to Darwinian theory because I fear we shall lose the consciousness of God’s presence in our daily life if we must accept the theory that through all the ages, no spiritual force has touched the life of man” (Colt and Jennings, 2012). This movement against evolution was very attractive among the evangelicals who saw evolution as a threat to the traditional interpretation of the Bible and a moral degradation (Blancke, 2014).

The fundamental efforts were successful as 23 states debated anti-evolution legislation and three states passed legislation prohibiting the teaching of evolution (Tennessee, Mississippi and Arkansas). The prohibition in Tennessee led to the Scopes Trial in 1925, which will be discussed in detail in the chapter Examining the Legal Conflict. Although John Scopes was found guilty and the Butler Act in Tennessee was upheld, Bryan was made to look like a fool after being questioned by Darrow (Kazin, 2006). Bryan died shortly after the case and the fundamentalist retreated into the shadows. As Rev. Randall M. Miller states, “The whole world has now seen not just the ignorance but the stupidity of the so-called fundamentalists, represented by William Jennings Bryan. How could any intelligent person believe in this kin?” (2012). At the same time evolution also disappeared from the textbooks for the next 40 years (Matzke, 2010). This will be discussed in more detail in the chapter Textbook Adoption.

In essence, the media coverage of the Scopes trial polarized the American people and there was a clear division between the liberals and the conservatives, between the modernists and the fundamentalists (Colt & Jennings, 2012). Moreover, according to Edward J. Larson, “The Scopes trial was such a visible repudia-

tion of the fundamentalists by the mainstream media and mainstream culture that there was a sense that, ‘Our ideas are no longer welcome. Rather than participating in the larger society, we should build our own subculture’” (2012). In a sense, the media coverage of the Scopes trial served as a vilification of the fundamentalists and thus during the 1930s and 1940s, the fundamentalists began to create a new image as part of their retreat – moving away from the term fundamental and focusing more on a cultural re-engagement of evangelicalism (Gribben, 2011).

These next couple of decades also marked other dramatic events in US history like the Great Depression beginning in 1929, the repeal of Prohibition in 1933, followed by World War II from 1939 to 1945. Following the economic and political upheavals in the 1920s, 30s and 40s, a new America emerged. As Stephen Prothero states, “I think we’ve always had a flirtation between religion and politics in American life, from the very beginning, from even before the founding of the republic. But what you get after World War II is really a marriage between the two, where religion and politics are going to be closer and closer intertwined” (2012c).

The Second Half of the 20th Century: In God We Trust

After a very brief period of peace, the Cold War Era began in 1947 and the belief in God became synonymous with patriotism (Soul of a Nation, 2012). One of the most influential leaders at this time was Billy Graham and his message for the nation was clear: “I believe today that the battle is between communism and Christianity! And I believe the only way that we’re going to win that battle is for America to turn back to God and back to Christ and back to the Bible at this hour! We need a revival!” He also proclaimed, “I would say to our international problems that the principles of Christ form the only ideology hot enough to stop communism! When communism conquers a nation, it makes every man a slave! When Christianity conquers a nation, it makes every man a king! And it is my prayer²⁵”

Billy Graham started this revival in New York in 1957. He booked Madison Square Garden for a six-week campaign and it was such a huge success that the campaign was extended for a total of three months. He also preached on Time Square and Wall Street, but his largest crowd was gathered in Yankee Stadium in front of 100,000 spectators (Soul of a Nation, 2012). It was during this event that he shared the pulpit with Vice-President, Richard Nixon, with whom Graham shared a long and meaningful friendship (King, 1997). Nixon had been raised as a Quaker but had been converted by an evangelist and Graham could envision Nixon as an excellent president, if only he would court the support of the Protestants (King, 1997). During his speech in Yankee Stadium, Nixon’s willingness to court the Christian vote became clear as he stated on that day, “One of the most basic

²⁵ Speeches from Billy Graham can be heard on PBS’s *God in America* series, hour five, entitled “Soul of a Nation”.

reasons for America progress in the past and for our strength today is that from the time of our foundation, we have had a deep and abiding faith in God”²⁶. This began a trend of political leaders placating to the evangelical masses – in fact Billy Graham has had a personal audience with all of the sitting presidents since 1957 (King, 1997).

Dwight Eisenhower (Republican) began his presidency during the last year of the Cold War in 1953. He joined the Christian bandwagon and was baptized and confirmed Presbyterian just weeks after his inauguration as he proclaimed, “It seems to me if we’re going to win this fight, we have got to go back to the very fundamentals of all things. And one of them is that we are a religious people. Even those among us who are so– in my opinion, so silly as to doubt the existence of an Almighty, we are still members of a religious civilization” (Soul of a Nation, 2012). Philip Goff states that, “You see it in the language of Dwight D. Eisenhower and in the language of Billy Graham, this sense that religion is a sign of democracy. And they marry the two. Very clearly, Eisenhower comes out and says that democracy is, in fact, a public expression, basically, of a deeply felt religion” (2012).

Thus, the word God begins to make its appearance in new places. The words “under God” were added to the Pledge of Allegiance²⁷ in 1954. Two years later in 1956, “In God We Trust” became the official motto of the United States Congress. These words were added to American paper currency in 1957²⁸. The “wall” between Church and State was slowly crumbling, although the religious leaders could not directly dictate political policy, the power and numbers of the evangelicals was growing so rapidly that it only made sense for the political leaders to appease them in order to remain popular among the majority of voters. Moreover, this new political face began to enter the public schools. In 1955, the New York Board of Regents decided to create a non-denominational prayer that was recommended to be recited by children in public schools in order to protect them against communist atheism. The prayer (later known as the Regent’s prayer) read, “Almighty God, we acknowledge our dependence upon thee and we beg thy blessings upon us, our parents, our teachers, and our country. Amen.” To most people, it seemed like an innocent, even positive phrase, yet it is a clear violation of the Constitution. The wording of the Constitution, created almost 200 years prior, gave Americans a handle to grasp. A group of parents decided to sue the

²⁶ This statement from Nixon can be heard on PBS’s *God in America* series, hour five, entitled “Soul of a Nation”.

²⁷ The Pledge of Allegiance was originally written by Francis Bellamy in 1894 and was formally adopted by Congress in 1942. The Pledge of Allegiance in its current form reads: “I pledge allegiance to the Flag of the United States of America, and to the republic for which it stands, one Nation under God, indivisible, with liberty and justice for all. It is commonly recited by schoolchildren every morning in public schools all over America.

²⁸ The words “In God We Trust” had been added to American coins in 1864 during Lincoln’s presidency during the final years of the Civil War (1861 to 1865).

school district for violation of the Establishment Clause. Yet the school district won in the New York State Court. The case was appealed and again the school district won at the New York Court of Appeals, but when the case was appealed to the Supreme Court, the school district lost, and thus prayer in public schools was banned nationwide from that point on, creating a massive change in how education was planned and conducted in the United States and according to Sarah Barringer Gordon, this decision by the Supreme Court was probably the most despised decision they had ever made (2012)²⁹.

Combining Religion and Politics: Civil Rights Movement, the Moral Majority and the Christian Coalition

This Civil Rights Movement (1955 to 1968) combined religion and politics once again in the United States. As Stephen Prothero states, “Throughout American history, the main story that we’ve gravitated toward has been the Exodus story, a people on the march with God by their side. And we’ve told it to ourselves as Puritans coming over to New England, as Mormons heading west across the mountains. And it was that story that really sustained the Civil Rights movement” (2012e). Martin Luther King, seen as the leader of the civil rights movement talked very openly about the religious motivation behind his actions, “And it seemed at that moment that I could hear an inner voice saying to me, ‘Martin Luther, stand up for righteousness! Stand up for justice!’ And lo, I heard the voice of Jesus saying still to fight on! He promised never to leave me, never to leave me alone, no, never alone!” (Soul of a Nation, 2012). According to Dr. Franklin Lambert, Martin Luther King saw the Constitution as a voice which gave a voice and an expression of fundamental biblical principles of justice and he wanted that the phrase “All men are created equal” as stated in the Declaration of Independence be taken seriously (2012)³⁰. Again, the words created by men in the 1700s were giving power and a voice to people in the 1900s looking for the same enlightened concepts of liberty and freedom.

The Civil Rights Movement, according to Frank Lambert changed religion in America, “What we see is a movement from emphasis of personal salvation to a social gospel. And that comes primarily from the Civil Rights Movement. They have refused to accept the gospel as simply a message of personal redemption” (2012). Stephen Prothero agrees, stating, “The success of the Civil Rights movement is going to move people to say, ‘Let’s use religion in the political space in the direction that we want to go,’ sort of a big, green light, in a way, to the conjoining together of religion and politics in American life” (2012e).

²⁹ Sally Gordon is a professor of Constitutional Law a widely recognized scholar and commentator on religion in American public life and the law of church and state. For more information about her and her work see <http://www.history.upenn.edu/faculty/gordon.shtml>

³⁰ Franklin Lambert is a professor of history. For more information see http://www.cla.purdue.edu/history/directory/?p=Franklin_Lambert

The 1960s in the United States marked the decade of John F. Kennedy's assassination, the US involvement in the Vietnam War, the passing of the Civil Rights Act. It was also a decade where the secular US came into the mainstream in the form of hippies, student rebellions and flower children. In 1967, the second evolution case of the century was heard in front of the US Supreme Court. And this time the anti-evolution statute of Arkansas was found to be unconstitutional and thus made it illegal in all states to pass similar legislature that prevented the teaching of evolution. This win in court also accompanied the revamping of science education in the United States and the reappearance of evolution in high school textbooks. More about these cases can be found in the chapters Examining the Legal Conflict and Textbook Adoption.

However, the point that drove conservative evangelicals back into politics in an organized fashion was the 1973 Supreme Court decision legalizing abortion (Of God and Caesar, 2012). The political activism this decade was led by Francis Schaeffer, an American fundamentalist theologian working in Switzerland (Of God and Caesar, 2012). He created a couple of film series aimed at secular humanism. As he stated, "The consensus of our society no longer rests upon a Christian basis but upon a humanistic one. Humanism is man putting himself at the center of all things, rather than the creator God. Having rejected God, the humanist" (Of God and Caesar, 2012). As Rev. Randall Balmar states, "Francis Schaeffer makes the case that not only should evangelicals consider entering into the political arena, but they have an obligation to do so" (2012). This idea was brought about by Jerry Falwell in 1979 when he launched a political organization called the Moral Majority to bring evangelicals back into national politics. Rev. Ed Dobson was the Moral Majority Executive from 1979 to 1987 and he described their mission as such, "We were desperate to have our voice heard and concluded that one way to get it heard was to register a bunch of people who had never registered and encourage them to vote. The idea was we need to, quote, 'save the country'" (2012). Within one year, the Moral Majority was set up in 47 states trying to mobilize 10 million evangelical voters. This is a crucial point in time, because a group of like-minded people is working to change policy, it offers politicians a group that they can cater to in order to increase their chances of election. And this is exactly what we see Ronald Reagan do during the 1980 presidential campaigns. Some of Ronald Reagan's proclamations were as follows:

"Our positive stance on family and children is consistent with our heartfelt convictions on the issue of abortion. Here again, we are not just against an evil. We are not just anti-abortion. We are pro-life. In the meantime, we in government will see to it that not one tax dollar goes to encouraging any woman to snuff out the life of her unborn child".

"No one will ever convince me that a moment of voluntary payer will harm a child or threaten a school or a state. But I think it can strengthen our faith in a creator who alone has the power to bless America".

Ronald Reagan was successful in receiving the support of the evangelical Christians and according to Rev. Randall Balmer, “I think a lot of Americans coming out of the 1980 election were wondering what had happened. Here you have this new political force that is making itself felt in American society, in American politics, and so Americans generally were quite anxious about what was going on with the religious right” (2012). But Ronald Reagan knew how to gain the support of the new, politically active religious right, as he stated, “In the book of John is the promise we all go by, tells us that for God so loved the world that he gave his only begotten son, that whosoever believeth in him should not perish but have everlasting life. With his message and with your conviction and commitment, we can still move mountains. We can work to reach our dreams and make to America a shining city on a hill” (*Of God and Caesar*, 2012).

Reagan’s statement appealed not only to the religious right due to the mention of the book of John but according to Stephen Prothero, “With this “shining city on a hill,” Reagan is really going back to the very origins of American colonialism, the British colonies, and this sermon on the Arabella that was given by the first governor of Massachusetts, where he said America will be a city on a hill. We’re going to be this place that, across from Europe, they will look and they will see, “Yeah, that’s how we want our society to be” (2012d). Rev. Balmer agrees, stating, “Reagan was a master of political symbolism. So when Falwell hears “a city on a hill”, what he hears is that this is going to be a Christian nation. We’re going to try to propagate this Christian vision of politics and religion not only in America, but more broadly throughout the world” (2012). Reagan’s religious appeals during his political campaign paid off and the Moral Majority is accredited with securing Reagan with two-thirds of the white, evangelical population’s vote (King, 1997).

After the Moral Majority was dissolved in the late 1980s, a new form of political action was created by the religious right. This time the evangelical political engagement was led by former presidential candidate Pat Robertson and his Christian Coalition. The Christian Coalition³¹ is said to be the most powerful interest group within the Republican Party and has received extensive credit for successes in Republican campaigning since its founding (King, 1997). The Christian Coalition took a different approach than the Moral Majority by focusing on organizing evangelicals at the grass roots level, for instance at the level of school board elections. Ralph Reed was hired to lead the efforts and he stated, “Religiously devout Christians are somewhere between 25 and 30 percent of the electorate. And I thought if we could figure out a way, by organizing them and mobilizing them and training them and deploying them and activating them, so that their influence and

³¹ The Christian Coalition is also currently accredited with being the largest conservative grassroots political organizations in America and according to their website they continue to offer “people of faith the vehicle to be actively involved in impacting the issues they care about – from the county courthouse to the halls of Congress”. About Us. Christian Coalition of America. http://www.cc.org/about_us (Accessed 15 September 2016)

effectiveness was even proportional to their numbers, we would transform American politics” (Of God and Caesar, 2012). Rev. Randall Balmer states, “It was very effective. Thousands of school boards across the country had conservative fundamentalist religious right majorities in the 1990s because of Ralph Reed and Christian Coalition” (2012). This type of development would obviously affect science education standards in the United States.

Modern America in the 21st Century: evangelicalism goes mainstream

The evangelical Christian political involvement would continue into the 21st century and the movement was given new hope with the presidential elections in 2000. As Amy Sullivan from Time Magazine states, “For many evangelical voters, George W. Bush was the candidate they had been waiting for, in that he brought together the right conservative stance on issues that mattered to them, but he also had the evangelical identity” (2012). Bush expressed his Christian beliefs clearly and openly during the presidential campaigns, “When you turn your heart and your life over to Christ, accept Christ as a savior, it changes your heart. It changes your life. And that’s what happened to me” (Of God and Caesar, 2012). Sullivan also stated, “And so instead of having another Ronald Reagan, for example, who was a conservative but not necessarily personally religious, they finally had somebody who could share their identity and could share their politics” (2012).

Rev. Pat Robertson, creator of the Christian Coalition also saw the election of George W. Bush as the ultimate green light, “With the election of George Bush, it was assumed that we had accomplished our goals. And once an evangelical is in that power, he has the ability then to call the shots” (2012). This trend towards political power among the evangelicals only continues to grow, in so much that at the turn of the twenty-first century, the evangelical lobby in America had become the most powerful grassroots coalition in the country (Gribben, 2011).

The influence of religion has been in America since the first colonist arrived over 500 years ago. And although the Founding Fathers used the principles of enlightenment to frame the Constitution, and Jefferson clearly stated there shall be a “wall of separation between Church and State”, the religious right in the form of the Fundamentalists, the Moral Majority or the Christian Coalition have been able to affect the implementation of new legislation guided by their belief in the inerrancy of the Bible throughout the past century. As Rev. Randall Balmer states, “The sense of America as a providential nation has been with us for a very long time. In the 17th century, you had John Winthrop’s notion of a city on a hill being a beacon to the rest of the world. In the 18th century, you had the sacred cause of liberty in its revolt against Britain in the 19th century, manifest destiny, 20th century, making the world safe for democracy. And the 21st century, who knows. It probably hasn’t emerged quite yet” (2012).

Summary

This chapter includes a plethora of American history, but the main purpose of this chapter was to offer a look at how a creationist movement can form in such a modern country by describing the process by which evangelical thought permeated the nation's population and political processes. This chapter illustrated that even the earliest settlers brought with them the idea of creating a Christian nation with the concept of the "city on a hill" which was repeated over hundreds of years of American history. It was shown that through the settlement of the frontier and growth of revivals as religious events that the Americans also began to develop a concept of a close and personal relationship with God. Due to the lack of organized churches on the new frontiers, Americans began reading the Bible for themselves and there was a major emphasis placed on the words of the Bible as a direct communication between God and man.

As the history of the nation continued, this special relationship to God and the special role of religion in American's lives became coupled with political movements. The United States began to see their role in wars as an expression of their relationship to God and as their position at the crown of God's creation. In the 20th century, as evangelical growth began to rise exponentially, there was a major focus on using their organized efforts to create political change. This could be seen through the foundation of political organizations such as the Moral Majority and the Christian Coalition. The success of these evangelical efforts could be seen in the way that politicians began to placate to the evangelicals and through the election of political leaders who expressed conservative beliefs such as Ronald Reagan and evangelical beliefs such as George W. Bush.

Subsequent chapters will look at how this growth of evangelicalism in the United States led fundamentalists and evangelicals to target evolution, as it was a direct challenge to this idea of America's special relationship to God. Yet targeting evolution not only promotes the growth of evangelical thought but also leads to a loss of science literacy and thus the next section will provide an overview of the theory of evolution and the nature of science in order to provide the reader with a clear vision of what is under attack and what would be lost if creationists were successful in reintroducing supernatural powers back into science.

Understanding the importance of Science, Evolution and Darwinism

“That evolution is a theory in the proper scientific sense means that there is both a fact of evolution to be explained and a well-supported mechanistic framework to account for it. To claim that evolution is ‘just a theory’ is to reveal both a profound ignorance of modern biological knowledge and a deep misunderstanding of the basic nature of science.”

TR Gregory (2008)

Since the beginning of the 1920s, there has been an organized effort to abolish or diminish the teaching of the theory of evolution in American public schools (Numbers 1992; Numbers, 1998; Numbers, 2006; Humes, 2007). This section will take a closer look at the nature of science, the robustness of the theory of evolution and how evolution became associated with Nazis, communism and atheism. The purpose of this chapter is to provide the information necessary to understand and address creationist claims and accusations with regards to evolution. By explaining the nature of science, it becomes clear why evolution is science while intelligent design is not. By looking at the evidence and development of the theory of evolution, it becomes clear why the newest trends in “teaching the controversy” or addressing the “weaknesses” of the theory of evolution are intellectually dishonest. Finally, by looking at the development of social Darwinism and the misuse of the theory of evolution for political reasons, one comes to understand why the evangelicals have a misunderstanding of Darwinism and its effect on morality.

Understanding Science

What is science? The evolution debate is so complex because it involves so many concepts such as science, religion, legal rights, freedom, etc. Because the creationists proponents are have tried to sell Scientific Creationism and now Intelligent Design as a legitimate scientific theory, the conflict has even resulted in the question: What is science? Can a theory that requires the presence of a supernatural power really be considered a scientific pursuit? This question has become a central topic since the creationists would like to have their alternative “theories” taught in high school science classrooms. The nature of science is thus called into question because in order for Intelligent Design to count as science the very notion of what science is would have to be deconstructed. To understand this point this section will first look at what is the definition of science.

If one looks in the Oxford dictionary, one will find the following concise definition that science is “The intellectual and practical activity encompassing the systematic study of the structure and behaviour of the physical and natural world through observation and experiment”. The Science Council offers a similar statement: “Science is the pursuit and application of knowledge and understanding of

the natural and social world following a systematic methodology based on evidence³². Yet, defining science is no simple feat, as it is then necessary to define the specific characteristics which separate it from all other spectrums of non-science and this is made even more difficult by the fact that science as a phenomenon, has developed very slowly through the eras, breaking itself away from religion, philosophy, superstition, and other areas of human opinion and beliefs (Ruse, 1979). There are many sources with many different definitions of what science is. Michael Ruse has also brought forth numerous publications explaining not only science, but also biology and evolution and has highlighted that the main components of scientific enterprise. According to Ruse, true scientific endeavors are able to create effective explanations and predictions based on these explanations, whereby the predictions should be testable and falsifiable (1982).

Ruse also helped establish one of the most relevant definitions of science for this purpose of this thesis – namely the legal definition of science. This is a crucially important classification since this definition will ultimately decide what can be considered science and thus be legally taught in American public schools. Ruse’s definition of science allowed Judge Overton to determine that Creation Science is in fact not science and thus a violation of the Constitution. In *McLean v. Arkansas*, 529 F.Supp. 1255 (1982) Overton established that science is defined by five central characteristics:

Tab. 5: Definition of science according to Ruse

Definition of science based on Ruse’s testimony in <i>McLean v. Arkansas</i>
It is guided by natural law; It has to be explanatory by reference to nature law; It is testable against the empirical world; Its conclusions are tentative, i.e. are not necessarily the final word; and It is falsifiable.

In *Edwards v. Aguillard*, 482 U.S. 578 (1987), science was defined in an amicus curiae brief submitted by 72 Nobel Laureates, 17 state academies of science and seven other scientific organizations. In the brief science is defined as follows:

“Science is devoted to formulating and testing naturalistic explanations for natural phenomena. It is a process for systematically collecting and recording data about the physical world, then categorizing and studying the collected data in an effort to infer the principles of nature that best explain the observed phenomena. Science is not equipped to evaluate supernatural explanations for our observations; without passing judgment on the truth or falsity of supernatural explanations, science leaves their consideration to the domain of religious faith. Because

³² What is Science? Science Council. <http://www.sciencecouncil.org/definition> (Accessed 14 July 2014)

the scope of scientific inquiry is consciously limited to the search for naturalistic principles, science remains free of religious dogma and is thus an appropriate subject for public-school instruction.”

For the purpose of this thesis, science will be defined by combining the above stated definitions, thus all future references of science in this paper will be using the definition: Science is the systematic study of the material universe and how it works using natural processes to explain natural phenomena. It does not use any supernatural powers or processes to explain reality as this would not be testable. Scientific theories must make predictions about the natural world and must be capable of being proven true or untrue through repeated experimentation.

This concept is important for students to understand, because the exclusion of supernatural forces as a causal agent was the cornerstone of the Age of Enlightenment and thus all subsequent scientific advancement (Humes, 2007).

Understanding the Building Blocks of Scientific Research

Science has four main building blocks: facts, hypotheses, laws and theories (Scott, 2009). It is important to define what is meant by these terms, not only how these terms are understood by the scientific community but also how these terms are often misunderstood by the general public. This discrepancy is vitally important because it leads some to believe that the theory of evolution is still largely tentative, lacking evidence and definitely not a fact. In 1998, The National Academy of Sciences published a book entitled *Teaching About Evolution and the Nature of Science*. In this book, they defined the most crucial scientific terminology in the following way:

Tab. 6: Terms used for teaching the nature of science (National Academy of Science, 1993)

Glossary of Terms Used in Teaching about the Nature of Science
<p>Fact: In science, an observation that has been repeatedly confirmed.</p> <p>Law: A descriptive generalization about how some aspect of the natural world behaves under stated circumstances.</p> <p>Hypothesis: A testable statement about the natural world that can be used to build more complex inferences and explanations.</p> <p>Theory: In science, a well-substantiated explanation of some aspect of the natural world that can incorporate facts, laws, inferences, and tested hypothesis. (<i>Teaching About Evolution and the Nature of Science, 1998</i>)</p>

Not only does the general public misunderstand the meaning of these terms in regard to how they are used in science, they also denote a different level of importance to these building blocks. As Eugenie Scott points out, if asked to list these building blocks in order to greatest importance most would state that facts are most important, followed by laws, theories and then hypotheses (2009). She later states

that scientists would place them in a different order, theories as most important, followed by laws, hypotheses and then facts (Scott, 2009). These building blocks will now be examined. Facts and laws will be covered briefly and then more time and detail will be spent on discussing hypotheses and theories since they are the most crucial components of the evolution-creationism circus.

Facts

Facts are simply observations about the natural world that have been confirmed through test and experimentation. Some examples of scientific truths are the fact that light travels at 186,000 miles/second or that there are more microorganisms on the surface of human skin than there are humans on the surface of the Earth. These facts are simple or interesting but most importantly they can be tested and confirmed.

Hypotheses

The importance of hypotheses is that science revolves around the hypothetico-deductive method, in other words the following steps are involved in true scientific inquiry (Shermer, 2006):

- formulating a hypothesis
- making a predication based on the hypothesis
- testing whether or not the predication was accurate

This is crucially important in the evolution-creationism debate because it is often discussed about whether or not evolution is testable and whether or not Intelligent Design or Creationism is testable. This is an important point because it is part of the definition of science itself (see above) and creationists like to claim that evolution is not testable (Hutchenson, 1986).

During the Kitzmiller trial, Dr. Kenneth Miller gave examples of how scientists can make hypotheses and test the theory of evolution. Since then he has given many talks and presentations to this effect. In this example, Dr. Miller gives a very vivid explanation of how we can test human evolution³³.

According to evolutionary theory, humans and chimpanzees (as well as the other great apes) share a common ancestor. Yet chimpanzees (as well as gorillas and orangutans) have 48 chromosomes, while humans have only 46. Is it possible that this pair of chromosomes just got lost? Dr. Miller explains that this is not possible, and it would be lethal. So the only logical (non-lethal) explanation – if great apes and humans do in fact share a common ancestor – is that one pair of chromosomes must have fused with another.

So evolutionary theory allows us to make a testable prediction (hypothesis), if humans share a common ancestor with great apes, then there should be evidence

³³ Kenneth Miller on Human Evolution: <https://www.youtube.com/watch?v=zi8fFMBYckk> (Accessed 10 October 2014)

of fused chromosomes in the human genome. According to Miller, if this evidence cannot be found, then it would disprove evolution or at least the part of evolutionary theory that stipulates common descent among apes and humans. Based on the known structure of chromosomes, if two did in fact fuse, then there should be telomeres not only on both ends of that chromosome (like all other chromosomes) but also a region in the middle containing telomeres and the chromosome should also accordingly have two centromeres. This is in fact the case in chromosome 2 as Hillier et al. published in *Nature* in 2005, “Human chromosome 2 is unique to the human lineage in being the product of a head-to-head fusion of two intermediate-sized ancestral chromosomes” (Hillier & al., 2005). To facilitate the understanding of this concept, see Figure 0–6.

Similarly, one could look at Creationism, Creation Science or Intelligent Design and see if they are in fact sciences, what type of testable hypotheses can be formed? Many say that they can postulate that if there is an intelligent designer/God, then there should be proof of an object that is intelligently designed. Evangelist Ray Comfort believes to have found this proof and has dubbed it “The Atheist’s Nightmare” – what he is referring to is the banana. According to Comfort, the shape of the banana, its non-slip surface, the fact that it is “perfectly” fit for the human hand and mouth and contains a “tab” for easy access much like a Coke Cola can proves that it is the product of God’s genius³⁴.

The scientists in the Intelligent Design camp have somewhat more elaborate postulations. Dr. Michael Behe’s most famous example is the bacterial flagellum. Behe came up with the notion of Irreducible Complexity (more about this in the chapter 0) which can be applied to any component of a living organism “in which the removal of an element would cause the whole system to cease functioning” (Behe, 1996). He presents the flagellum as a “molecular machine” in which the individual parts have supposedly been specifically crafted to work as a unified assembly therefore providing “genuine scientific proof” of the actions of an intelligent designer. Because Behe’s concept was based on somewhat scientific grounds, he did receive an official rebuttal from the scientific community (Coyne 1996; Miller 1999; Depew 1998; Thornhill and Ussery 2000), while Comfort is just mocked as “the banana man” by Dr. Richard Dawkins.

Theories

Many individuals, including high school students, confuse a scientific theory with the common usage of the word ‘theory’ to mean an unproven assumption synonymous with an educated guess or a conjecture (Branch & Mead, 2008). A scientific theory is of course not just speculation and much more than an educated guess. According to Miller and Levine, authors of the Prentice Hall Biology textbook, “[i]n

³⁴ Ray Comfort on the Banana: <https://www.youtube.com/watch?v=BXLqDGL1FSg> (Accessed 10 October 2014)

science the word theory applies to a well-tested explanation that unifies a broad range of observations” (Branch & Mead, 2008) and only very few hypotheses ever become theories. There are very few theories that are stronger than the theory of evolution (Shermer, 2006). The relationship between hypotheses and theories was described in the amicus curiae brief in *Edwards v. Aguillard*, 482 U.S. 578 (1987):

“The process of continuous testing leads scientists to accord a special dignity to those hypotheses that accumulate substantial observational or experimental support. Such hypotheses become known as scientific ‘theories’. If a theory successfully explains a large and diverse body of facts, it is an especially ‘robust’ theory. If it consistently predicts new phenomena that are subsequently observed, it is an especially ‘reliable’ theory. Even the most robust and reliable theory, however, is tentative. A scientific theory is forever subject to reexamination and – as in the case of Ptolemaic astronomy – may ultimately be rejected after centuries of viability”.

Some examples of well-known theories from different fields include the Big Bang Theory (Astronomy), Evolution (Biology), Climate change (Climatology), Theory of Relativity (Physics), Chaos Theory (Mathematics), Plate tectonics (Geology), etc. In later chapters it will be discussed how legislature proposed to teach students’ critical thinking by analyzing the “strengths and weaknesses” of a scientific theory always involve the theory of evolution but do not include other theories like plate tectonics or relativity.

The clearest example of the creationist misunderstanding of the word theory as used in science is the textbook stickers approved by Cobb County Board of Education in 2002 that stated, “This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered”. These stickers were placed on over 30,000 textbooks, further fueling students’ misunderstanding of the word theory.

Laws

Another point where many members of the general public are confused is the difference between a scientific theory and a scientific law – often believing that the term theory implies that it is much weaker than a law and that theories transform into laws once they have been “proven” (Scott, 2009). Many anti-evolution crusaders hone in on the point that it is the theory of evolution and that if scientists were sure about it, then it would be the law of evolution.

Alina Bradford wrote an article in 2015 “What is a Law in Science?” where she clearly illustrated the difference between the two, “While scientific theories and laws are both based on hypotheses, a scientific theory is an explanation of the observed phenomenon, while a scientific law is a description of an observed phenomenon. Kepler’s Laws of Planetary Motion, for example, describe the motions of planets but do not provide an explanation for their movements” (2015).

Other examples of scientific laws are Newton's Law of Universal Gravitation or the Laws of Thermodynamics. As Bradford goes on to explain, "Some disciplines, such as physics and chemistry, have many laws because a large number of the principles behind these sciences can be related as mathematical equations. Comparatively, biology has fewer laws and more theories because there are many aspects of this field of science that cannot be broken down in mathematical terms³⁵.

A lot of energy in the form of books and videos has gone into explaining the use of the word theory in science. Now that there is more information available about the nature of scientific theories, some creationists have moved away from harping upon the "just a theory" refrain and moved on to claiming that that evolution is not even a theory. As Answers in Genesis states "Although some Christians have attacked evolution as 'just a theory,' that would be raising Darwin's idea to a level it doesn't deserve"³⁶. So, the new attack seems to be: evolution – not even a theory.

By understanding the differences between laws, facts, hypotheses and theories, it should allow a student to better discern between theories such as evolution that have been tested and affirmed through decades of research and religiously motivated ideas such as Creation Science that are marketed as equal scientific alternatives.

What is Evolution?

Now that the definition of science and the building blocks of scientific discovery have been discussed, it is important to define what is meant by evolution. Yet defining evolution can be as difficult as trying to define science. Many authors, such as Mayr, Hoßfeld, Levit, Kutschera, Junker and Ruse, have expended enormous amounts of energy and time in trying to define – what is evolution? There are definitions of evolution that are assigned by scientists, which will be discussed in detail, but again, since the fate of evolution education is often decided in court rooms, it is necessary to look at how evolution has been defined legally. Evolution has been defined in numerous state legislation acts that are aimed at diminishing the coverage of evolution in the classroom, such as the Arkansas' Balanced Treatment Act or Act 590 in 1982, which was the focus of the McLean case.

³⁵ For example, Newton's Law of Universal Gravitation states: $F=Gm_1m_2/d^2$, where F is the force of gravity, G is a constant (the Gravitational Constant) that can be measured, m_1 and m_2 are the masses of the two objects, and d is the distance between them.

³⁶ Evolution: Not even a theory. Answers in Genesis. <https://answersingenesis.org/theory-of-evolution/evolution-not-even-theory/> (Accessed 14 July 2014)

Tab. 7: Legal definition of evolution-science

Definition of evolution-science according to the Arkansas Balanced Treatment Act
<p>“Evolution-science’ means the scientific evidences for evolution and inferences from those scientific evidences. Evolution-science includes the scientific evidences and related inferences that indicate: (1) Emergence by naturalistic processes of the universe from disordered matter and emergence of life from nonlife; (2) The sufficiency of mutation and natural selection in bringing about development of present living kinds from simple earlier kinds; (3) Emergence by mutation and natural selection of present living kinds from simple earlier kinds; (4) Emergence of man from a common ancestor with apes; (5) Explanation of the earth’s geology and the evolutionary sequence by uniformitarianism; and (6) An inception several billion years ago of the earth and somewhat later of life</p> <p>McLean v Arkansas Board of Education, 529 F.Supp. 1255, E.D Ark. (1982)</p>

Here one can see that there is an emphasis on fact the natural processes are responsible for the origin and development of biological systems including humans. This emphasis on the naturalistic development of nature is a point that many creationists emphasize when speaking of evolution. This can be seen by the description of the materialistic or naturalistic value of the evolutionary theory as Phillip Johnson states, “The theory in question is a theory of naturalistic evolution, which means that it absolutely rules out any miraculous or supernatural intervention at any point. Everything is conclusively presumed to have happened through purely material mechanisms that are in principle accessible to scientific investigation, whether they have yet been discovered or not” (1990).

Within the science community, there has also been an attempt to define this immense theory. Although some members of the general public and most creationists think of evolution simply as a theory, which was proposed by Darwin in the 1800s, the idea and theory of evolution has itself evolved throughout the past 150 years since the publication of *On the Origin of Species*. Some scientists including Kutschera, Niklas and Mayr have created simplified outlines of Darwin’s theory in order to clearly delineate what was proposed by Darwin directly. Kutschera and Niklas, for example, created a list of the 8 principle propositions made in Darwin’s *On the Origin of Species* as such (2004):

Tab. 8: The eight major principle of Darwin’s theory according to Kutschera and Niklas (2004)

Eight principle propositions made in Darwin’s <i>On the Origin of Species</i> According to Kutschera and Niklas (2004)
<p>Supernatural acts of the Creator are incompatible with empirical facts of nature. All life evolved from one or few simple kinds of organisms Species evolve from pre-existing varieties by means of natural selection The birth of a species is gradual and of long duration Higher taxa (genera, families etc.) evolve by the same mechanism as those responsible for the origin of species.</p>

The greater the similarities among taxa, the more closely they are related evolutionarily and the shorter their divergence time from a last common ancestor
 Extinction is primarily the result of interspecific competition
 The geological record is incomplete: the absence of transitional forms between species and higher taxa is due to gaps in our current knowledge

Here Kutschera and Niklas focus on all of the propositions stated by Darwin in his monumental publication. Ernst Mayr took a different approach as he created a simplified outline of the principles of evolution by pinpointing the five general tenets of the theory of evolution as put forth Darwin with the addition of the knowledge, which has been gained in the time since the publication of *On the Origin of Species* (Mayr, 2004):

Tab. 9: Tenets of evolutions according to Mayr (2004)

Five general tenets of evolution as put forth by Darwin According to Mayr (2004)
Evolution: change over time.
Descent with modification: variation over generations with adaptation to changing environment.
Gradualism: slow, steady change. Microevolution leading to macroevolution.
Multiplication: an increasing of new species.
Natural selection: differential reproductive success.

By looking at the models proposed by Kutschera, Niklas and Mayr, one could boil down both outlines to a definition offered by Junker and Hoßfeld, which states that Darwin proposed that various types of life forms share a common ancestor and that these forms have developed in various directions through the natural forces of variation and selection (2009). For the purpose of this thesis, the most important point that Darwin made was that new species could come into being purely through natural forces without any assistance from supernatural powers. This is the most relevant point also in the debate with creationists, since it is this idea that directly contradicts the idea of humans being a product of special creation by a personal god.

Yet within the science community, scientists often discuss evolution according to the mechanisms and the scale of evolution. Evolution is often broken down into different categories within the scientific community. Some of these categories are based on the scale of evolution, i.e. microevolution and macroevolution, which can be defined as follows:

Macroevolution is the evolutionary change at or above the level of species. In other words, macroevolution is the creation of a new species (speciation) through the splitting of a species into two different species or the change of one species into another species. It is also the evolution of new families, phyla or genera, but it is not restricted to these higher levels (Padian, 2010).

Microevolution is the evolutionary change below the level of species. This refers to the change in the frequency of alleles within a population or a species and how the frequency changes effect the phenotype of organisms in that population or species (Padian, 2010).

The distinction between macro- and microevolution is an important differentiation to make, especially in the context of creationism, as many creationists will concede that there is evidence of microevolution, which can be seen in the great variety of dog breeds, yet they vehemently oppose the idea that there is any evidence of macroevolution. In fact, the distinction between micro- and macroevolution originated because Russian zoologist Jurij A. Filipzenko realized the importance of differentiating between two types of evolution that would require different mechanisms and thus additional explanation (Filipzenko, 1927; Junker & Hoßfeld, 2009).

The other manner in which scientists categorize different epochs of evolutionary theory is dependent upon the amount of information incorporated into the theory, i.e. neo-Darwinism versus Synthetic Theory (Levit et al., 2011). This is an intriguing categorization since, although Darwin proposed the idea of descent with modification, there was no knowledge of genetics during this time. The study of genetics has since revolutionized the study of evolution and provided some of the most compelling evidence to substantiate Darwin's theory. Junker, Hoßfeld, Kutschera, Levit and Niklas have presented concise definitions of the different epochs of evolutionary theory beginning with the pure Darwinian sense, followed by the neo-Darwinian theory and then the Synthetic Theory.

Darwinism: The term Darwinism originated after the publication of Darwin's book, *On the Origin of Species*, in 1859. Darwinism cannot be seen as a term synonymous with evolution (gradual change of species over time) since the concept of evolution existed prior to 1859. Darwinism is different from the simple concept of evolution in that it explains the major cause of evolution through the principle of natural selection (Junker & Hoßfeld, 2009; Kutschera & Niklas, 2004; Levit & Hoßfeld, 2011).

Neo-Darwinism: Neo-Darwinism differs from Darwinism in that the Lamarckian concept of soft inheritance is no longer seen as the source of genetic variability but instead was replaced by the concept of sexual reproduction by A. Weissman at the end of the 19th century (Junker & Hoßfeld, 2009; Kutschera & Niklas, 2004; Levit & Hoßfeld, 2011).

Synthetic Theory or Modern Synthesis: The Synthetic Theory of Evolution (STE) or Modern Synthesis refers to a coherent and empirically well-substantiated system that incorporates various fields of biology such as genetics, systematics, evolutionary morphology, developmental biology and paleontology (Junker & Hoßfeld, 2009; Levit & Hoßfeld, 2011). The development of the Modern Synthesis began in the 1930s and ended in 1947 (Kutschera & Niklas, 2004; Levit & Hoßfeld, 2011; Mayr 1999). The Synthetic Theory also proposed convincing ex-

planations for macroevolution making alternative evolutionary explanations obsolete (Levit & Hoßfeld, 2011; Levit, et al., 2014).

One could go into greater detail about the theory of evolution itself and the various mechanisms of evolution. However, since this thesis is concerned with the defense of evolution against the attacks made by creationists, it will suffice to present some evidence in support of the theory of evolution.

Examining the theory: Scientific facts supporting evolution

Examining the evidence for the theory of evolution could fill volumes of books (Junker, 2011). In fact, there is so much information supporting the theory of evolution from experimental data, historical indices, morphological data and even genetic proof that evolution can truly be seen as a fact (Junker, 2011). Yet for the purpose of this thesis, it is not important to reprove the validity of the theory of evolution but the focus is to provide evidence that can be easily explained to the general public in order for them to better grasp the concept of evolution and address creationist accusations about the weaknesses of the theory. Throughout the past hundred years, creationists have continued to raise the same questions and accusations, which largely stem from the inability to directly observe evolution (Junker & Hoßfeld, 2009). Some of the most typical questions are: Where is the evidence of macroevolution, i.e. the missing links? Where is the evidence for human's decent from apes? Is natural selection really capable of producing new species? As these questions continue to appear, it is important to provide concise answers with compelling examples. For that reason, this section will briefly look at a couple examples that have been used by scientists in the past to explain evolution to creationists by discussing the evidence in the fossil record with a focus on macroevolution, genetic evidence with a focus on common decent between humans and primates and observable evidence of natural selection.

Macroevolution visible in the fossil record

The theory of evolution states that organisms have modified and changed very slowly over millions of years. This theory allows scientists to make the predication that if organisms changed very slowly over millions of years and that new species came into being and other species died out then it should be possible to find so-called 'missing links'. Creationists often argue that there is a lack of intermediate forms within the fossil record (Ruse, 2006). "Design theorists suggest that various forms of life began with their distinctive features already intact: fish with fins and scales, birds with feathers and wings, mammals with fur and mammary glands... Might not gaps exist... not because large numbers of transitional forms mysteriously failed to fossilize, but because they never existed?" (Davis & Kenyon, 1989). Even Darwin himself was concerned about the lack of transitional fossils stating: "geology assuredly does not reveal any such finely graduated organic chain;

and this, perhaps, is the gravest objection which can be urged against my theory” (Darwin, 1859).

These transitional fossils or transitional forms, the so-called ‘missing links’, are the remains of organisms that show the characteristics of two different species. For instance, if the theory of evolution states that birds evolved from dinosaurs, then it should be possible to find an animal that has both the characteristics of a bird and a reptile and that this fossil should be found at the time in which the species were thought to have split. This fossil was found and is named *Archaeopteryx* and lived 155–150 million years ago.

These types of transitional fossils actually illustrate the manner in which evolutionary theory can be tested using the hypothetico-deductive method. This type of research is apparent in the research project led by Daeschler, Shubin and Jenkins in 1999 in which a group of scientists began to actively search for a particular fossil based on evolutionary and geological data. Using the hypothetico-deductive method, Daeschler and his team made a prediction based on the evolutionary tree of life that if fish gave rise to land animals then there should be evidence of an organism that shows both fish and amphibian characteristics. According to evolutionary theory, such an organism should have lived between 360 and 380 million years ago (Daeschler, 2006). And thus to test their hypothesis, scientists went to the Canadian arctic where large amounts of stone from an ancient shore line are exposed and began to search for this fossil in order to test their prediction (Shubin, 2008).

In 2004, their efforts were rewarded with the discovery of what would later be called *Tiktaalik*. *Tiktaalik* has both the characteristics of primitive fish and amphibians, filling in the gap between water dwellers and land dwelling tetrapods and illustrating how evolutionary science is able to specifically apply the scientific method (Shubin, 2008). Shermer sums up the fossil issue very clearly as he states: the “geological strata consistently reveal the same sequence of fossils. A quick and simple way to debunk the theory of evolution would be to find a fossil horse in the same geological stratum as a trilobite” (2006).

Kevin Padian in fact suggests that teaching macroevolution may be the best way of marginalizing creationists and getting the message to the majority of students who are still on the fence about evolution. He believes that one of the best ways of explaining what scientists know about macroevolution is to include evograms in textbooks and other educational materials such as the one seen here (Padian, 2010).

Common Decent

Common decent among primates and humans may be one of the most bitter of pills for the creationists to swallow as it moves man away from the crown of God’s special creation and lumps him along with the other animals as descent from ancient microorganisms. Despite evolution-doubters’ unwillingness to accept the common

decent of man, there is extensive physiological evidence that humans evolved from simpler organisms and there are dozens of fossils that illustrate the intermediate stage since hominids branched off from the great apes six million years ago (Padian, 2010; Shermer, 2006). Humans also have a number of vestigial structures or anatomical structures, which have decreased in size and usefulness over the course of time and can be seen as markers of evolutionary descent. Some examples of vestigial structures in humans that allow us to see our common history with simpler organisms include (Shermer, 2006):

Coccyx

Wisdom teeth

Appendix

Body hair

Goose bumps

Extrinsic ear muscles

The presence of these vestigial structures allows teachers to offer a simple and clear example of evolutionary evidence for the common decent of man to students who have trouble comprehending the evolution of hominids from other animals.

Genetic evidence of common decent: chromosomes

Another way that teachers can help student comprehend the common decent of man is by explaining the extensive and interesting genetic data that proves how humans evolved from primates. This point was wonderfully illustrated by Ken Miller and was mentioned above to explain how the theory of evolution allows scientists to postulate and test hypotheses.

According to evolution, humans have evolved from simpler ape-like beings. One issue that has been raised is the fact that apes have 48 chromosomes while humans have 46. If the concept of common decent is correct then one would have to be able to find evidence of how the number of chromosomes was reduced. The possibility that these chromosomes just disappeared would have proved to be fatal. Therefore, if the theory of common decent is correct then there should be evidence of a fusion of chromosomes.

This is in fact the case and it is human chromosome number 2 as published in Nature in 2005, "Human chromosome 2 is unique to the human lineage in being the product of a head-to-head fusion of two intermediate-sized ancestral chromosomes" (Hillier & al., 2005).

The genetic evidence of human decent may be more complex for teachers to explain to teachers without the necessary support, but if this point could be included in high school textbooks, it could provide teachers and students with a clear explanation of the evidence available.

Observable mechanism of evolution: natural selection and antibiotic resistance

The theory of evolution or, in this case, Darwin specifically stated, “natural selection acts only by taking advantage of slight, successive variations” (1859). If this is true, one should be able to organize an experiment to test this theory. Hypothesis: bacteria that can become resistant to certain types of antibiotics should more abundant in a population.

The test here is simple and easily observable in daily life. In the case of antibiotic resistance, a term that is familiar to most of the general public, bacteria that have become resistant to a certain type of antibiotic. How does this happen? During reproduction, the DNA of bacteria is susceptible to mutation, just like any other strand of DNA. Bacteria, which contain a DNA mutation that allows them to survive in the presence of a certain antibiotic, will continue to live and to reproduce. If all other bacteria in the population without the mutation die, then the bacteria with the advantageous mutation will prosper. They will become the dominant bacteria in the host and all of its offspring that contain this mutated DNA will also be able to survive. These bacteria are said to be resistant. They are not only a provable scientific fact, but also a huge problem and danger for the medical field. The only way to combat this problem is to understand its evolutionary mechanism and prevent these resistant bacteria populations from forming or spreading.

This example could be used to explain the differences between naturalistic processes that allow an organism to adapt to its environment versus the explanation that could be offered by Intelligent Design, which would have to postulate that an intelligent designer actively re-designs these bacteria in order to prevent their death. This is not only non-science, but it raises the question of the character of this designer who would spend so much time re-designing bacteria in order to cause more damage and pain to their human hosts.

The next section will now take a closer look at Darwin himself and how he developed his extraordinary theory. Darwin is a key figure in this thesis since so much of the anti-evolution crusades are directed at Darwin himself or the concept of Darwinism and Darwinists. Once Darwin has been introduced, the subsequent section will describe how his name and theory became misassociated with numerous ideologies.

History of Darwin’s Theory of Evolution or Descent with Modification³⁷

A history of the theory of evolution, especially as part of a thesis surrounding the debate around evolution education and creationism will necessarily need to look at the history of evolution in the connection with Darwin since it was the ideas that

³⁷ Darwin never actually used the word “evolution” to describe his theory, but instead referred to it as “descent with modification”. In fact, Darwin shunned the use of the word “evolution” to describe his theory since that term was already used in the field of biology at that time to describe a theory of embryology that could not be reconciled with Darwin’s own theory (Gould, 1992).

Darwin published in *Origin* in 1859 that changed the way humans see the world and caused a revolution in science equal to that of Copernicus' discovery of heliocentrism (Ruse, 2002). In fact, the theory of evolution is one of the most important theories humans have ever discovered (Hoßfeld, 2014; Ruse, 2002). Although the theory has advanced in great leaps throughout the past 150 years, many opponents of evolution still associate evolution solely with Darwin – often using the term Darwinism interchangeably with evolution and Darwinists as a sign of any individual who believes the theory of evolution – often with an emphasis on naturalistic evolution to denote the absence of supernatural intervention (Johnson, 1990; Johnson, 1993). The term Darwinist is often used in a derogatory sense by fundamentalists seen by statements made by Adnan Oktar, Turkish author and proponent of Islamic creationism, who has stated that “all the members of terrorist organizations – even those that portray themselves as Muslim organizations – are Darwinists” (Steinvorth, 2008). Oktar's anger, like many other creationists is directed not only at the idea of evolution, but primarily at Darwin himself and the demise of society they believe he has caused (Steinvorth, 2008). The following sections will look at how Darwin developed his theory and who he was influenced by and then at how his theory was further developed (and at times misused) by other philosophers, world leaders and scientists.

It should be mentioned that the history and analysis of Darwin and his theory is so intriguing and complex that some authors have dedicated their entire careers to the study of this man and his ideas. A comprehensive look at Darwin and his proposals about the natural world would thus fill volumes and go far beyond the scope of this thesis. For that reason, to fulfill the purpose of this dissertation, it is only relevant to discuss the aspects of Darwin's actions, words and proposals that are pertinent to the conflict between evolution and creationism.

First of all, it is important to establish that many pondered the mutability of species well before Darwin; as early as 611 B.C.E., in fact, Anaximander stated that “Man to begin with was generated from living things of another kind, since, whereas others can quickly hunt for their own food, men alone require prolonged nursing. If he had been like that in the beginning, he would never have survived...” Moreover, it is important to point out that although many anti-evolutionists point to Darwin and the theory of evolution as the move towards materialism and naturalism – biology was actually one of the last science fields to adopt a purely naturalistic explanation of natural laws (Numbers, 1992). The scope of this thesis is not large enough to go through 2000 years of history or to look at the transformation of all of the sciences, so it suffices to say that many men contributed to the knowledge then available in the 1800s that allowed Darwin to develop his theory about the mechanism of the transmutation of species (Levit et al., 2008; Ruse, 2003).

As most people know, Darwin boarded the *Beagle* in 1831 at the age of 22. Many people are aware of Darwin's observation of the various beak forms of the

finches inhabiting the Galapagos Islands and how these variations were caused by different environmental pressures and allowed the birds to each fill a different niche reducing competition and allowing them all to co-exist. These observations and the idea of variation among and within species is not the concept that has caused the great debates between creationists and evolutionists. The idea that fuels the debate is with respect to human origins and the idea that the creation of new species can take place solely through natural processes – namely natural selection. Therefore, this section will concentrate on how the Beagle voyage affected Darwin’s belief about the origins of man.

Less well-known is Darwin’s stop in Tierra de Fuego in 1832, where he viewed the native inhabitants, whom he described as “miserable degraded savages,” and the sight of these natives caused Darwin to reflect upon the whole human race as he wrote, “I could not have believed how wide was the difference between savage and civilized man: it is greater than between a wild and domesticated animal, inasmuch as in man there is a greater power of improvement” (Darwin, 1860). This may have been the first glimpse at Darwin’s realization of the mutability of humans.

Six years later, in 1838, the first orangutan was brought to England. The ability to observe an orangutan from close up allowed Darwin to recognize the lines of similarity between orangutans and humans, with the “savages” from Tierra de Fuego as the intermediary as he stated in March 1838 in his diary:

“Man – wonderful Man, with divine face, turned towards heaven, he is not a deity, his end under present form will come...he is no exception. – he possesses some of the same general instincts and feelings as animals. Let man visit Ourang-outang in domestication, hear its expressive whine, see its intelligence when spoken [to]; as if it understands every word said – see its affection. – to those it knew. – See its passion & rage, sulkiness, & very actions of despair... [L]et him look at the savage, roasting his parent, naked, artless, not improving yet improvable & let him dare to boast his preeminence. It is absurd to talk of one animal being higher than another. We consider those, where the intellectual faculties most developed as highest. – A bee doubtless would [use]...instincts as criterion.” Darwin March, 1838.

Yet although Darwin was able to notice the potential of development among animals, he still had not formulated a means to drive that potential. Just eight months after this diary entry, in October of 1838, Darwin read an essay by the economist Thomas Malthus who postulated that the human population would grow exponentially if certain “checks” did not reduce the population. The “preventive checks” included moral restraints such as abstinence or delayed marriage, while “positive checks” included anything which would cause a premature death to an individual and thus balance the population growth with the arithmetical growth of the food supply (Gould, 1992). These “positive checks” included such things as disease, starvation and war. Malthus also postulated that catastrophes

within a human population caused by these “positive checks” would return population to a lower, more “sustainable” level (Malthus, 1798). Malthus’ ideas acted as a propellant for Darwin as he formulated his selection postulation (Mayr, 1994; Junker & Hoßfeld, 2009). Darwin describes his thoughts about Malthus in another diary entry in 1838.

“[F]ifteen months after I had begun my systematic enquiry, I happened to read for amusement Malthus on Population, and being well prepared to appreciate the struggle for existence which everywhere goes on from long-continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of a new species.

“Here, then, I had at last got a theory by which to work; but I was so anxious to avoid prejudice, that I determined not for some time to write even the briefest sketch of it.”
*Darwin October 1838*³⁸

It is important to emphasize that it was Malthus and not Darwin who poignantly described the struggle to survive in human terms with an almost brutal live-and-let-die attitude. Malthus clearly described that limited resources and increases in birth rates will ultimately lead to mass deaths, which will consequently re-balance the system. He described two types of checks to keep populations within the resource limits: positive checks that increase the death rate such as hunger, disease and war, and negative checks that lower the birth rate such as abortion, birth control, prostitution, postponement of marriage and celibacy³⁹. Had Malthus been associated with this human struggle of the fittest instead of Darwin, the entire evolution circus may have been avoided. However, that is unfortunately not true. Twenty years after reading Malthus, Darwin introduced his concept of decent with modification in 1858 at a meeting of the Linnaean Society. Darwin’s *On the Origin of Species* was published in November 1859.

Although Darwin’s *On the Origin of Species* is his most well-known publication among the general public and often considered the publication that removed man from the crown of creation – it does not actually address the origins of man or include any of his thoughts about apes or savages. In the entire book, containing almost 500 pages, there is but one vague line dedicated to the origin of man stating simply “Light will be shed on the origins of man” (Darwin, 1859). It was not until 1871 that Darwin directly addressed the topic of human evolution in his book *The Descent of Man*, but by this point Darwin was already accustomed to controversy. His theory quickly found fans and opponents after its publication and in fact took as the central topic in the legendary debate between Bishop Samuel

³⁸ Darwin’s Diary. PBS <http://www.pbs.org/wgbh/evolution/darwin/diary/1838.html> (Accessed 3 January 2015)

³⁹ Geoffrey Gilbert, introduction to Malthus T.R. 1798. *An Essay on the Principle of Population*. Oxford World’s Classics reprint. viii

Wilberforce and Thomas Henry Huxley a year after its publication in 1860 (Junker & Hoßfeld, 2009) and has continued to fuel debates around the world ever since.

Part of the reason that Darwin and his theory are so heatedly debated is because many anti-evolutionists believe that evolutionary thought can cause moral degradation and atheism (Morris, 1972). These associations have originated largely due to the development of social Darwinism in the late 19th century when various philosophers tried to apply the biological concepts of natural selection and survival of the fittest to sociology and politics (Bowler, 2003). The following section will describe the rise of social Darwinism and how the (mis)use of Darwin's principles have led many to believe that evolutionary theory is a dangerous ideology that should not be taught in science classrooms.

Darwinism devolves into social Darwinism

It is important to look at how Darwin's theory of biological evolution transformed into other concepts such as "Social Darwinism" since it is this aspect that fuels so many of the fears that creationist harbor, in other words: teaching evolution will lead to social Darwinism. Social Darwinism can be understood as the transfer of the Darwinian concept of struggle for existence in nature to the realm of human existence at the individual level, races or nations (Bowler, 2003). It is also important to notice that this transformation occurred without much input from Darwin, yet as early as the 1860s philosophers began to apply his biological concepts to sociological structures and politics (Claeys, 2000). It can be argued that Darwin's proposals did not give rise to these ideologies, but by referring to these biological arguments regarding nature's laws, philosophers and political leaders were able to substantiate their own opinions by lending it a waft of scientific validity (La Vergata, 1994; Junker & Hoßfeld, 2009). Moreover, the notion of a natural struggle for existence was used to justify policies that showed little or no sympathy to those individuals who could not support themselves (Bowler, 2003).

There is no uniform ideology of social Darwinism, but instead a complex web of ideologies that exploit the idea of "survival of the fittest" in different ways (Bowler, 2003; Paul, 1988). In the early 1900s, for example, Vernon Kellogg drew a connection between German war atrocities and Darwin's concept of survival of the fittest⁴⁰. Although, this idea is most associated with Darwin and misused in social Darwinism, Darwin did not actually use this term in the original 1859 publication of *On the Origin of Species*. The term was first used by Herbert Spencer in his book *Principles of Biology* in 1864 (Bowler, 2003). Spencer was a polymath who was interested in Darwin's work and was the first to use Darwin's ideas and

⁴⁰ These types of associations have had very a very strong influence on the creationist movement, as it was this connection between Darwin/evolution and the German's vile acts that spawned the fundamentalist in America to rally against evolution education following the publication of Kellogg's book (more on this in chapter 3).

extend them into the realms of sociology and ethics and thus he is often seen as the father of Social Darwinism (Hodgson, 2004). Darwin did not make any public statement in opposition to or support of Spencer's usage of his theory and did decide to incorporate the term "survival of the fittest" into the 1869 version of *Species* at Alfred Russel Wallace's insistence (Claeys, 2000; Hodgson, 2004).

Creationist often claim that the teaching of evolution leads to such ideologies as communism, atheism, fascism and thus it is important to look and how these associations came to be. Although Karl Marx is associated with the birth of communism, the idea was actually postulated by Plato, in his *Republic*, in which he outlined a society with communal holding of property in 380 BC – more than 2000 years before Marx or Darwin actually picked up a pen. Yet Marx did try to substantiate his own theories on modern communism by using Darwinian principle. Because Karl Marx's most well-known publication *The Communist Manifesto* (1848) appeared eleven years prior to *Origin of Species*, there could be no mention of Darwin or his ideas of natural selection – yet in the second edition of *Das Kapital* (1873) Marx does make of direct mentions of Darwin. Even though Darwin does not take on a central role in any of Marx's formal publications, it is obvious through his private communications that Marx greatly admired Darwin's work and saw how it could be used to support his own theory (Gould, 1977; Gould, 1992). As he wrote in a letter to his friend Ferdinand Lasalle in January 1861, "Darwin's work is most important and suits my purpose in that it provides a basis in natural science for the historical class struggle" (Marx, 1942). Furthermore, Marx went on to send a copy of *Kapital* to Darwin himself with the inscription, "Mr. Charles Darwin, On the part of his sincere admirer, (signed) Karl Marx – London, 16 June 1873". Charles Darwin's association with atheism may have had its first step in the associations made by Marx, but the link between evolution and the demise of people's faith in God was helped along by Nietzsche.

Friedrich Nietzsche saw evolution as an accurate explanation of biological history and quickly realized that it could have far-reaching effects on other philosophical realms. If evolution is true, then there is no longer a need for God. He is no longer a requirement to explain the existence of humankind. This meant to Nietzsche that evolution would lead to the collapse of all traditional values and moral sediment of society (Birn, 2000). As Nietzsche stated in his 1882 publication *The Gay Science*, "Morality is the herd instinct in the individual." He also made his most well-known statement "God is dead" in this publication. This blunt statement has caused an American counter-attack on Nietzsche in the form of multiple t-shirts and bumper stickers reading, "Nietzsche is dead! – God". Nietzsche also formulated the concept of the "Übermensch" – unfortunately, this term will forever be associated with Adolf Hitler and the Nazi's since this concept was frequently used by Hitler to describe the superiority of the "Aryan" or Germanic master race (Alexander, 2001).

Social Darwinism has been blamed for causing both world wars and Nazism (Hodgson, 2004). In fact, by using Adolf Hitler as a poster boy for social Darwinism, the creationists have been able to point a finger and say ‘this is what Darwin’s theory leads to’ thus allowing religiously conservatives to charge Darwin with the “moral responsibility for the crimes of Hitler” in order to undermine the theory of evolution (Richards, 2013). Yet scholars continue to debate whether or not Hitler even accepted evolution as a valid theory. What is known is that he does not ever mention Darwin directly. He does, however, use biological concepts to argue his opinion about the necessity of maintaining the purity of the superior Aryan race as he said, “If Nature does not wish that weaker individuals should mate with the stronger, she wishes even less that a superior race should intermingle with an inferior one; because in such a case all her efforts, throughout hundreds of thousands of years, to establish an evolutionary higher stage of being, may thus be rendered futile” (Mein Kampf, 1925).

The link between these types of statements and Darwin’s theory of natural selection continue to be debated, but ultimately for this thesis, it is not necessary to prove whether or not Hitler was in fact a Darwinian. It suffices to show that the creationists believe this to be true and use this as a tool to fight evolution. The clearest example of this can be seen in the books by Richard Weikart, namely: *From Darwin to Hitler* (2004) and *Hitler’s Ethic: The Nazi Pursuit of Evolutionary Progress* (2009), in which Weikart argues “No matter how crooked the road was from Darwin to Hitler, clearly Darwinism and eugenics smoothed the path for Nazi ideology, especially for the Nazi stress on expansion, war, racial struggle, and racial extermination” (2004). Here it is clear that Hitler is used as a propaganda tool by the creationists in order to denigrate evolutionary theory – as Richard Weikart is none other than a senior fellow at the Center for Science and Culture at the Discovery Institute (the Intelligent Design think tank). Barbara Forrest gone one step further to show that not only is this use of Hitler a type of propaganda, but the publishing of such books is tactic taken directly from the Intelligent Design Wedge strategy to show that Darwinian science is cause moral decay (2004). The Discovery Institute and the Wedge strategy will be addressed in more detail the following chapter.

Summary

In this section, it could be shown that the theory of evolution is a very valid and well-supported theory in contrast to many creationist claims. Darwin did not invent the idea of transmutation of species or evolution but provided the mechanism by which evolution could take place, i.e. natural selection. It was illustrated that the intention of science and scientists is to describe how the natural world works and that the reliance upon using natural forces to explain natural phenomenon is not an attack on Christianity or morality but simply the manner in which science functions and leads to scientific advancement and that the banishment of supernatural causal

agents formed the foundation of the science revolution. Moreover, clear examples of how science works and clear examples of how the theory of evolution can be tested and supported were provided to act as examples of what could be incorporated into school textbooks in order to alleviate a teacher's responsibility of explaining this complex theory to high school students.

Finally, an explanation was provided for how many misassociations between evolution and concepts such as survival of the fittest, atheism, fascism, and communism originated. It was made clear that these concepts were not instigated by Darwin or his theory but were instead linked to evolution through the usage of his basic ideas by other philosophers, scientists and world leaders to add scientific validity to their own ideas or through cleverly crafted propaganda tactics from creationists themselves.

In the following chapters, Creationism, Scientific Creationism and Intelligent Design will be discussed in more detail. The background information that was provided in this chapter should allow the reader to more easily recognize the fallibility of creationist claims in the following chapter and help the reader understand why Scientific Creationism and Intelligent Design cannot be considered a science and why the teaching of these principles in science classrooms would confuse students about the general nature of science. The information provided in this section will also help the reader understand the misleading quality of "teaching the strengths and weaknesses of evolution" that will be discussed in later chapters.

Creationism and Intelligent Design

The purpose of this chapter is to highlight the differences and similarities creationism, creation science and intelligent design. This chapter will focus on the origin and reasoning behind each of these creationist varieties and offer reasons for the diversification of the creationist movement. The main focus will be placed on the intelligent design movement since it is the most current of the creationists' trends and poses the largest threat to science education (Forrest, 2007).

Creationism and Creationists

Every culture in the world has its creation story. In the context of this thesis, the term creation is in reference to the Christian creation story based on the story of Genesis. The story of Genesis is told separately in two different chapters and the stories are not identical. The creation story of Genesis is actually older than Christianity as it belongs to the first book of the Old Testament. The roots of the Genesis story date back to the beginning of Judaism. For the creationist, Genesis is not just a story to be read like poetry but is a story that is believed to be the word of God that explains exactly how God created the Earth and man (Ham, 2012; Ham, 2013, Hemminger, 2009). This concept that the Bible should be read literally is closely linked to fundamentalism. For more information, about fundamentalism and how it

originated see the previous sections on American History and Religion and Fundamentalism. There is a difference in the degree in which the Genesis story is seen as being understood for its literal meaning. For some “the real point of the Creation story was not meant to teach us how God created; it was meant to teach us that God created” (Hamilton, 2005). Yet for some creationists the story of Genesis does in fact mean for them that it is exactly how God created and have found that the manner in which God created is in direct opposition to how life came to be according to the theory of evolution (Ham, 2013).

A distinction will be made in this thesis between a person of faith who may just simply believe very strongly in God and that He created life and the creationist who believes that Genesis describes exactly how God created. Because a person of faith who believes in the allegorical symbolism of the Bible and believes in a personal God but is nevertheless comfortable with the fact that God may have used evolution as a tool to create life poses no true threat to educational standards since they would arguably not be opposed to the teaching of evolution nor interested in promoting the watering down of evolution education in favor of Creation Science or Intelligent Design (ID). Such persons of faith are often referred to as supporters of theistic evolution.

The creationists pose a threat to science education because they believe that the story of Genesis can and should be used as a guide to understanding how the natural world came into being (Ham, 2012). In other words Genesis in the eyes of a creationists could be seen as a scientific manual that should be taught in schools as an equal theory to evolution or as the basis of a theory such as Intelligent Design (Forrest, 2007). It is the creationists who are also now Intelligent Design proponents (Scott, 2009), which will be the focal point of this thesis and therefore the term creationist in all further text will be in reference to the creationists and will include those who refer to themselves as Intelligent Design proponents. As briefly described in the chapter Religion and Fundamentalism, there is a continuum of Creationism that was tabulated by Eugenie Scott. This chapter will go into more detail about the positions and differences among the groups.

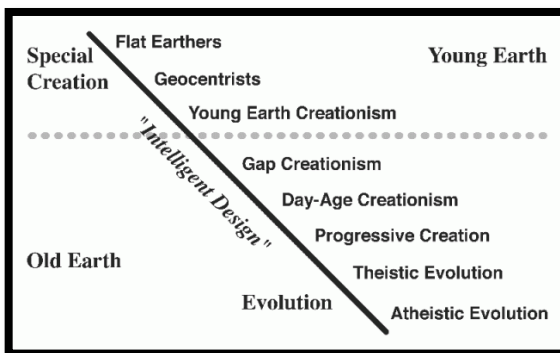


Fig. 3: *Creationism Continuum (Scott)*

First, it is important to notice that Scott made a point of placing Intelligent Design outside of the continuum. This point will be discussed in more detail later in this chapter and will illustrate how ID has become the “big tent” in which all creationists can gather. But before discussing ID, this chapter will first begin with a look at the separate creationist camps.

Flat Earth Creationists are those creationists who believe in the most literal interpretation of the Bible as they hold that the world is flat, just as it is stated in various books of the Old Testament, perhaps most clearly in Isaiah 40:22 “He sits enthroned above the circle of the earth, and its people are like grasshoppers. He stretches out the heavens like a canopy, and spreads them out like a tent to live in”. Moreover, the New Testament states that Jesus ascended up into Heaven. Many who are not familiar with the creationist movement may find it hard to believe that anyone in a modern country with access to free-education would be capable of maintaining such thoughts, but according to Charles K. Johnson, former head of the International Flat Earth Research Society, “Reasonable, intelligent people have always recognized that the earth is flat.” Johnson goes on to explain that it is not just that the world is flat, but that many other characters of space and distances are different in the eyes of the Flat Earth creationists. He describes Earth in the shape of a phonograph, the North Pole is in the center, the edges are guarded by southern ice walls 150 feet high, the dome of heaven is approximately 4000 miles away and the stars are much closer than that, only about “as far as San Francisco is from Boston” and the sun and moon are each about 32 miles in diameter. And Johnson’s views on science are clear, “The whole point of the Copernican theory is to get rid of Jesus by saying there is no up and no down. The spinning ball thing just makes the whole Bible a big joke”. In addition, when asked about more current science showing the spherical shape of the Earth, Johnson simply claims, “You can’t orbit a flat earth. The Space Shuttle is a joke—and a very ludicrous joke” (1980). He goes on to point out that the entire purpose of the space program is to “prop up a dying myth – the myth that the earth is a globe” (Schadewald, 1980).

Geocentric creationists take one step forward from the Flat Earth creationists’ belief and accept that the Earth is a globe but still claim that the Earth is the center of the solar system. Again, these claims are based on strict literal interpretations of particular passages from the Bible. For many, it may be difficult to understand how a group of people could maintain such a belief in a modern, industrialized country, but they do and they are utilizing modern technology and media to share their view with as many listeners as possible. They are in the process of writing blogs, printing books and broadcasting lectures on an appropriately named website “galileowaswrong.com”. Although Eugenie Scott stated that this group, like the Flat Earth creationists reject almost all modern physics, astronomy and biology (Scott, 2009), the Geocentric creationists seemed to have learned to use science to propagate their religious beliefs. Ironically, the same year that Scott

stated that they reject modern science, the geocentric creationists came out with the book entitled *Galileo Was Wrong: The Church Was Right: The Scientific Evidence for Geocentrism* authored by Robert Sungenis and Robert Bennett. And it is now available in three volumes.

It is clear, when looking at the lectures broadcast on galileowaswrong.com and youtube.com that they have learned to guise themselves as scientific, talking about Galileo's observations and Newton's laws and saying "Newton is correct" but the conclusions were wrong. In essence, they are now trying to use science to explain the physics behind their geocentric ideas. In a lecture entitled *Geocentrism – The Coming Scientific Revolution – 3* Robert Sungenis states, "So we can use Newton's Laws for the geocentric system. All we have to say is: What occupies the center of mass? It's the Earth. Very easy". So they have moved away from rejecting modern science, into manipulating it for their own theory. As Sungenis states himself in his lecture, "So what we're doing is, we're using modern science but we're using it for a completely different system." Although Scott stated that Geocentric creationists (despite all their renewed efforts) pose an insignificant threat to evolution, their most recent efforts to (mis)use of science or at least science terminology can be very misleading to students who do not understand enough about physics to discern whether or not these geocentric claims are true.

Taking it another step forward, the Young Earth creationists (YECs) accept that the Earth is a globe and accept the concept of heliocentrism (i.e. that the sun is the center of the solar system) but they deny all scientific conclusions regarding the age of the Earth. For the YECs, the Earth is between 6000 and 10000 years old (Scott, 2009). This form of Creationism is largely associated with Henry Morris (Blancke, 2014; Numbers, 1992; Scott, 2009) who co-authored *The Genesis Flood* with John C. Whitcomb Jr. in 1961. In fact, prior to Morris, the majority of creationists accepted the antiquity of the earth (Blancke, 2014). Henry Morris is arguably the most influential creationists in the second half of the twentieth century (Scott, 2009). He and Whitcomb were not necessarily the first to claim scientific rationale for YEC beliefs but they were the first to draw a large following, so much so that the young-earth belief system became the majority opinion among creationists within just a few decades (Blancke, 2014). According to Scott, *Creation Science* (which will be discussed in detail later) was formed through the hundreds of books and pamphlets written by Morris and those who were inspired by him. Morris also founded the Institute for Creation Research (ICR) in 1970, which is now led by his son John Morris. More information about the ICR will be discussed later, but it suffices to say that the YECs are a much larger threat in the battle against evolution because they have a much larger following who is willing to invest exponential amounts of time and money in defending their view of a young Earth. Just by taking a quick glance at their website icr.org one finds over seven pages of books and DVDs available for sale, plus apparel. Unlike the Flat

Earth creationists and the geocentric creationists, the YECs have found their way into mainstream America.

Moving on to the group of creationists that have been able to accept physics and geology and astronomy, but are still grappling with biology are the Old World Creationists (OECs). Their name in itself shows that these creationists accept the idea of an ancient Earth as fact. Within this group, though, are many sub-groups who each differ in their own way of being able to incorporate the ideas of an ancient Earth and of special creation, i.e. that God created the Earth and all life upon it.

The Gap Creationists for instance believe that the six days of creation are in fact 24 hour periods, but they have found any easy solution to incorporate the ancient age of the Earth simply by deciding that there was a large temporal “gap” between Genesis 1:1 and Genesis 1:2. In other words, God created the heavens and the earth and then took a very long break. After this temporal gap, the 24-hour periods continue in their normal literalist fashion, i.e. there are no more temporal gaps between any of the following verses in Genesis 1:2–1:31 (Scott, 2009).

The Day-Age Creationists take a different approach to their solution in that they do not try to incorporate the six days of creation into the modern concept of a 24-hour period and simply state that the days themselves were very long, even thousands to millions of years long. This view allows this group of creationist to enjoy their perceived parallels between organic evolution and Genesis, although they ignore the anomalies such as birds occurring before land animals (Scott, 2009).

Progressive Creationism is the majority view of today’s Old Earth Creationists. They have basically accepted that simple, single-celled organisms appeared before multicellular organisms, followed by more complex forms of life, much like is seen in biological evolution, yet the progressive creationists differ greatly from an evolutionist in that they do not believe that the series of appearance is due to evolution, i.e. that the God created special kinds as they are and that they did not evolve from each other. God simply created life in this pattern – simple first, then more complex (Scott, 2009).

Although mentioned in the continuum, this section will not go into large detail about either Theistic Evolution or Atheistic Evolution since they accept that one species gives rise to another and accept descent with modification through natural processes instead of divine intervention and thus do not pose any threat to evolution education in the United States (Scott, 2009). The only point that may be added that theistic evolution is the official position of the Catholic Church as Pope John Paul II stated in 1996 that God created the world, evolution happened and humans may have descended from more primitive forms, but God was responsible for the creation of the human soul (Scott, 2009). Atheistic evolution obviously in fitting with its name rejects all possibility of God and His involvement in the creation of humans or any other species.

Various polls in the United States show that anywhere between 70 to 90% of Americans believe in God. These polls are not necessarily important for this study, but what is important to see is who is willing to join groups and work towards a common goal. If one were to take look at the idea of Flat Earthism, one would see that before Johnson's death, the International Flat Earth Research Society had a membership of 3,500 (Martin, 2001) while the best-known atheist group, American Atheists, only has a membership of 2,200 members (Scott, 2009) pointing to the fact that the creationists of all forms can pose a threat simply through their passion and desire to defend and propagate their beliefs. This leads to the next part which talks about creationism as a movement.

Creationism as a Movement

For the purpose of this thesis, Creationism as a movement is defined as a movement that aims to defend the biblical account of God's special creation and is focused on removing/weakening/undermining the teaching of evolution. This is an important inclusion because a simple focus on defending the biblical account of special creation could take place in the form of a pious movement that uses theological tools to increase biblical literacy (Hemminger, 2009). Christians discussing the theological implications of special creation would not cause any legal conflict within the walls of the church or parochial schools, nor would it have as much of an effect on science education. But instead, this movement focuses on opposing evolution, specifically the teaching of evolution. All further reference to Creationism as a movement will be in reference to this opposition to the teaching of evolution since it is this specific aspect that poses an endangerment to the educational science standards in America.

The creationist movement, partially due to the different attitudes carried by the various creationists, is multifaceted in its approaches. Sometime the attack is obvious and over-the-top like the statements made in the 1920s, "The Germans...were angels compared to the teachers, paid by our taxes who feed our children's minds with the deadly, soul-destroying poison of Evolution" (Humes, 2007)⁴¹. And also more current attacks like those from Ken Ham, who accuses evolution of destroying society (2012). In general though, the direct attacks on evolution have become more discrete, cloaked as Creation Science and most recently as Intelligent Design in order to imply that they are also interested in the pursuit of scientific truth and in the better education of America's youth⁴², but as Eugenie Scott has discovered through her numerous years at the National Center for Science Education that despite their claims, that all groups of creationists are

⁴¹ T.T. Martin Hell and the High School. Taken from Humes, 2007 pg 50.

⁴² Details about these changes in name and strategy are discussed in more detail in the second part of this thesis in Examining the Legal Conflict..

ultimately interested in banishing evolution due to their strict religious beliefs, as she stated:

“[The] pursuit of scientific and intellectually valid truth is not really what creationism is all about. Creationism is about maintaining particular, narrow forms of religious beliefs – beliefs that seem to their adherents to be threatened by the very idea of evolution. In general, it should not be anyone’s business what anyone else’s religious beliefs are. It is because creationism transcends religious belief and is openly and aggressively political that we need to sit up and pay attention. For in their zeal to blot evolution from the ledger books of Western civilization, creationists have tried repeatedly for well over a hundred years to have evolution either watered down, or preferably completely removed, from the curriculum of America’s public schools. Creationist persistently and consistently threaten the integrity of science teaching in America – and this, of course, is of grave concern” (Scott, 2009, p xii).

As Scott pointed out, this creationist attack on evolution has been taking place for over one hundred years, but when exactly and why did this opposition to evolution education begin? The exact beginning of the creationist movement is difficult to pinpoint and there is disagreement among authors. Some state that Darwin’s *Origin of Species* was under attack since it was first published in 1859 (Shermer, 2006). Other authors state that Darwin’s concept of evolution was generally accepted and did not meet a high state of controversy until the 20th century (Matzke, 2010). While some state that the world’s population rejected naturalistic evolution prior to the 1900s, organized antievolutionism did not exist until the 1920s (Numbers, 2009). What is certain is that the concept of naturalistic evolution has been a topic that has been debated and discussed since the very beginning as can be seen for example in the legendary debate between Huxley and Wilberforce in 1860 (Ruse, 2001). Yet the purpose of this thesis is to look at how creationism has affected education in the United States, which these types of debates did not. For that reason, this thesis will focus on the organized movement against evolution that began in the United States in the early 1900s. Matzke has further broken down the history of the movement into four epochs, the first of which began in 1920.

According to Matzke, the first movement took place between 1920 and 1968 and was focused on banning evolution and it was during the beginning of this time that we find the first organized “fight” against evolution in the US. In other words, this is the first time when large groups come together to protest the evolution and were willing to take political action to reach this goal, in other words, not just isolated debates but a movement (2010). The movement spawned just after World War I, the German military and intellectual leaders had justified their militarism and imperialistic expansion using classic social Darwinism, in other words the survival of the fittest nation, the creation of the superior German race through the elimination of the unfit races (Shermer, 2006). Vernon Kellogg wrote in his

book *Headquarters at Night*; a record of conversations and experiences at the headquarters of the German army in France and Belgium that the creed of natural selection was the gospel of the German military (1917). In his exact words, he wrote:

Well, I say it dispassionately but with conviction: if I understand theirs, it is a point of view that will never allow any land or people controlled by it to exist peacefully by the side of a people governed by our point of view. For their point of view does not permit of a live-and-let-live kind of carrying on. It is a point of view that justifies itself by a whole-hearted acceptance of the worst of Neo-Darwinism, the Allmacht of natural selection applied rigorously to human life and society and Kultur. (Kellogg, 1917, p. 22)

Professor von Flussen [not true name] is a Neo-Darwinian, as are most German biologists and natural philosophers. The creed of the Allmacht of natural selection based on violent and fatal competitive struggle is the gospel of the German intellectuals; all else is illusion and anathema. (Kellogg, 1917, p. 28)

The Germans at this time were associated with evil, with publications claiming that the German military forces had poisoned French wells and children's candy during WWI (Humes, 2007), yet Kellogg's observations and the connection that he made between the German militarism and Darwin may not have played such a dramatic role in the future of anti-evolution movement in the United States had his work not be emphasized and supported by such a poignant forward to the book, written by none other than President Theodore Roosevelt himself who stated:

One of the most graphic pictures of the German attitude, the attitude which has rendered this war inevitable, is contained in Vernon Kellogg's 'Headquarters Nights.' It is convincing, and an evidently truthful exposition of the shocking, the unspeakable dreadful moral and intellectual perversion of character which makes Germany at present a menace to the whole civilized world.

The man who reads Kellogg's sketch and yet fails to see why we are at war, and why we must accept no peace save that of overwhelming victory, is neither a good American nor a true lover of mankind.

Thus, Kellogg made it clear that the German actions were based on Darwinistic thinking and Roosevelt made it clear that anyone who is not convinced by Kellogg's writing is not a good American. This coincides with many of the statements made in the chapter on American History that the belief in God became equated with democracy and patriotism, while here one can see that evolution is equated with German evil and fascism. Thus by fighting evolution, one could protect the righteous Americans against the evils caused by Darwinism in fascist Germany. Kellogg was in fact capable of convincing many Americans of his view point, in particular William Jennings Bryan, who read *Headquarters at Night* and it fueled his already cynical view of evolution or in the words of Stephen Jay Gould, "Bryan conflated a per-

verse interpretation with the thing itself and affirmed his worst fears about the polluting power of evolution” (1987). As Bryan stated, “I object to Darwinian theory because I fear we shall lose the consciousness of God’s presence in our daily life if we must accept the theory that through all the ages, no spiritual force has touched the life of man” (Colt and Jennings, 2012). Bryan played an indispensable role in getting the anti-evolution ball rolling, as Gould states, “without Bryan there never would have been anti-evolution laws, never a Scopes trial, never a resurgence in our day, never a decade of frustration and essays for yours truly, never a Supreme Court decision to end it all”⁴³ (Gould, 1987).

During this time in history, the creationist attack on evolution was clear, obvious and straightforward (Numbers, 1992; Matzke, 2010). Multiple states began to ponder legislation prohibiting the teaching of evolution and some states passed this legislation that included very clear language as is seen in the Butler Act, which was passed in Tennessee in 1925 and stated: “Be it enacted by the General Assembly of the State of Tennessee, That it shall be unlawful for any teacher in any of the Universities, Normals and all other public schools of the State which are supported in whole or in part by the public school funds of the State, to teach any theory that denies the story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals.”

The Butler Act was put to the test by the American Civil Liberties Union (ACLU) the same year the bill passed in the now well-known Scopes Trial (the laws and trials will be discussed in detail in the chapter Examining the Legal Conflict). During the trial, the people involved as well as the spectators were very open about their distaste for evolution and the dangers they perceived involved when evolution is taught (Humes, 2007; Numbers, 1998). Again, William Jennings Bryan played a lead role and acted as the lawyer for the prosecution. In his closing statement of the trial, he stated:

“The real attack of evolution, it will be seen, is not upon orthodox Christianity or even upon Christianity, but upon religion – the most basic fact in man’s existence and the most practical thing in life. If taken seriously and made the basis of a philosophy of life, it would eliminate love and carry man back to a struggle of tooth and claw” (Shermer, 2006, p. 23).

In the end, Scopes was found guilty. Following the trial, the anti-evolutionist lived in a friendly ecosystem where evolution was almost nowhere to be found in classroom textbooks around the country for almost 30 years (Humes, 2007; Matzke, 2010). For more information about this period and about the process of textbook adoption in the United States see the chapter Textbook Adoption.

⁴³ Gould made this statement in 1987 believing that the Edwards decision would put an end to this creationist movement but, as will be discussed later, this decision only led to a mutation of the creationist approaches.

Things began to change once the race to space began with the USSR; the Americans began to panic and realized that they needed to update their textbooks and educational standards in order to keep up the soviets (Padian, 2010). The Biological Science Curriculum Study thus began work on creating a series of state-of-the-art biology textbooks and by the 1960's evolution finally made a reappearance in school textbooks (Humes, 2007; Numbers, 2006; Ruse, 2005). During this same decade, many of the bans on teaching evolution were also lifted. *Epperson v. Arkansas* 1968 overturned the laws from the 1920s banning the teaching of evolution in the classroom. The Supreme Court in a vote 9:0 thus made any laws preventing the teaching of evolution to be unlawful. (For more information about this case, see the chapter: Examining the Legal Conflict.)

The *Epperson* decision caused a shift in the creationist's environment. They were forced to respond to this environmental change in order to survive. So they mutated and evolved leading to the second epoch which would dominate the creationist movement strategies from 1968 until 1987 (Matzke, 2010). At this point, the straightforward attack on evolution gave way to a more discrete form of attack in the hopes of surviving not only the *Epperson* decision but also the newest threat: the Lemon Test, which was established in 1971.

The Lemon Test is a judicial tool used to test whether or not a policy or action is in violation of the Establishment Clause (i.e. whether or not it violates the freedom of religion). For more information on the Lemon Test and the Establishment Clause, see the chapter Examining the Legal Conflict. Accordingly, the creationist movement began a new campaign that might survive the American judicial system. As early as 1968 the term "equal time" appeared in print for the first time and became the banner for the second epoch of the creationist movement that was focused on the promotion of Creation Science or Scientific Creationism (Matzke, 2010; Numbers, 2006). This idea of "equal time", sometime also called "balanced treatment", refers to the concept of teaching two alternative theories equally within public school science classrooms; the two theories being: 'evolution science' and 'Creation Science' (Dixon, 2008; Ruse, 1999).

Creation Science/Scientific Creationism

This new species of creationism, "Creation Science" or "Scientific Creationism" differs from the original strain of creationism in that the proponents of Creation Science attempt to find scientific support for the Genesis creation narrative and also try to find "evidence" that disproves scientific facts about the history of the Earth and the evolution of animals upon the Earth (Morris, 1961; Numbers, 2014). As Scott describes it, biblical creationism relies solely upon biblical revelation to ex-

pound and defend the creation model, while Scientific Creationism⁴⁴ attempts to avoid reliance upon Biblical revelation and instead tries to utilize scientific data to support and expound the creation model (2009). As Numbers stated, “The trans-mogrification of creationism from religion to science took place in direct response to the events in California, which encourage creationists to believe that they could squeeze into science classrooms simply by shedding superfluous biblical weight” (Numbers, 2006).

Although this concept of Creation Science or Scientific Creationism may have acted as the poster child for the creationist movement in the 60s, 70s and 80s following the Epperson case, the roots of this idea reach much farther back in history.

As mentioned earlier, the main beliefs propagated by Creation Science are in line with general YEC thought, in that creation happened out of nothing, the Earth is around 6,000 years old, all life was created as a fixed kind, and that fossils distribution was caused by a large cataclysmic flood (Morris, 1961). Throughout the 1900s, YEC was promoted in particular by the Seventh-day Adventists, conservative Lutherans and other literalists (Numbers, 2006; Matzke, 2010). In fact, prior to the promotion of Creation Science, the majority of creationists – even those who believed in the literal interpretation of the Bible – accepted the antiquity of the Earth (Numbers, 2006; Numbers, 2014).

This new generation of YEC and Creation Science proponents were led by an Adventists and “flood geology” advocate, George McCready Price (Matzke, 2010). Like other fundamentalists of the age, Price also believed that evolution would lead to the demise of Christianity, ethics and political freedom – yet instead of focusing on passing legislation, Price was focused on finding scientific data to support biblical accounts (Numbers, 1992). As early as 1902, Price produced a manuscript for a book, in which he proposed that there was geological evidence of the story of Genesis and that the sequence of fossils resulted from the different responses of animals to the encroaching flood (Numbers, 2006). Moreover, he described how Niagara River Gorge, the Grand Canyon, the Alps and the Himalayas had also been formed during this great flood (Numbers, 1992). Interestingly, because he believed that the problem with evolution was centered on the idea of successive geological ages, Price paid very little attention to the biological aspects of evolution such as the formation of species (Numbers, 1992). By 1923, he had created his own college textbook entitled *The New Geology* in which he put forth these ideas and ultimately sold over 15,000 copies of his book (Numbers, 2006). Yet, Price’s interpretation of geological history remained limited to the peripheral

⁴⁴ Scientific Creationism and Creation Science are terms that can be used interchangeably as they refer to the same movement. The two terms exist for one ideology due to disagreements within the movement among the members who could not unanimously decide which term better described the work they were doing. Ultimately Morris believed that neither of these terms did the movement justice (Morris, 2001; Numbers, 1992).

groups of fundamentalists, but this would change once Price began to collaborate with John C. Whitcomb, Jr and Henry Morris (Numbers, 2014).

In 1938, a group of Adventists in cooperation with Price founded the Deluge Geology Society (DGS), which required that members believe in the six literal days of Creation and be devoted to studying the Deluge as the major cause of the geological changes since creation (Numbers, 1992). The DGS also began some of the earliest creationist searches for Noah's ark and investigations of human fossil footprints – even forming a Footprint Research Committee (Numbers, 1992). This society provided the link between Price and Henry Morris, who became a member of Deluge Geology Society while he was a graduate student (Numbers, 1992). Morris had chosen to study hydraulic engineering with a minor in geology so that he would have a good understanding of how the floodwaters had shaped the face of the Earth and took the idea of deluvial geology and ran with it (Flank, 2007).

Henry Morris is often referred to as the “father of modern creation science” and although Morris was not the first to claim scientific rationale for YEC beliefs he was the first to draw a large following and thus it can be argued that Morris was one of the most influential creationists in the second half of the twentieth century (Numbers, 2006; Scott, 2009). In fact, Morris can be seen as the figure responsible for moving the majority of creationists towards a belief in a young Earth, which had been a view point limited to the Seventh-Day Adventists⁴⁵ prior to Morris' influence (Numbers; 2006). As Morris began to lead this new movement in a new more “scientific” direction, one thing remained identical to the original creationist movement and that was the clear disdain for evolution and Darwin as Morris stated, “Evolution is the root of atheism, of communism, Nazism, behaviorism, racism, economic imperialism, militarism, libertinism, anarchism and all manner of anti-Christian systems of belief and practice” (1972). Yet as stated before because of the changing social and political structure in the United States, this new form of Creationism would not survive on these old anti-evolution fumes; they had to make serious amendments and learn to disguise their religious quest as a scientific theory as Morris clearly proclaimed, “Creationism is on the way back, this time not primarily as a religious belief, but as an alternative scientific explanation of the world in which we live” (Numbers, 2006).

Morris published hundreds of books and pamphlets. His most well-known publication was *The Genesis Flood*, which he co-authored with John C. Whitcomb, Jr. and which was published for the first time in 1961. The title of this book actually came from Whitcomb's Th.D. dissertation that he completed in 1957 in

⁴⁵ Seventh-Day Adventists emerged during the religious revival climate of the Second Great Awakening after Baptist preacher William Miller's proclamation that Christ would be returning on October 22, 1844 but was formally established in 1863 and currently is characterized by their observation of Saturday as the Sabbath and the expectation of the Christ's literal second coming. www.adventists.org (Accessed 8 May 2016).

which he presented 450 pages of the historicity and geological evidence for Noah’s flood (Flank, 2007). While Whitcomb had relied primarily on the findings by Price, Morris’ education as a hydraulic engineer allowed him to add scientific touch to the book by adding chapters on radioactivity and stratification (Numbers, 1992). Although their original work had been greatly motivated by the work done by Price, Morris and Whitcomb deleted almost all mention of Price and the Adventists from the book in the hope of a new start (Numbers, 1992).

According to Matzke, the Genesis Flood is the most important creationist book of the 20th century since the book and Morris “transformed YEC from a somewhat obscure doctrine of extreme fundamentalists and spread it far and wide across evangelical churches” (2010). Morris emphasized that the three greatest events in world history were Creation, the Fall and the Flood, again focusing on the fact that the earth was created in six literal days, that no death was present until after the Fall and that major formations on earth were caused by the Flood (Numbers, 1992). The book went through twenty-nine printings and sold over 200,000 copies (Numbers, 1992). This book did indeed start a revolution as Michael D. Gordin, science historian, describes it; The Genesis Flood is “one of postwar America’s most culturally significant works about the natural world. It was read by hundreds of thousands, spawned its own research institutes, and remains absolutely rejected by every mainstream biologist and geologist” (Gordin, 2012).

The research institutes that Gordin was referring to are the Creation Research Society (CRS) founded by Morris in 1963, the Creation Science Research Center (CSRC) founded in 1970 and the Institute for Creation Research (ICR) founded in 1972. These institutes were designed to provide scientific support for YEC beliefs including flood geology and the special creation of biological “kinds” (Matzke, 2010). This term “kinds” is widely referenced in creationist texts and is derived from the Genesis verse that states “And God made the beast of the earth after his kind, and cattle after their kind, and everything that creepeth upon the earth after his kind: and God saw that it was good” (King James Version). Below is an example of the statement of belief that members of the Creation Research Society had to sign (Numbers, 1992).

Tab. 10: Statement of Belief for members of the Creation Research Society

Statement of Belief for CRS Members
<p>1. The Bible is the written Word of God, and because it is inspired throughout, all its assertions are historically and scientifically true in all the original autographs. To the student of nature this means that the account of origins in Genesis is a factual presentation of simple historical truths.</p> <p>2. All basic types of living things, including man, were made by direct creative acts of God during the Creation Week described in Genesis. Whatever biological changes have occurred since Creation Week have accomplished only changes within the original created</p>

kinds.

3. The great Flood described in Genesis, commonly referred to as the Noachian Flood, was an historic event worldwide in its extent and effect.

4. We are an organization of Christian men of science who accept Jesus Christ as our Lord and Saviour. The account of the special creation of Adam and Eve as one man and woman and their subsequent fall into sin is the basis for our belief in the necessity of a Saviour for all mankind. Therefore, salvation can come only through accepting Jesus Christ as our Saviour.

Despite the heavy focus on Christ in the belief statement, the CRS stressed education and research rather than evangelistic or political actions using their limited resources to focus on publishing the CRS Quarterly and creating a high-school biology textbook (Numbers, 1992). The focus on creating high-school materials came in part through the actions of the Biological Science Curriculum Study (BSCS), who began disseminating new textbooks that highlighted evolution as a key component of biology in 1963, creating a furious backlash as creationists felt like the country was making an “attempt to ram evolution down the throats of our children” (Numbers, 1992). The CRS succeeded in producing a textbook in 1970 entitled *Biology: A Search For Order in Complexity* (Moore and Slusher) and Morris’ own textbook, *Scientific Creationism*, came out in 1974.

In *Scientific Creationism*, Morris attempted to remove all religious connotations with his new ideas and to present them as science (Numbers, 1992). This symbolized a major tactical shift amongst creationists as they moved away from denying evolution to claiming that scientific creationists had as valid of a scientific theory as the Darwinist (Numbers, 1992). This idea of scientific appearance spawned the later institutions, Creation Science Research Center (CSRC) founded in 1970 and the Institute for Creation Research (ICR) founded in 1972, to circulate journals that are still in publication and they were particularly popular among the American public in the 1970s⁴⁶ (Matzke, 2010).

Tab. 11: Legislative definition of Creation Science

Definition of Creation Science according to Arkansas Act 590
<p>Creation Science provides scientific evidence that indicates:</p> <ol style="list-style-type: none"> (1) Sudden creation of the universe, energy, and life from nothing; (2) The insufficiency of mutation and natural selection in bringing about development of all living kinds from a single organism; (3) Changes only within fixed limits of originally created kinds of plants and animals;

⁴⁶ This coincided with the period in American history when the Christian Voice, Moral Majority and Christian Coalition began to take political action in the United States and tried to pass legislation that was in line with Christian thought by bypassing the separation of church and state (see previous chapter on American History).

- (4) Separate ancestry for man and apes;
- (5) Explanation of the earth's geology by catastrophism including the occurrence of a worldwide flood; and
- (6) A relatively recent inception of the earth and living kinds.

The 1970s in the United States was a period in which evangelicalism began to flourish and expand quickly – replacing the old time trend towards fundamentalism – with more and more Americans identifying themselves and “born again Christians” (Gribben, 2011). In fact, the growth of the evangelical movement was so rapid and popular among the Americans during this time that Newsweek proclaimed 1976 the “year of the evangelical” (Gribben, 2011). This rapid expansion of evangelicalism, coupled with the desire for political change, made it possible for the creationist institutes to gain enough support that they could begin to focus directly on disseminating their ideas to schools and they were in fact so successful that the CRS textbook *Biology: A Search For Order In Complexity* was adopted for use in public schools in the state of Indiana. In fact, the CRS textbook became the subject of a court case in 1977, *Hendren v. Campbell*, which ruled that using such textbooks in public school was unconstitutional (more information can be found in the chapter Examining the Legal Conflict).

Following the loss in 1977 in the case of *Hendren v. Campbell*, Wendell Bird authored a legal article describing how one could legally get Scientific Creationism into the classroom by using empirical evidence to construct scientific discussion that were separate from theological reasoning and terminology (1978). Bird joined the ICR and began to update the “equal time” strategy so that it was aimed at pro-creationists school boards rather than legislatures and then these resolutions were distributed across the US in 1979 (Matzke, 2010). Despite Bird’s suggestion of targeting school boards, a group of creationist, led by Paul Ellwanger, changed the resolution into a legislative proposal and distributed it to legislators and just a year later legislation requiring equal time for Creation Science was proposed in dozens of state legislatures in 1980 and 1981 and was passed in Arkansas and Louisiana (Larson, 2003). The Arkansas Act 590 provided a clear definition of Creation Science as it stated:

The main marketing strategy behind Creation Science was to “Sell more science” – in other words promoters of this creationist trend continually barked upon the scientific status of Creation Science – explaining that censoring scientific information contradictory to evolution is synonymous with religious dogma (Numbers, 1992). There was another push for research that resulted in the formation of CRS research facilities in the 1980s such as the Grand Canyon Experiment Station in Arizona and a Grasslands Experiment Station in Oklahoma designed to study the survival of animals during flood-like conditions (Numbers, 1992). The new marketing tactics proved to be successful and bills supporting the two-model approach passed in Arkansas and Louisiana thus providing the ACLU with cases that they could use to test the legality of Creation Science. The Arkansas bill

was the subject of the McLean v. Arkansas Board of Education in 1982, and the Louisiana bill was challenged in the Edwards v. Aguillard case in 1984 (decided by the US Supreme Court in 1987). These cases proved to be the downfall for Creation Science.

The Creation Science epoch began to face its demise in 1982 with the McLean v. Arkansas case and received the kiss of death following the Edwards v. Aguillard case in 1987. Both of these cases directly addressed this balanced treatment/equal-time issue and in both cases the judge ruled against Creation Science. More information about these cases can be found in the chapter Examining the Legal Conflict. For this chapter it is important to note that Judge Overton was very detailed in his ruling and clearly defined why Creation Science is not science.

Judge Overton's legal definition of science:

1. It is guided by natural law;
2. It has to be explanatory by reference to natural law;
3. It is testable against the empirical world;
4. Its conclusions are tentative, i.e. are not necessarily the final word; and
5. It is falsifiable.

Overton's reasons for why Creation Science does not meet these criteria:

1. Sudden creation "from nothing" is not science because it depends upon a supernatural intervention which is not guided by natural law, is not explanatory by reference to natural law, is not testable and is not falsifiable.
2. "insufficiency of mutation and natural selection" is an incomplete negative generalization.
3. "changes only within fixed limits of originally created kinds" fails as there is no scientific definition of "kinds", the assertion appears to be an effort to establish outer limits of changes within species but there is no scientific explanation for these limits which is guided by natural law and the limitations, whatever they are, cannot be explained by natural law.
4. "separate ancestry of man and apes" is a bald assertion which explains nothing and refers to no scientific fact or theory.
5. Catastrophism and any kind of Genesis Flood depend upon supernatural intervention, and cannot be explained by natural law.
6. "Relatively recent inception" has no scientific meaning, is not the product of natural law; not explainable by natural law; nor is it tentative.
7. No recognized scientific journal has published an article espousing the creation science theory as described in the Act, and though some witnesses suggested that the scientific community was "close-minded" and so had not accepted the arguments, no witness produced a scientific article for which publication has been refused, and suggestions of censorship were not credible.
8. A scientific theory must be tentative and always subject to revision or abandonment in light of facts that are inconsistent with, or falsify, the theory. A theory that is by its own terms dogmatic, absolutist, and never subject to revision is not a scientific theory.
9. While anybody is free to approach a scientific inquiry in any fashion they choose, they cannot properly describe the methodology as scientific, if they start with the conclusion and

refuse to change it regardless of the evidence developed during the course of the investigation. The creationists' methods do not take data, weigh it against the opposing scientific data, and thereafter reach the conclusions stated in [the Act] Instead, they take the literal wording of the Book of Genesis and attempt to find scientific support for it.

Fig. 4: Overton's on why Creation Science is not science based on Ruse's testimony

Overton also addressed the two-model approach that was taken by the Act, which was promoted by the Institute for Creation Research. The two-model approach delineates that there are only two explanations for the origins of life and existence of man, plants and animals: it was either the work of a creator or it was not. Creationists then assume that any and all scientific evidence that fails to support the theory of evolution is thus evidence in support of Creationism. Overton stated that this is contrived dualism that has no scientific factual basis or legitimate educational purpose⁴⁷. Based on these findings, the judge ruled that the specific purpose for the balanced treatment of Creation Science and evolution was to advance religion and was therefore a violation of the First Amendment's Establishment Clause.

Judge Overton's ruling was so detailed and precise that it allowed the Chief Justice William Rehnquist to make a summary judgment in the Edwards ruling since the two cases were based on almost identical legislation in two different states. The main difference between McLean and Edwards was that the Edwards decision was made by the Supreme Court, meaning that it not only overturned the "Creationism Act" in Louisiana, but made it illegal for Creationism or Creation Science to be taught in American public schools and outlawed any legislation that proposed a balanced treatment of Creation Science and evolution.

Thus, the creationists were again faced with a new dilemma: How could they survive in a country where there is a separation of Church and State and a test to determine the religious or secular nature of an action? Now with Creation Science ruled religious, it meant creationism was faced with possible extinction (at least in the American public school system). However, within just two years of the Edwards v. Aguillard ruling the creationists began to mutate again. And much like fossil record shows the appearance of new species, the creationist textbook, *Of Pandas and People*, provided the proof of this simple mutation.

The book was amended in 1989 after the teaching of Creation Science had been outlawed. The word creator, present in the pre-1987 versions, was now substituted simply by the vague referral to an "intelligent designer"⁴⁸. During the Kitzmiller case, employees from the National Center of Science Education poured over various drafts of *Pandas* from the late 1980s and found the transitional fossil, "cdesign proponentsists" showing a clear copy paste mistake trying to replace

⁴⁷ *McLean v Arkansas Board of Education*, 529 F.Supp. 1255, E.D Ark. (1982)

⁴⁸ The comparison between Creation Science and Intelligent Design is described in detail in a table at the end of this chapter.

creationists with design proponents. (For more information about this creationist textbook see the chapters: Textbook Adoption.). And violà! The Intelligent Design species of Creationism emerged starting the third epoch of the creationist movement which lasted from 1989 to 2005 (Matzke, 2010).

Intelligent Design

The creationism movement has been so successful in the past because of their ability to evolve and adapt to a changing environment. With each failed attempt, they create a new strategy to get God back into the classroom. The newest form of creationism, Intelligent Design, directly continues trends found in Creation Science (Matzke, 2010). Yet Intelligent Design and the accompanying strategy known as the Wedge may be the most potent version yet – it threatens not only the education of the nation’s children but the constitutional separation of church and state as well (Forrest, 2007).

The leaders of this movement are no longer just trying to equate Darwin with evil, nor trying to find “proof” of Noah’s flood but they are now trying to use examples of bacteria flagellum in order to work religion into the classroom (Behe, 1996). As Humes describes it, the ID movement is the “the most politically potent, media-savvy, and pugnacious challenge of evolutionary theory” (2007). The outright attacks on Darwin have been replaced by perfectly tailored statements such as these from Phillip Johnson, “The intelligent design position is not that miracles should be arbitrarily invoked in place of logical inferences from evidence, but rather that evidence pointing to intelligent causes, where present, should not be disregarded due to bias....the argument for intelligent design rests primarily on the existence of complex genetic information and the absence of a natural mechanism for creating it” (2000).

The proponents of ID have put in a great effort to paint ID as an alternative scientific theory yet as Forrest points out, “The conception of ID as non-biblical and of its status as an alternative scientific theory – a conception based on ID proponents’ self-description, which has echoed throughout the popular media – is wrong” (2007). Yet unfortunately, high school students and the general public are not able to easily discern the difference between true science and good marketing.

Unfortunately, whether the science world wants to accept it or not, in order to defend evolution education in America, one needs to understand what we are up against. Therefore, this section will now take a closer look at the Intelligent Design strain of Creationism since it is currently alive (and thriving) in American society. Its particular popularity seems to be due to the religious culture found in the Unit-

ed States and which Bill O'Reilly⁴⁹ states is an idea that the Americans already believe: "There's a deity and the deity formed the universe and things progressed from there" (Humes, 2007).

Origins of Intelligent Design

The concept of Intelligent Design (ID) has become increasingly present in the media over the past two decades. In fact, the general opposition to the teaching of evolution seems to have increased in the last decades with the reelection of a conservative Congress in 2004 and with President George W. Bush who repeatedly endorsed the teaching of Creationism and Intelligent Design in public schools (Humes, 2007). The high point of the media interest in Intelligent Design was around the *Kitzmiller v. Dover* case in Pennsylvania in 2005, which will be discussed in detail in the chapter Examining the Legal Conflict.

The core concept of Intelligent Design or at least the deduction of an intelligent designer from perceived design in nature is in itself not a novel idea. It has been polished and better marketed in the past decades, but the idea is anything but new. In fact, the first concept of an intelligent designer was postulated by William Paley in his book, *Natural Theology: or, Evidences of the Existence and Attributes of the Deity, Collected from the Appearances of Nature* in 1802 (more than fifty years before Darwin published *Species*). In his book, Paley made the now widely referenced "watchmaker" argument for the first time.

In crossing a heath, suppose I pitched my foot against a stone, and were asked how the stone came to be there. I might possibly answer, that, for any thing I knew to the contrary, it had lain there forever. But suppose I had found a watch upon the ground, and it should be enquired how the watch happened to be in that place. The inference, we think, is inevitable; that the watch must have had a maker; that there must have existed, at some time and in some place or other, an artificer or artificers who formed it for the purpose which we find it actually to answer; who comprehended its construction, and designed its use...

There cannot be design without a designer; contrivance without a contriver...The marks of design are too strong to be got over. Design must have a designer. That designer must have been a person. That person is GOD. (Paley, 1802)

For Paley it was a simple deduction watch: watchmaker equals "designed" universe: universe maker. The flaw in this argument is, of course, that if God created the earths and heavens then it should be possible to see evidence of design in all of His creations, thus one should be able to see that God created the rock. However, Paley's deductive reasoning continues to play a role in the current Intelligent Design thinking, and many are currently involved in research and debate trying to show that

⁴⁹ Bill O'Reilly is the host of the political commentary program *The O'Reilly Factor* on the Fox News Channel. He is also an author, syndicated columnist and political commentator in the United States.

there is truly observable design in the universe (more about the specifics of this research can be found below).

This 100-year-old argument of evidence of design equals existence of a designer was resurrected by the Godfather of the modern Intelligent Design movement, Phillip Johnson. In 1991, Johnson chose to use his experience as a lawyer to use and indict Darwin in his book entitled *Darwin on Trial*. Johnson states that “[his] primary goal in writing *Darwin on Trial* was to legitimate the assertion of a theistic worldview in the secular universities” (1993). A theistic worldview would be in direct opposition to the materialistic or naturalistic view currently present in society according to Johnson, who describes materialism as being motivated by the sinful wish to control everything; it is a pseudoscience that distorts reality to conform it to our desires, while the theistic worldview begins with the Word of God, materialism begins at the opposite pole with matter in motion (Johnson, 2000).

The danger of this materialistic standpoint is illustrated in his book, as Johnson included an excerpt from the speech given by Julian Huxley in 1959 at the Centennial Week celebration in Chicago (1993):

...In the evolutionary pattern of thought there is no longer either need or room for the supernatural. The earth was not created, it evolved. So did the animals and plants that inhabit it, including our human selves, mind and soul as well as brain and body. So did religion....

Finally, the evolutionary vision is enabling us to discern, however incompletely, the lineaments of the new religion that we can be sure will arise to serve the needs of the coming era.

In using this excerpt from Julian Huxley, Johnson attempts to show how much Darwinism removed the need for the supernatural generally and God specifically and how this has affected society as he states, “Darwinism was not just a theory of biology, but the most important element in a religion of scientific naturalism, with its own agenda and plan for salvation through social and genetic engineering” (1993).

The Religious Nature of Intelligent Design

There is no doubt that Intelligent Design is religious (Matzke, 2010). Yet the God-connection is a double-edge sword in that it makes it very popular among the American public, but is also the kiss of death constitutionally when proponents attempt to sell it as a scientific theory for the school boards (Humes, 2007). For this reason, many proponents of Intelligent Design (ID) have learned to try to avoid identifying the designer (due to legal issues), opting to make vague referrals to the nameless designer (Meyer, 2009; Meyer, 2014). Johnson, though, like Paley, clearly states that this designer is God of the Bible. He does not shy away from his clear goal of having the theistic worldview replace the materialistic (Johnson, 1993; Johnson, 2000).

He clearly states that he believes that the biblical story will eventually prevail over the materialist story since the “biblical story is grounded on the solid rock of the reality we can’t not know, and the materialist story is grounded on the shifting sand of human ambition” (Johnson, 2000).

Anyone who would like to argue that Intelligent Design is not just as religiously motivated as Creationism or Creation Science simply has to read Johnson’s motivational statement for his fight against evolution and promotion an intelligent designer: “We are removing the most important cultural roadblock to accepting the role of God as creator”⁵⁰. He makes a very clear point about his own personal religious beliefs in that he states that divine authority instructs us that God is real and involved in our lives and that it is our job to glorify God in order to obtain eternal life (Johnson, 2000). His personal religious beliefs would be inconsequential if they were not directly linked to his motivation behind the ID movement and the destruction of science education in the United States. He makes a clear statement that he is concerned about the state of education in the United States and believes that although American educational planners consider it enormously important that school children learn about evolution, they find it entirely unimportant whether they learn enough about Jesus to evaluate his claims and further goes on to say that he would far rather promote the gospel of Christ around the world than the philosophy of the National Academy of Sciences (Johnson, 2000).

Even all of these statements made by Johnson would be meaningless for science education in the United States, if it were not for the fact that Johnson is very good at motivating and moving people towards his vision of an overthrow of the naturalistic philosophy present in modern society by attacking evolution education (Pearcey, 2002). In the forward of Johnson’s 2002 book, *The Right Questions: Truth, Meaning & Public Debate*, Nancy Pearcey describes how Johnson has greatly affected the creationism/evolution arena (Johnson, 2002).

Tab. 12: How Intelligent Design acts as the “Big Tent” for all creationists

Forward to Johnson’s 2002 book by Nancy Pearcey outlines Johnson’s “Big Tent” Approach
In introducing this book I would like to cast a glance back over the past several years and describe the innovative ways Johnson has transformed the terms of the evolution debate. When Johnson entered the arena, he immediately launched a new strategy. Call it “unite and win.” He rallied Christians behind the crucial point of confrontation with the secular world – the issue that stands at the heart of the conflict between Christianity and secular academia...philosophical naturalism. (page 9) Christians may argue about the details of how God created or the timing of creation; but they all agree that the universe is the handiwork of a personal God. (page 9) One of the beauties of Johnson’s approach is that it has the potential to unite Christians across a broad spectrum. They might disagree over such details as the age of the universe,

⁵⁰ Enlisting Science to Find the Fingerprints of a Creator, *The LA Times*, 3/25/2001.

but all orthodox Christians can concur in rejecting a blind, mindless, materialistic mechanism for the origin and development of life. (page 11)

[Intelligent Design] has become a “big tent” drawing together Christians across a wide range of disciplines and positions, from strict young-earth creationist to theistic evolutionists... (page 11)

With Christians tangled in endless arguments over Genesis 1, Johnson redirected the debate along fruitful lines by jumping over Genesis and focusing on John 1:1 “In the beginning was the Word” – the Logos – the Greek word for reason, intelligence, rationality, information. (page 16)

So regardless of how other proponents of the ID movement would like to sell, it is clear that ID is not only a religious movement but very clearly Christian movement aimed at propagating the biblical account of the world. Pearcey in these passages highlights Johnson’s strategical genius. She exemplifies why Scott’s portrayal of Intelligent Design encompassing all branches of Creationism (see above) is completely accurate (Scott, 2009). Johnson has found a way to band all of the broken fractions of creationists together in one camp – moving away from the disputes over the age of the earth and the universe. Moreover, by referring to the Gospel of John, Johnson is able to move the movement away from the vague Judeo-Christian God of the Bible, and towards a truly Christian driven force. For if one looks at the entire first chapter of John, it is not just about the word of God but that this word is Jesus (John 1:14 NIV “The Word became flesh and made his dwelling among us. We have seen his glory, the glory of the one and only Son, who came from the Father, full of grace and truth”).

In this way ID is tied much closer to Jesus Christ than Creationism had been before since many of the former creationists claims were based on liturgy from the Old Testament. This is extremely important because it accomplishes two goals. As discussed earlier part in this chapter, the creationists are/were fairly fragmented into particular groups: YEC, OEC, Gap creationists, Day-Age creationists, etc. This fragmentation impeded a unified movement and this fragmentation was caused primarily by the interpretation of the first chapter of Genesis.

By focusing on these words from the John versus Genesis, it accomplishes the goal of uniting all of the creationists by moving away from the indecision of how to read Genesis. All creationists can believe the Gospel according to John (Johnson, 1997). Furthermore, there are very many Christians who believe in Jesus but who were never inclined to read the Bible literally (Ruse, 2001). Such middle-of-the-road Christians would not have identified with many of the literalist creationist claims, yet even moderate Christians believe in the Gospel of John because it tells the Christians that Jesus is God, in essence the foundation of Christian belief. So by referring to the Gospel of John instead of Genesis, it also means that ID has the potential of attracting more moderate Christians who would not have otherwise considered themselves to be creationists. Once Johnson had created a tent

where creationists could unite and attract more Christians, he then moved on to his higher (primary) goal of attacking naturalistic science as Pearcey describes:

...Johnson has developed a strategy summed up in his trademark metaphor of the wedge. Because of his position at the University of California at Berkeley and his considerable intellectual gifts, Johnson has functioned as the “thin edge” of a wedge⁵¹, making an initial crack in the “log” of scientific naturalism. But he has known from the start that the thin edge cannot do the work alone. For his wedge to be successful the opening breakthrough has to be followed by the “thick edge” of the wedge – an expanding group of scientists, scholars and writers fanning out behind the leader. A single high-profile celebrity might succeed in attracting money and media attention, but it takes a large-scale movement to bring about an intellectual revolution. (page 21)

Johnson realized that engaging the Christian community would not be enough to propel his ideas into the classroom and definitely not enough to assert a theistic worldview into the secular universities. In order to accomplish this goal, he would need help from the scientific world, to gain scientific knowledge that would help him fight this religious battle (Johnson, 2003). Here the major difference to Creation Science can be seen in that Johnson did not look for scientists who could help prove the Genesis story but instead to find “scientific” data that would not only help disprove evolution but also point directly to the existence God or in their words evidence of an intelligent designer.

Intelligent Design Movement

In Johnson’s search for other individuals who would support the ID movement, he began to look for scientists who did not believe in Darwinist supremacy. As Forrest states, “The ID movement developed out of the rejection of evolution by people who believe that the moral ills of the modern world have been caused by Charles Darwin’s revolutionary ideas” (2007). Johnson went about systematically looking for these individuals as documented in the ID film *Unlocking the Mystery*. In 1993, Phillip Johnson invited a group of scientists to Pajaro Dunes, California to discuss alternatives to the theory of evolution. Some of the scientists present at this meeting were Dr. Paul A. Nelson, Dr. Dean H. Kenyon, Dr. Michael J. Behe, Dr. Stephen C. Meyer (Allen, 2002). Following this fateful meeting in 1993, the ID movement began to gain momentum. Some of the scientists began to conduct research, most notably Dr. Michael Behe, Dr. Stephen Meyer and Dr. William Dembski, whose work will be discussed in more detail below, while others began to write articles and books in support of Intelligent Design like Dr. Dean H. Kenyon and later Johnathan Wells.

Kenyon was not new to the creationist platform. He had in fact provided testimony supporting creationism in both the McLean and Edwards cases. He was

⁵¹ The concept of the wedge will be discussed in detail below.

also in fact the co-author of the Creation Science and later Intelligent Design textbook, *Of Pandas and People* and had attempted repeatedly to teach Creationism in his introductory biology class at SFSU⁵² until he was asked to stop in 1992 (Numbers, 2006). In 1993, Meyer decided to write about Kenyon's punishment for attempting to teach Intelligent Design in his introductory biology courses and caught the attention of Bruce Chapman who is founder and former president of the Discovery Institute (Wilgoren, 2005).

The Discovery Institute is a conservative, Christian think-tank, located in Seattle, Washington. It was founded in 1990 and despite its own claims, it is primarily involved in policymaking and politics not science and it has been primarily funded by right-wing religious groups (Shermer, 2006). Chapman sought out a meeting with Meyer after reading his 1993 article and following their meeting, the ball was set in motion for the creation of the Center for the Renewal of Science and Culture (later the Center for Science and Culture) within the Discovery Institute (Shermer, 2006).

After Chapman and Meyer were able to procure funding, the Center for Science and Culture (CSC) was founded in 1996. Dr. Stephen Meyer became Program Director for the center and Phillip Johnson became the Program Advisor. Like the rest of the Discovery Institute, the CSC also had close ties to the religious right (Humes, 2007). For instance, a large part of the funding (\$750,000 over three years) for the center came from the Ahmansons who were included in the 2005 Time Magazine profile of the 25 Most Influential Evangelicals in America (Van Biema, 2005). The center also received a smaller grant from the Maclellan Foundation, which according to their website support organizations "committed to furthering the Kingdom of Christ" (Wilgoren, 2007).

The Center for Science and Culture is focused on promoting Intelligent Design, as they state on their website www.discovery.org/id (Accessed 20 March 2015), "We are the institutional hub for scientists, educators, and inquiring minds who think that nature supplies compelling evidence of intelligent design. We support research, sponsor educational programs, defend free speech, and produce articles, books, and multimedia content".

The CSC is very active and boasts that they have over 75 peer-reviewed articles published in scientific journals (as of April 2014)⁵³. The majority of these publications has been published since 2004 and has been largely generated by the Institute's fellows and from work within their research groups and institutes. They have created two main research groups. The first is the Biologic Institute (<http://www.biologicinstitute.org>) which states on their website "The scientists of Biologic Institute are developing and presenting the scientific case for intelligent

⁵² Professor Teaching Disbelief In Evolution And Being Chastised, *Gadsden Times*, Dec 17, 1980

⁵³ List of peer-review articles. <http://www.discovery.org/id/peer-review/> (Accessed 5 February 2015)

design in biology. We think life looks designed because it was designed, and we think that careful science is backing this up—not just in one field, but in many”.

The CSC has also created the Evolutionary Informatics Lab, which states its objectives somewhat more hidden than the Biologic Institute. They state on their website (<http://www.evoinfo.org>), “Evolutionary informatics merges theories of evolution and information, thereby wedding the natural, engineering, and mathematical sciences. Evolutionary informatics studies how evolving systems incorporate, transform, and export information. The Evolutionary Informatics Laboratory explores the conceptual foundations, mathematical development, and empirical application of evolutionary informatics. The principal theme of the lab’s research is teasing apart the respective roles of internally generated and externally applied information in the performance of evolutionary systems...” One has to read to the end of the page for them to come to the point, i.e. “Evolutionary informatics, while falling squarely within the information sciences, thus points to the need for an ultimate information source qua intelligent designer”.

As stated above in the abstract from Pearcey, all of this focus on scientists and scientific data were in line with Johnson’s concept of a wedge. Johnson’s wedge concept has a couple main components: the wedge (with the thin edge and the thick edge) and the log that is to be divided by the wedge. In this metaphor, the log represents the ruling philosophy of modern culture, which can be called naturalism, materialism or physicalism or simply modernism and according to Johnson, this current philosophy contends that there is no personal God and that all plants and animals are products of undirected and purposeless evolutionary processes (Johnson, 2000). Within the metaphor, Johnson sees himself as the thin edge of the wedge, making the initial crack in the log of naturalism by getting the ball in motion and laying down the foundation for the movement (Johnson, 2002). The CSC, the scientists, the research are all parts of his envisioned thick edge of the wedge that will help him split the log. Once the log has been split, Johnson expects the downfall of naturalistic philosophy as the theologian John Haught describes it, he believes that in Johnson’s eyes “the cutting edge of the wedge consists of the brave (and academically marginalized) defenders of ‘Intelligent Design’, especially William Dembski, Michael Behe, and Johnson himself. Inserted into the ‘log of naturalism’ and hammered home by Johnson’s logic, the Wedge – in combination with the cultural influence of evangelical Christianity – will breach the palisade of scientific naturalism and expose the infectious evolutionary ideas that are its main carrier” (Forrest, 2007).

Johnson’s concept of the wedge has not only provided an image for the ID movement and a metaphor for the roles of each of the movement’s participants but it also provided the title for the document that was published by the CSC (at that time the CRSC), mapping their exact strategy for the overthrow of materialism and its cultural legacies.

The Wedge

The Wedge document made its appearance on the internet in 1999 shortly after the CSC was founded and represents one of the most dangerous and potent strategies in creationist history (Forrest, 2007). The document in its wholeness can be found in the Appendix. This document describes the aggressive strategy that Johnson and the CSC have created to reintroduce a theistic world view, as Forrest states, “using Johnson’s metaphor of a metal wedge that can split a log, the ID movement aims to use its aggressive public relations program of book publication, lectures, etc., to create an opening for the supernatural in the public’s understanding of science – and in the minds of the policymakers (2007).

Here is the introduction of the document, which clearly outlines the motivations, and strategy of the Wedge. Numbers have been added to each of the paragraphs to ease the analysis of the document below.

INTRODUCTION

(1) The proposition that human beings are created in the image of God is one of the bedrock principles on which Western civilization was built. Its influence can be detected in most, if not all, of the West’s greatest achievements, including representative democracy, human rights, free enterprise, and progress in the arts and sciences.

(2) Yet a little over a century ago, this cardinal idea came under wholesale attack by intellectuals drawing on the discoveries of modern science. Debunking the traditional conceptions of both God and man, thinkers such as Charles Darwin, Karl Marx, and Sigmund Freud portrayed humans not as moral and spiritual beings, but as animals or machines who inhabited a universe ruled by purely impersonal forces and whose behavior and very thoughts were dictated by the unbending forces of biology, chemistry, and environment. This materialistic conception of reality eventually infected virtually every area of our culture, from politics and economics to literature and art.

(3) The cultural consequences of this triumph of materialism were devastating. Materialists denied the existence of objective moral standards, claiming that environment dictates our behavior and beliefs. Such moral relativism was uncritically adopted by much of the social sciences, and it still undergirds much of modern economics, political science, psychology and sociology.

(4) Materialists also undermined personal responsibility by asserting that human thoughts and behaviors are dictated by our biology and environment. The results can be seen in modern approaches to criminal justice, product liability, and welfare. In the materialist scheme of things, everyone is a victim and no one can be held accountable for his or her actions.

(5) Finally, materialism spawned a virulent strain of utopianism. Thinking they could engineer the perfect society through the application of scientific knowledge, materialist reformers advocated coercive government programs that falsely promised to create heaven on earth.

(6) Discovery Institute’s Center for the Renewal of Science and Culture seeks nothing less than the overthrow of materialism and its cultural legacies. Bringing together leading scholars from the natural sciences and those from the humanities and social sciences, the Center explores how new developments in biology, physics and cognitive science raise serious doubts about scientific materialism and have re-opened the case for a broadly theistic understanding

of nature. The Center awards fellowships for original research, holds conferences, and briefs policymakers about the opportunities for life after materialism.

(7) The Center is directed by Discovery Senior Fellow Dr. Stephen Meyer. An Associate Professor of Philosophy at Whitworth College, Dr. Meyer holds a Ph.D. in the History and Philosophy of Science from Cambridge University. He formerly worked as a geophysicist for the Atlantic Richfield Company.

Fig. 5: Introduction of the Wedge document

First of all, from paragraph 6 it is obvious that the Wedge document was put forth by the DI, specifically from the Center for Renewal of Science and Culture (CRSC) later renamed the Center for Science and Culture (CSC), which is led by Dr. Stephen Meyer, as seen in paragraph 7. Therefore, it is clear that this document is the direct result of the momentum that Johnson initiated through the Pajaro Dunes meeting in 1993. It illustrates how within 6 years, the effort that a handful of men invested in this cause was able to create a center dedicated to propagating ID with a very clear strategy of how to accomplish their goals.

The introduction alone provides great insight into their motivations and goals. As can be seen from paragraph 1, they believe that the idea that humans are created in the image of God (as stated in the Bible) is crucial and that this belief brings about positive developments, i.e. representative democracy, human rights, free enterprise, and progress in the arts and sciences.

Starting in paragraph 2 it can be seen that they believe that intellectuals used modern science to attack this principle and instead brought forth the idea that humans are equal to animals whose behavior is dictated by biology, chemistry and the environment, opposed to morals. They equate this to Darwin, Marx and Freud who created a materialistic perception of reality that has now infected culture, politics, economics, literature and art.

In paragraph 3, they begin to talk about the dangers of a materialistic view since it denies objective morals and that it now underpins our economics, political science, psychology and sociology. This point is particularly important when one begins to ponder the implications of the movement – namely, if they are successful, they hope to see a change not only in how science is taught and conducted but would like to see a change in economics, political science, psychology and sociology.

Paragraph 4 continues by pointing out that materialism also removed the concept of personal responsibility, affecting criminal justice, product liability, and welfare. In addition, supports the idea that humans can engineer a perfect society – paragraph 5. These two paragraphs, like paragraph 3, point to the broad spectrum of change they would like to see occur.

By paragraph 6, they state very clearly that the center “seeks nothing less than the overthrow of materialism and its cultural legacies”. And then they go on to talk about how they plan on accomplishing this goal. But first, it is important to look at what they mean exactly by cultural legacies. As stated in paragraphs 3, 4

and 5 they believe that the following areas of society have been particularly affected by materialism: economics, political science, psychology and sociology as well as criminal justice, product liability, and welfare and the rise of utopianism. However, they do not say exactly what these are. Some authors and illustrators have speculated about what these legacies could be. The figure seen here is a pictorial presentation of the cultural legacies of philosophical evolution according to the creationists.

According to this particular image, some of those legacies are interpreted to be laws allowing for abortion, funding for genetic engineering, education systems allowing for uncensored books and much more. Regardless of how these legacies are interpreted, it is certain that the authors of the Wedge and the individuals interested in destroying a materialistic philosophy, are focused on changing those aspects of society that are not in line with Christian principles (Johnson, 2002). In other words, they would like to overthrow the cultural legacies of materialism in order to create an America where the economics, political science, psychology and sociology as well as criminal justice, product liability, and welfare are in line with biblical thought (Dembski, 2010). As Robert Boston from the ACLU states, “The objective [of the wedge strategy] is to convince people that Darwinism is inherently atheistic, thus shifting the debate from creationism vs. evolution to the existence of God vs. the non-existence of God. From there people are introduced to ‘the truth’ of the Bible and then ‘the question of sin’ and finally ‘introduced to Jesus’” (1999). The effects that this could have on society will be discussed in a later section. For now, this section will look at the end of paragraph 6, which shows how they plan on accomplishing this goal.

Basically it can be seen in paragraph 6 that they plan to recruit scholars who are able to raise doubts about scientific materialism and try to make a shift towards a theistic understanding of nature, i.e. move away from the unguided principles of natural selection that created man from the genes of lower primates to a principle in which God created man in His image. The center plans on investing money in fellowships, conferences and plans to try to effect policymakers. The rest of the document, which can be found at the end of this chapter, discusses the different phases in which the strategy will be rolled out.

Again, here one can see the clear and strategic thinking behind the Intelligent Design movement. In general, there is much more reference to concepts such as “unguided principles” and “scientific materialism”, which is in stark contrast to Scientific Creationism that openly focused on trying to “prove” the inerrancy of the Bible (Behe, 2007; Behe & Dembski, 2013; Dembski, 2004; Dembski, 2010). Intelligent Design is much more concerned with the overall proof of God’s existence and to do this in a manner presented as scientific endeavor (Behe, et al., 2013; Dembski, 2002; Dembski, 2004; Meyer, 2009; Meyer, 2014). The following figure gives a quick comparison between the two to highlight the rebranding effect.

Tab. 13: Comparison of Scientific Creationism to Intelligent Design

Scientific Creationism	Intelligent Design	Source
Creation means that various forms of life began abruptly through the agency of an intelligent creator with their distinctive features already intact – fish with fins and scales, birds with feathers, beaks and wings, etc.	Intelligent Design means that various forms of life began abruptly through the agency of an intelligent agency with their distinctive features already intact – fish with fins and scales, birds with feathers, beaks and wings, etc.	From Of Pandas and People Davis & Kenyon (1987) ⁵⁴
Scientific Creationism	Intelligent Design	Source
1. There was a sudden creation of the universe, energy, and life from nothing.	1. High information content (or specific complexity and irreducible complexity constitute strong indicators or hallmarks of past intelligent design.	Intelligent Design in Public School Science Curricula: A Legal Guidebook By DeWolf, Meyer, & DeForrest (1999)
2. Mutations and natural selection are insufficient to bring about the development of all living kinds from a single organism.	3. Naturalistic mechanisms or undirected causes do not suffice to explain the origin of information (specified complexity) or irreducible complexity.	
3. Changes of the originally created kinds of plants and animals occur only within fixed limits.	2. Biological systems have a high information content (or specified complexity) and utilize subsystems that manifest irreducible complexity.	
4. There is a separate ancestry for humans and apes. 5. The earth's geol-	4. Therefore, intelligent design constitutes the best explanation for the	

⁵⁴ Version 1 with Creation definition was prior to the Edwards decision forbidding the teaching of creationism in public schools, Version 2 with ID definition was created directly afterward

ogy can be explained via catastrophism, primarily by the occurrence of a worldwide flood. 6. The earth and living kinds had a relatively recent inception (on the order of ten thousand years).	origin of information and irreducible complexity in biological systems.	
Scientific Creationism	Intelligent Design	Source
Scientific Creationism: the belief that the account of creation in the early chapters of Genesis is scientifically as well as religiously valid and that it can be supported by scientific evidence apart from scriptural authority.	Intelligent Design: the theory that the universe and living things were designed and created by the purposeful action of an intelligent agent.	www.dictionary.com (Accessed 30 March 2011)

Thus one can see that intelligent design proponents spend an enormous amount of intellectual energy trying to separate themselves from their creation science relatives mostly due to the legal problems that proponents of the creation science faced in the courtrooms in the 1980s (Dembski, 2004; Forrest, 2007; Numbers, 2014). The intelligent design proponents also appear to succeed in this marketing strategy – repeating that they are beginning with the science and going where the science leads them, i.e. to the presence of an intelligent designer, while the creation scientists clearly began with the biblical accounts and tried to find scientific proof to verify these accounts (Behe et al., 2013; Ham, 2013; Meyer, 2009; Johnson, 2002).

Selling Intelligent Design as Science

This section will look at the specific phases of action that are planned in the Wedge document and how the CSC plans to achieve their goals of overthrowing materialism, specifically by using scientific veils. Although it was made clear in previous sections that ID is simply the newest form of Creationism, it will be illustrated here how through the following action steps ID proponents plan to go about maximizing the scientific appearance of ID in order to minimize the religious appearance of the movement in order to increase their chances of getting their idea taught in American science classrooms (Forrest, 2007; Scott, 2009; Matzke, 2010).

Phase I of the Wedge strategy is focused on the recruitment of scientists and ascertaining “scientific” data:

Phase I is the essential component of everything that comes afterward. Without solid scholarship, research and argument, the project would be just another attempt to indoctrinate instead of persuade. A lesson we have learned from the history of science is that it is unnecessary to outnumber the opposing establishment. Scientific revolutions are usually staged by an initially small and relatively young group of scientists who are not blinded by the prevailing prejudices and who are able to do creative work at the pressure points, that is, on those critical issues upon which whole systems of thought hinge. So, in Phase I we are supporting vital writing and research at the sites most likely to crack the materialist edifice.

Fig. 6: Phase I of the Wedge

Again, the language used here is very interesting. They are looking for “scientists who are not blinded by the prevailing prejudices and who are able to do creative work at the pressure points, that is, on those critical issues upon which whole systems of thought hinge.” By looking at the words “creative work” and “pressure points” a clear trend becomes evident that exists throughout their entire work. They are not interested in scientific endeavor but rather are simply interested in “unhinging” evolution. In other words, they believe that they can accomplish their goal of overthrowing materialism and reintroducing theism by conducting research that could unhinge evolution (Dembski, 2004; Johnson, 1999). They believe that if they can unhinge evolution, that it will automatically lead people to see the only alternative theory (as they would like to propagate) that of special creation by God or Intelligent Designer (Johnson, 1999). The proponents of Intelligent Design see the situation as similar to that of a two party election campaign, i.e. any bad press for one candidate is good press for the other. Michael Behe explains in detail the advantages of trying to get people to doubt evolution as a valid scientific theory:

“Darwinism is the most plausible unintelligent mechanism, yet it has tremendous difficulties and the evidence garnered so far points to its inability to do what its advocates claim for it. If unintelligent mechanisms can’t do the job, then that shifts the focus to intelligent agency. That’s as far as the argument against Darwinism takes us, but most people already have other reasons for believing in a personal God who just might act in history, and they will find the argument for intelligent design fits with what they already hold. With the argument arranged this way, evidence against Darwinism does count as evidence for an active God, just as valid negative advertising against the Democratic candidate will help the Republican, even though Vegetarian and One-World candidates are on the ballot, too. Life is either the result of exclusively unintelligent causes or it is not, and the evidence against the unintelligent production of life is clearly evidence for intelligent design⁵⁵.”

⁵⁵ Behe, “The God of Science”, Weekly Standard, June 7, 1999, p. 35

The last sentence is a banner under which the ID proponents run their campaign – “evidence against the unintelligent production of life is clearly evidence for intelligent design” (Behe, 1999). Therefore, the leaders of the ID movement set about looking for evidence and while the strategic thinkers like Johnson began setting the stage for the scientists to present their evidence against evolution. Johnson proposed that evolution is not science at all but instead a pseudo-science and that “it will collapse once it becomes possible for critics to get a fair hearing” (2000). He further provokes the situation by saying that if the Darwinists had a good case then they would welcome the critics for an open debate in an academic forum, yet instead they seem afraid to encounter the best arguments against their theory (Johnson, 2000).

As the ID scientists began to look for places where they could drive their wedge, they found that Darwin himself had pointed out where the “hinges” were in his theory. As Darwin himself said, “If it could be demonstrated that any complex organ existed which could not possibly have been formed by numerous, successive, slight modifications, my theory would absolutely break down” (Darwin, 1859). And so Behe went to work trying to find this complex organ and he believed that he found it in the complexity is the bacterial flagellum. Using this example Behe came up with the concept of irreducible complexity. Behe describes his concept of irreducible complexity in his book *Darwin’s Black Box*:

By irreducibly complex, I mean a single system composed of several well-matched, interacting parts that contribute to the basic function, wherein the removal of any one of the parts causes the system to effectively cease functioning. An irreducibly complex system cannot be produced directly (that is, by continuously improving the initial function, which continues to work by the same mechanism) by slight, successive modifications of a precursor system, because any precursor to an irreducibly complex system that is missing a part is by definition non-functional. Since natural selection can only choose systems that are already working, then if a biological system cannot be produced gradually it would have to arise as an integrated unit, in one fell swoop, for natural selection to have anything to act on (Behe, 2006).

Here it is important to note how Michael Behe directly references Darwin’s statement, even using the same wording such as “slight, successive modifications” and directly stating that natural selection would not be a valid mechanism to bring about this complexity. Behe also presented his work during the Kitzmiller case and was then rebutted by Dr. Ken Miller who showed how exactly the bacterial flagellum could come about through small evolutionary steps and discussed this flagellum evolved out of other structures that were used for other purposes within the bacteria. To make his point even clearer, he used a modified mousetrap as a tie clip during the trial to illustrate how similar structures can have different functions, while being equally useful for the organism (Kitzmiller, 2005).

Dr. William Dembski also came up with an idea that he believed could unhinge evolution called specified complexity. In *Design Inference* Dembski states that specified complexity is a reliable empirical marker of intelligent design and goes on to describe what it means to be complex and specified. A long sequence of random letters could be considered complex but not necessarily specified, while a short sequence of letters like “cat,” “the,” or “so” could be considered specified but definitely not complex. Lack of specificity or complexity means that there is a chance that the result is caused through random acts. While according to Dembski, a Shakespearean sonnet would be both complex and specified and thus allow the reader to infer a designer (1998). This of course again points to the same hinge as Behe was working on, just from a different angle. If it is too complex, it could not have evolved.

Another concept that has been propagated by the ID proponents and seems to be gaining momentum is simply based on the presence of information (genetic or otherwise) in living organisms and it is believed to provide proof that they are products of an Intelligent Designer (Meyer, 2009; Johnson, 2000). This idea is currently being developed in depth by Stephen Meyer who was one of the featured experts in the film, *Darwin’s Dilemma*, where this idea of information creation is examined in great length. The proposition is that the development of the new animal types, especially during “the Cambrian Explosion,” would require a massive increase in genetic information and they claim that there is no scientific explanation for this increase information (Meyer, 2014). Meyer has also authored a book entitled *Signature in a Cell: DNA and the Evidence of Intelligent Design* in which he claims that all previous scientific efforts to explain the origins of biological information have failed, and he argues that the best explanation of life’s beginning is an Intelligent Designer (Meyer, 2009). As Johnson says, “Unless biologists can provide a testable mechanism capable of [creating new information], then the correct scientific conclusion is that biological creation is an unsolved mystery” (2000).

Jonathan Wells on the other hand has not come up with any new concepts or theories, nor has he performed any research in the laboratory, but he has tried to unhinge the theory of evolution simply by attacking it as a myth and that is the focus of his book, *Icons of Evolution: Science or Myth? Why Much of What We Teach About Evolution is Wrong* (Wells, 2000). According to Wells there are 10 main icons of evolution presented in classroom textbooks which are wrong, myths or fraudulent. Those 10 icons are: The Miller-Urey Experiment, Darwin’s Tree of Life, Homology in Vertebrate Limbs, Haeckel’s Embryo Drawings, Archaeopteryx, Peppered Moths, Darwin’s Finches, Four-Winged Fruit Flies, Fossil Horses and Directed Evolution, and From Ape to Human. Wells believes that by refuting these icons that the entire evolution edifice will fall as he states in the introduction of his book “The following chapters compare the icons of evolution with published scientific evidence, and reveal that much of what we teach about evolution

is wrong. This fact raises troubling questions about the status of Darwinian evolution. If the icons of evolution are supposed to be our best evidence for Darwin's theory, and all of them are false or misleading, what does that tell us about the theory? Is it science, or myth?" (Wells, 2000). However, the vast amount of data supporting evolution dwarfs these ten icons and the idea that disproving them will refute the theory of evolution is incorrect (Shermer, 2006).

Yet regardless of whether or not Wells' icons are relevant or not, and regardless of whether or not any of his claims are true, his book will nevertheless have an effect on the general public of the United States and specifically on science education in America. This is because the ID proponents are marketing experts (Humes, 2007). Wells' book has already been made into a video, and being promoted on numerous religious websites such as ChristianAnswers.net where they state that in Wells' film, "Scientists and researchers report their findings — and tell why it's time to reevaluate what's being taught to our children in school. As one scientist remarked, 'You go where the data leads you,' rather than start from the conclusion of evolution in mind. For anyone who wants to discover the exciting evidence, Icons is essential and enlightening viewing. After seeing it, you'll understand more clearly than ever why it's time for educators—and society as a whole—to discover what science is finally acknowledging: Darwin's theory is outdated at best and intelligent design should be presented as a valid alternative⁵⁶".

This type of marketing of the ID products is in direct alignment with Phase II of the Wedge strategy.

The primary purpose of Phase II is to prepare the popular reception of our ideas. The best and truest research can languish unread and unused unless it is properly publicized. For this reason we seek to cultivate and convince influential individuals in print and broadcast media, as well as think tank leaders, scientists and academics, congressional staff, talk show hosts, college and seminary presidents and faculty, future talent and potential academic allies. Because of his long tenure in politics, journalism and public policy, Discovery President Bruce Chapman brings to the project rare knowledge and acquaintance of key op-ed writers, journalists, and political leaders. This combination of scientific and scholarly expertise and media and political connections makes the Wedge unique, and also prevents it from being "merely academic."

Other activities include production of a PBS documentary on intelligent design and its implications, and popular op-ed publishing. Alongside a focus on influential opinion-makers, we also seek to build up a popular base of support among our natural constituency, namely, Christians. We will do this primarily through apologetics seminars. We intend these to encourage and equip believers with new scientific evidences that support the faith, as well as to "popularize" our ideas in the broader culture.

Fig. 7: Phase II of the Wedge

⁵⁶ "Icons of Evolution: Dismantling the Myths". ChristianAnswers.net <http://christiananswers.net/catalog/icons-vs.html> (Accessed 12 February 2015)

The ID proponents have enjoyed much greater success in fulfilling Phase II of their plan than Phase I. They may not have been able to rile up much scientific support for either Behe's or Dembski's ideas, but they were able to get several books published, films produced and have had their idea of ID featured in an enormous amount of magazines, newspapers, and movies. Regardless of the lack of scientific data supporting the idea, it still continues to pop up on websites, blogs, Twitter, podcasts, and even the Intelligent Design Facebook page has over 2000 likes (as of July 2014).

Johnson has placed himself in leading role of the Wedge as he states in his homonymous book, "The Wedge of my title is an informal movement of like-minded thinkers in which I have taken a leading role. Our strategy is to drive the thin edge of our Wedge into the cracks in the log of naturalism by bringing long-neglected questions to the surface and introducing them into public debate" (Johnson, 2000). In trying to fulfill the Phase II goals, not only did Johnson make multiple appearances and produce multiple publications, but he also led the way to Phase III by using his law degree to co-author the Santorum Amendment that U.S. Senator Rick Santorum proposed to Congress on June 13, 2001. The Santorum Amendment stated:

Santorum Amendment

It is in the sense of the Senate that (1) good science should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science; and (2) where biological evolution is taught, the curriculum should help students understand why this subject generates so much continuing controversy and should prepare the students to be informed participants in public discussions regarding the subject.

Fig. 8: Santorum Amendment

Johnson describes his motivation behind the legislation, "What I had hoped to accomplish with the language of the amendment was primarily to make it difficult for public school authorities to justify firing or disciplining a teacher who informs students of the weaknesses of the Darwinian theory, rather than teaching it in the authoritarian and dogmatic manner that Darwinians have been able to enforce up until now. Beyond that, how much effect the amendment may have depends on what the public makes of it. If people at the grassroots level are active in raising objections to Darwinian dogmatism, the amendment will protect their legal position. If the people allow themselves to be cowed by the authority of the current rulers of "science", then Darwinian dogmatism will go on much as it did before the amendment was passed" (Johnson, 2002).

The amendment's creation and language are particularly interesting because it illustrates how the Wedge strategy is being played out like a well-planned chess attack. First, generate controversy, then pass legislation to allow teachers to explain what that controversy is all about. The legislation protects teachers who would like to discuss the weaknesses of evolution and thus allows an opening for

Phase III, which is directed, at getting ID into classrooms and making much bigger waves.

Phase III. Once our research and writing have had time to mature, and the public prepared for the reception of design theory, we will move toward direct confrontation with the advocates of materialist science through challenge conferences in significant academic settings. We will also pursue possible legal assistance in response to resistance to the integration of design theory into public school science curricula. The attention, publicity, and influence of design theory should draw scientific materialists into open debate with design theorists, and we will be ready. With an added emphasis to the social sciences and humanities, we will begin to address the specific social consequences of materialism and the Darwinist theory that supports it in the sciences.

Fig. 9: Phase III of the Wedge

The implementation of Phase III, with regard to the “integration of design theory into public school science curricula” has also begun to be implemented and will be discussed in detail in the chapters the next two chapters. This phase is particularly scary as political scientist Benjamin Barber states, “Public schools are not merely schools for the public, but schools of publicness: institutions where we learn what it means to be a public and start down the road toward common national and civic identity⁵⁷.”

The Wedge’s strategy clearly illustrates that the ID proponents know exactly how to get ID in the heads of America. They are legally savvy, creative and organized. They know how to use legal loopholes in order to access the public schools and realize that the majority of America is not reading Nature, they are watching TV, going to church and reading for fun and thus fairly easy to convince through the rebranding of their new version of creationism. The ID proponents are geniuses when it comes to marketing themselves and making important alliances. That is why ID and the proponents of this idea will be the major focus of the rest of this thesis since they pose a much greater threat to American education than any other of the extreme fractions of Creationism.

Summary

In looking back at the beginning of this chapter, one can compare the groups of creationists. On the one hand, there are the Geocentric creationists and Flat Earth believers, which are groups of people who although they have extremely strong convictions, their beliefs are so extreme and dependent on the literal reading of the Bible that it meant that they were not be able to create a large enough following and

⁵⁷ Strauss, Valerie, *Why public education must be preserved*. Washington Post online edition. Posted 10/04/2011. Retrieved July 24, 2014.

are not organized enough to threaten education standards. The Young Earth Creationists, however, despite their almost equally strict adherence to the literal interpretation of the Bible were more successful in popularizing their beliefs through the incorporation of flood geology and other pseudo-scientific pursuits that lead to the creation of research institutes and the publishing of hundreds of books. Yet, their aim of proving Genesis and the young age of the Earth was so apparently motivated by religion that they did not have much power in persuading someone in the secular world of the validity of their new “scientific theory” and were thus fairly quickly barred from spreading their ideas in public school classrooms. The Creation Science movement was successful though, in that it unified many creationists and focused on a movement towards creating a “scientific theory” that could upset the dominance of the theory of evolution.

This experience in success and failure among the creation scientists led to a better-managed campaign for the newest form of creationist: Intelligent Design. It is clear that this newest trend is the most potent of all through its well-planned strategies, marketing concepts, legal knowledge and the masterminds behind the Wedge. If left unheeded, the ID movement and the Wedge strategy could truly cause damage to the American education system, because although Intelligent Design as a pseudo-science is clearly not going to convince the science world of its legitimacy, it is catching on with the general public, especially those who do not have the scientific background to understand the false claims made by the intelligent design marketing campaigns (Forrest, 2007). This is a very crucial point, because as will be discussed in chapter 0, it is not the scientific community that is choosing the textbooks or even controlling the science standards in American school systems – it is the American school boards, made up of elected members from the general public who are being influenced by the marketing campaigns of the ID proponents.

Moreover, by looking at the Wedge document it became obvious that the ID proponents are also focused on a largescale overhaul of society – moving away from a materialistic philosophy and towards a society that is run based on Christian principles. If successful, the ID proponents would like to see the entire log of naturalism split in order to undo all of the cultural legacies of evolution that can be seen in legalized abortion, divorce, etc.

The next chapter will look specifically at how the legal system reacts to creationism, creation science and intelligent design when it is introduced into public schools in America. The following chapter will also provide more detail about the case rulings that helped shape the changes in the creationist movement.

Examining the Legal Conflict

This chapter will examine the conflict between evolution and Creationism inside the walls of a courtroom. The focus will be placed on the court cases that occurred from the Scopes trial in 1925 to the Kitzmiller case in 2005. Before going into detail about the particular cases, it is important to first look at the general structure of the American legal system and the American Constitution.

This is important background information that is necessary to understand the impact of the particular court cases. By understanding the US court system, it becomes apparent why certain cases carry more weight than other cases, i.e. some judgments have precedential power in only one county, while other judgments affect the entire nation. The next section is devoted to the Constitution and its amendments and will provide the necessary information to understand the basis of all of the cases since all of these cases are tested against the Constitution and decided by determining whether a violation to the Constitution has occurred. This first section will also discuss other pertinent laws or tests that were developed in the 1900s to help judges “test” the constitutionality of an action or policy.

Finally, in the latter half of this chapter, the particular cases will be examined in detail. The analysis of the cases will include who was involved, who won and what was the effect of the decision on the overall conflict.

An overview of the US court system, the Constitution and other relevant laws

The American legal system consists of a federal court system and state court systems. The federal court system includes the US District Courts, the US Courts of Appeals and the US Supreme Court. This overall structure of the American judicial system was outlined in Article III of the Constitution. The Judiciary Act of 1789 further divided the country into 12 judicial districts or “circuits” plus one federal circuit, which has nation-wide jurisdiction in specialized cases such as patent laws. There is one Court of Appeals per circuit meaning that there is a total of 13 Courts of Appeals in the US. Within the 12 geographical circuits, there are 94 districts, meaning that there are 94 District Courts within the US. The District Courts have original jurisdiction and trials are heard by a judge and a jury. The Courts of Appeals are responsible for rulings made at the District Courts within their circuit and are in place to determine whether or not the correct decision has been made at the district level. The highest Court is the Supreme Court, which has the authorization to establish laws that lower courts must abide by⁵⁸.

The general role of the federal courts is to interpret and apply the laws established by Congress. Most importantly, the federal courts serve to protect the rights and liberties granted to the American people by the Constitution (to be discussed in more detail later). In most of the cases involving the teaching of evolution – this would be the rights guaranteed by the first amendment. Federal judges are appointed for life by the President and approved by the Senate. This includes judges for the US Supreme Court, US Courts of Appeals and the US District Courts. Thus, the make-up of the Supreme Court and other federal courts can change with the political environment of the United States. For instance, George W. Bush appointed a total of two Justices⁵⁹ to the US Supreme Court (including one Chief Justice), 62 judges to the US Courts of Appeals and 261 judges to the US District Courts. Interestingly, one of these judges was Judge Jones who presided over the *Kitzmiller* case and was expected to rule against the parents since he had been appointed by George W. Bush and was thus assumed to be conservative and share Bush’s pro-ID views (Humes, 2007).

In addition to the federal court system, the United States legal system also includes a state court system. Each system, federal and state, has jurisdiction in different matters. The different court systems also have a different range of jurisdiction in regard to their rulings. In other words, rulings made in the US Supreme

⁵⁸ A general overview of the American court system can be found at <http://www.uscourts.gov>, while more in depth details can be found in *America’s Court and the Criminal Justice System* by David D. Neubauer (2008).

⁵⁹ A Justice is a member of a “supreme” court: either the US Supreme Court or a state’s Supreme Court. The US Supreme Court is comprised of eight associate justices and the Chief Justice.

Court have precedential⁶⁰ value nationwide, whereas rulings made by a state's Supreme Court would only have precedential value in that state.

All of the cases involving the teaching creationism or the banning of evolution were first heard within the state court system or in a US District Court. Cases move from lower courts to higher courts through the process of appeals. An appeal is a request to have the ruling of a case reviewed by a higher court. For example, decisions made in US District Courts can be appealed to the US Courts of Appeals and can then move to the US Supreme Court. Appealing a decision means that the decision will be reviewed by the US Court of Appeals or the appellate courts of the state, where the decision can either be upheld or overturned. In fact, it is the goal of an appeal is that the higher court will overturn the decision of the lower court. For this reasons, the party who submits the appeal or the appellant is in almost all incidences the party who lost their claim in the lower court.

In general, the appellate court does not hear the trial but only reviews the evidence presented in the trial court and the per-trial proceedings. The appellate court may then decide to affirm, modify or reverse the decision of the lower court through a summary judgment. In the Scopes Trial for example, John Scopes was found guilty of violating Tennessee law. The decision was then appealed and the appellate court affirmed the decision stating that the Butler Act was indeed constitutional, but the appellate court did reverse the decision of the \$100 fine for John Scopes since a jury should have decided this amount and not the judge.

The US Supreme Court has the highest power in the country and it is in the interest of all parties to have their case heard in the highest court possible in order to have the largest impact on nationwide curriculum rulings. For that reason, some of the cases have multiple dates or courts depending on how many times the decision has been appealed. Only two of the evolution cases were ever heard by the US Supreme Court.: *Epperson v. Arkansas* (1968) and *Edwards v. Aguillard* (1987). In the case of *Epperson v. Arkansas* (1968) the case was first heard in the Arkansas State Court (Chancery) and was then heard by the Arkansas State Supreme Court and finally was heard by the US Supreme Court. The US Supreme Court ruled that the Arkansas' Anti-Evolution Statute from 1929 was in violation with the American Constitution. The statute was therefore overturned and because it was decided by the US Supreme Court, it prevented the passing of similar anti-evolution legislation in the future.

This section will now take a more in depth look at the Constitution and its relevant amendments: 1st Amendment including the Establishment Clause, Free exercise Act, Freedom of Speech and the 14th Amendment. It will include a brief

⁶⁰ Precedential power simply means that it sets a precedent, which other courts are obliged to follow. In other words, when a judge makes a ruling on a case, it becomes a precedent or guideline for subsequent decisions made by judges presiding over similar disputes. Edwards, Richard. The Importance of *Precedence*. <http://biotech.law.lsu.edu/map/TheImportanceofPrecedent.html> (Accessed 11 January 2015)

description of the relevant laws or tests that have been passed over the past 50 years to help judges “test” whether or not an action or policy is in violation of the Constitution.

The Constitution

The American Constitution was adopted September 17, 1787 – four years after the end of the American Revolution – by the Founding Fathers⁶¹ of the United States. Scholars have long disagreed about the religious views of the Founding Fathers – from rationalists to born-again Christians. What is for sure is that they all came from similar Protestant backgrounds (Holmes, 2006). The Founding Fathers attempted to learn from the mistakes of the past (details about American history and the general trends of this time can be found in Chapter 2) and thus regardless of their background and possibly in spite of their personal beliefs, the Founding Fathers realized the necessity of separating religion and politics. As James Madison stated, “The purpose of the separation church and state is to keep forever from these shores the ceaseless strife that has soaked the soil of Europe in blood for centuries⁶².”

In 1789, ten amendments were added to the Constitution with the purpose of limiting the power of the central government and guaranteeing certain personal freedoms. These first ten amendments are collectively known as the Bill of Rights and of these ten, the first amendment plays the central role in all of these cases. Since 1789, over 11,000 proposals for amendments have been made, only a total of 23 have been ratified⁶³. The only other amendment that is pertinent for these cases is #14 which extends these personal freedoms to citizens at a state level.

1st Amendment Rights

The specific separation of church and state, which is also referred to as religious freedom or religious liberty and was included in the Bill of Rights as part of the 1st Amendment: “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof...” The statement includes two concepts of religious freedom: one that the government cannot force a religious belief upon an individual (...no law respecting an establishment of religion...) and two that an individual is able to practice his belief without interference or persecution from the government (...no law...prohibiting the free exercise [of religion] ...). The two parts of the religious clause of the 1st Amendment are known respectively as the Establishment Clause and the Free Exercise Clause. It should also be stated that the

⁶¹ Founding Fathers is a term collectively used for individuals from the 13 original British colonies of the United States who were involved in leading the American Revolution and who were either involved in signing the Declaration of Independence in 1776 or part of the Constitutional Convention that drafted and signed the Constitution in 1787.

⁶² James Madison was one of the Founding Fathers and also the fourth president of the newly created United States of America.

⁶³ “Measures Proposed to Amend the Constitution.” *Statistics and Lists*. United States Senate.

Freedom of Speech is also granted by the 1st Amendment as it continues: “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press;...”. This is an important point, because some of the teachers claim that their right to free speech should protect them if they choose to discuss Creationism within the classroom. This perceived right is also currently branded as “academic freedom”. This will not be analyzed in-depth since this free speech argument defense does not hold up in court. The Supreme Court has interpreted this clause of the 1st Amendment in reference to public schools and teachers and decided that the “fundamental” right of free speech is not “shed...at the schoolhouse gate⁶⁴” yet although a teacher retains their freedom of speech as a private citizen at work they are seen as an integral part of the government body and are thus required in their professional life to uphold the separation of church and state (Humes, 2007). In other words, a teacher may be a very active Pro-Life advocate in their spare time but would not be allowed to teach their students in the classroom that abortion is wrong and sinful.

The chapter focused on post-Kitzmiller trends will address the passing of “Academic Freedom” legislation, which is permissive and not prescriptive in nature and thus has a better chance of passing judicial scrutiny. This has been attempted in 16 states (as of 2015) since the Kitzmiller case⁶⁵. More about this can be found in chapter 6.

14th Amendment

Originally, the rights declared in the Bill of Rights only applied to the rights of the people in relation to the federal government, i.e. that Congress cannot establish religion. Since the public schools in the US are state institutions they would therefore be exempt from having to uphold these rights, but the 14th Amendment⁶⁶ to the Constitution granted these rights to the people at a state level. This means that the state and all state institutions must also respect the citizens’ right to freedom from the establishment of religion. And the fact that the schools are also bound by the Establishment Clause and the Free Exercise Clause is what makes it possible for parents to sue the school district or the Governor of a state for establishing policies or conditions where Creationism could be taught in public school classrooms. The US Supreme Court is especially vigilant in policing the Establishment Clause within public schools because public school attendance is compulsory, the teachers play an authoritative role in the classroom, and young children and adolescents are impressionable by nature (Wexler, 2010).

⁶⁴ *Tinker v. Des Moines Indep. Cmty. Sch. Dist.*, 393 U.S. 503, 506 (1969)

⁶⁵ “Academic Freedom” Legislation. NCSE. <http://ncse.com/book/export/html/11903> (Accessed 14 January 2015)

⁶⁶ The 14th Amendment was ratified in 1868 as one of the Reconstruction Amendments following the Civil War.

Legal Tests: Lemon Test, Endorsement Test and Balancing Test

The conflict of teaching evolution or Creationism is varied, from prohibiting the teaching of evolution to requiring the teaching of Creation Science if evolution is taught. Some conflicts are much subtler such as the *Kitzmiller* case, which surrounded a 1-minute statement that should be read to the class before evolution was taught, which told students that evolution was a theory that included gaps and that another alternative theory existed known as Intelligent Design – see figure for full statement.

As can be seen from this statement, it is not always easy to recognize the religious nature of an action set forth by the state. Yet, the court has the responsibility to balance the protection of the freedom of speech and the separation of church and state and it is therefore necessary that the courts can interpret the legal texts and are able to judge the current situation and how those legal texts apply to the situation. In the US, the final arbiter of the meaning of those words is the US Supreme Court. As mentioned earlier, only two of the cases involving the teaching of evolution ever reached the Supreme Court. Most cases take place in lower courts whereby the lower court decisions may conflict with one another. Litigants can thus call upon the courts of appeals, an intermediate court capable of interpreting the words of the Constitution. However, the Supreme Court is the only court that can set rules by which American citizens must live.

To make it easier for lower courts to make decisions that are in line with the Constitution, certain “tests” have been established in past rulings that can assist a judge when ruling on whether a particular policy is in conflict with the Constitution. With regard to the separation of church and state, a judge can use either the Lemon Test or the Endorsement Test. In order to determine a teacher’s right of speech a judge may use the Balancing Test.

The courts can apply what is known as the Lemon Test in order to decide if public school policy conflicts with the Establishment Clause. The Lemon Test was articulated by the Supreme Court in 1971 in the case of *Lemon v. Kurtzman* (*Lemon v. Kurtzman*, 403 U.S. 602). The Lemon Test has three prongs: purpose, effect and entanglement. Purpose means that the government (public school) action must have a secular purpose. Effect means that the effect of the policy may neither support nor inhibit religion. Entanglement means that the result of the action may not be an excessive entanglement of government with religion.

The Lemon Test was used by Judge Jones in his decision in *Kitzmiller v. Dover* in 2005 when he analyzed the actions of the school board and the intent of the school board in creating the statement discussed above. Due to the ambiguous nature of many of the newer creationist strategies, the Lemon Test was applied to many of the cases involving Creationism.

It should be mentioned though that despite its extreme usefulness in cases regarding Creationism and Intelligent Design, there is a good chance that the Lemon Test may be discarded in the future by the current (2011) conservative US Supreme Court (Wexler, 2010).

A court can also use the Endorsement Test to determine what message a certain governmental policy or enactment is trying to convey. The Endorsement Test was adopted by the Supreme Court in 1989 in the case of *County of Allegheny v. ACLU*, which involved various holiday displays near a courthouse in Pennsylvania. The Endorsement Test had first been mentioned though by Justice O'Connor in *Lynch v. Donnelly* in order

to clarify both the Lemon's purpose and effect prong. The Endorsement Test asks whether a "reasonable observer" would feel that the governmental action (or specifically in evolution cases, the school board's policy) has sent a "message to non-adherents that they are outsiders, not full members of the political community, and an accompanying message to adherents that they are insiders, favored members of the political community" (*Lynch v. Donnelly*, U.S. 465: 668, 687. 1984). The Endorsement Test could not be used in the only two anti-evolution cases reviewed by the US Supreme Court as both occurred before 1989 (*Epperson and Edwards*), but the Endorsement Test could be used in all anti-evolution cases since 1989 for example in *Selman v. Cobb* and *Kitzmiller v. Dover*.

The Balancing Test can be used to determine whether or not a public employee's speech is protected by the First Amendment. The test is "a balance between the interests of the employee, as a citizen, in commenting upon matters of public concern and the interest of the state, an employer, in promoting the efficiency of the public services it performs through its employees" as first defined in *Picering v. Board of Education* in 1968. The test was used by the US Supreme Court in

Statement read to students in the Dover Schools
The Pennsylvania Academic Standards require students to learn about Darwin's theory of evolution and eventually to take a standardized test of which evolution is a part.

Because Darwin's Theory is a theory, it is still being tested as new evidence is discovered. The Theory is not a fact. Gaps in the Theory exist for which there is no evidence. A theory is defined as a well-tested explanation that unifies a broad range of observations.

Intelligent design is an explanation of the origin of life that differs from Darwin's view. The reference book, *Of Pandas and People*, is available for students to see if they would like to explore this view in an effort to gain an understanding of what intelligent design actually involves.

As is true with any theory, students are encouraged to keep an open mind. The school leaves the discussion of the origins of life to individual students and their families. As a standards-driven district, class instruction focuses upon preparing students to achieve proficiency on standards-based assessments.

Fig. 10: Dover school board statement regarding the teaching of evolution

Rankin v. McPherson in 1987. It has since then been used in evolution cases involving a teacher's claim to free speech within the classroom or the now popularized claim to academic freedom. For example, this test was used in *Pelozo v. Capistrano* in 1992 and it was determined that "the interests and concerns of the school district overrule the plaintiff's claimed right to free speech." The interest of the school district was defined as "maintaining its secular purpose of educating high school students" (Wallis, 2005).

Court cases involving creationism: from Scopes to Kitzmiller

The evolution/Creationism conflict is in itself evolving. Each court case ruling down the strategy for the next trend. For instance, when the US Supreme Court ruled in *Epperson* in 1968 that any law prohibiting the teaching of evolution were unconstitutional, the trend thus turned towards writing "balanced treatment" legislation that would require the teaching of Creation Science if evolution was taught. Then in 1987 when the US Supreme Court ruling in *Edwards* prohibited the teaching of Creation Science in the schools, it led to the birth of a new movement toward promoting Intelligent Design. This section will examine these cases and the other cases that have taken place in the time between *Scopes* (1925) and *Kitzmiller* (2005) in more detail to get a better understanding of the nature of this conflict.

The following table gives an initial overview of the trials that took place in the 80 years between *Scopes* (1925) to *Kitzmiller* (2005) with their corresponding date and the state in which the trial was held. This next section will focus on these 12 cases. Since the *Kitzmiller* case, there have been another 15 cases (within 10 years), which will be discussed in chapter 7 due to the very different nature of these later, more modern cases.

Tab. 14: Evolution/Creationism cases from 1925 to 2005

Eighty Years of Evolution/Creationism cases: 1925 to 2005		
Case	Year	State
Tennessee v Scopes	1925	Tennessee
Epperson v. Arkansas	1968	Arkansas
Daniel v. Waters	1975	Tennessee

Hendren v. Campbell	1977	Indiana
Segraves v. California	1981	California
McLean v. Arkansas	1982	Arkansas
Edwards v. Aguillard	1987	Louisiana
Webster v. New Lenox	1989	Illinois
Peloza v. Capistrano	1992	California
Freiler v. Tangipahoa	1997	Louisiana
LeVake v. ISD #656	2000	Minnesota
Kitzmiller v. Dover	2005	Pennsylvania

The first thing that is apparent from this table is that there is a clumping of cases in both time and location. Regarding time, it is clear that the Scopes case is quite isolated, i.e. there are no cases previous to Scopes and then forty years between Scopes and Epperson. After Epperson, there is then a steady flow of cases from 1968 to 2005 with an average of four years between each case. Tennessee, Arkansas and California all have two cases within their borders, while Indiana, Illinois, Minnesota and Pennsylvania all only have one.

The reasons for the timing and location of the trials will be discussed after each of the cases has been described in detail. Each of the case descriptions will include the official title of the case, the year it took place and the location of the case. It will also include the court that it took place in since this is important to understand how large the impact of the decision was. The official case number or judgment citation is included for any further references required. A breakdown of the name of the plaintiffs and defendants or appellees and appellants (in the case of appeals such as the Edwards case) are listed as well as the grounds for the case and the judgment made. Following these details, there is then a short summary of the background that led up to the case and a description of the parties involved. The general impact that this case and ruling had on education is also included. Finally, when possible, the original legislation/book/stickers that were the subject of the case have also been included.

It is important to point out that although the Scopes Trial (1925) and the Kitzmiller (2005) have received the most media coverage of all of the trials and act as the bookends of this analysis, they were not necessarily the most important cases in a legal sense. In fact, many of the less known trials have had an equally large or larger impact on the high school curriculum than either the Scopes or the Kitzmiller Trial (Forrest, 2007). In general, the trials that made it to the US Supreme Court have the largest impact as the judgments in these cases determine how laws are enforced and interpreted in the future by all the lower courts in the entire country, whereas, cases heard in the lower courts only decide whether or not a law has been broken and set precedence only in that court's jurisdiction area. For example, the Kitzmiller ruling by Judge Jones III, despite its fame, only has precedential value in one district in Pennsylvania and does not prohibit any other school district from trying to enact similar Intelligent Design policies, whereas, the Edwards ruling of 1987 prohibited the teaching of Creation Science in all public schools in the entire country. For more information about the American legal system, see the previous section.

The cases will now be discussed in detail in chronological order. Each of the cases will be summarized using a uniform layout that includes the year, location, court level, plaintiffs, defendants, charges, ruling, summary and the cases specific effect on education. When relevant, the summary will also include the object of the charges such as state legislation or disclaimer. This sleek design allows a thorough overview of the cases in a simplified and organized manner so that the reader can (1) quickly recognize the key components of the case, which allows the reader to (2) understand how many cases are built upon one another, (3) see how the results of these cases cause creationists to change strategies in order to avoid further legal problems, (4) glimpse at the complexity of the problem for parents, students and teachers.

Scopes Trial (The State of Tennessee v. John Thomas Scopes)

Year: 1925

Place: Dayton, Tennessee

Court: Criminal Court of Tennessee

Citation: John Thomas Scopes v The State of Tennessee, 154 Tenn. 105 (1925), 289 S.W. 363 (1927)

Plaintiff: State of Tennessee

Defendant: John Thomas Scopes – biology teacher

Charges/Grounds: The defendant is in violation of the Butler Act (criminal offense)

Judgment for the: Plaintiff (anti-evolution)

Summary: In 1925, the Butler Act was passed in Tennessee making it unlawful “to teach any theory that denies the story of divine creation as taught by the Bible and to teach instead that man was descended from a lower order of animals.” The ACLU (American Civil Liberties Union) looked for a volunteer to go on trial to

oppose this act. John Scopes volunteered to incriminate himself. The judge decided in favor of the prosecution. John Scopes was fined. The trial was later appealed. Although the higher court waved the fine on a technicality, the Butler Act was affirmed as constitutional and was not repealed until 1967. This is the only case that was lost by the pro-evolution/secular party.

Impact on education: Following the Scopes Trial, many publishers of high school textbooks avoided the topic of evolution all together as they did not want to risk the chance of being boycotted/banned (Humes, 2007).

Butler Act*(1925): AN ACT prohibiting the teaching of the Evolution Theory in all the Universities, Normals and all other public schools of Tennessee, which are supported in whole or in part by the public school funds of the State, and to provide penalties for the violations thereof.

Section 1. Be it enacted by the General Assembly of the State of Tennessee, That it shall be unlawful for any teacher in any of the Universities, Normals and all other public schools of the State which are supported in whole or in part by the public school funds of the State, to teach any theory that denies the story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals.

Section 2. Be it further enacted, That any teacher found guilty of the violation of this Act, Shall be guilty of a misdemeanor and upon conviction, shall be fined not less than One Hundred \$ (100.00) Dollars nor more than Five Hundred (\$ 500.00) Dollars for each offense.

*Tenn. HB. 185, 1925

Epperson v. Arkansas (Susan Epperson, et. al. v. Arkansas)

Year of decision: 1968

Place: Arkansas

Court: Arkansas State Court (Chancery) to Arkansas State Supreme Court to US Supreme Court

Citation: Epperson v Arkansas, 393 U.S. 97 (1968)

Plaintiffs: Susan Epperson – science teacher, H.H. Blanchard – parent

Defendant: Arkansas State

Grounds: Epperson filed to have the Anti-evolution statute from 1929 nullified as it was seen to violate here First and Fourteenth Amendment rights.

Judgment for the Plaintiff (pro-evolution)

Summary: Susan Epperson, 10th grade high school teacher, challenged the constitutionality of Arkansas' "anti-evolution" statute. The statute made it unlawful for a teacher in any state-supported school or university to teach or to use a textbook that teaches, "that mankind ascended or descended from a lower order of animals." The State Chancery Court declared that the statute violated the 1st and 14th Amendment. The decision was reversed by the State Supreme Court stating that it is within the state's power to specify public school curriculum. The

US Supreme Court declared that the Arkansas statute was in fact unconstitutional as it violated the Establishment Clause of the First Amendment.

Impact on education: This ended the era of the Scopes trial by overruling the 1928 Arkansas statute, which had prohibited the teaching of evolution and thus prevented the passing of similar laws in the future.

Anti-evolution statute* (1929)

80–1627 – Doctrine of ascent or descent of man from lower order of animals prohibited. – It shall be unlawful for any teacher or other instructor in any University, College, Normal, Public School, or other institution of the State, which is supported in whole or in part from public funds derived by State and local taxation to teach the theory or doctrine that mankind ascended or descended from a lower order of animals and also it shall be unlawful for any teacher, textbook commission, or other authority exercising the power to select textbooks for above mentioned educational institutions to adopt or use in any such institution a textbook that teaches the doctrine or theory that mankind descended or ascended from a lower order of animals.

80–1628 – Teaching doctrine or adopting textbook mentioning doctrine – Penalties – Positions to be vacated. – Any teacher or other instructor or textbook commissioner who is found guilty of violation of this act by teaching the theory or doctrine mentioned in section 1 hereof, or by using, or adopting any such textbooks in any such educational institution shall be guilty of a misdemeanor and upon conviction shall be fined not exceeding five hundred dollars; and upon conviction shall vacate the position thus held in any educational institutions of the character above mentioned or any commission of which he may be a member."

*Initiated Act No. 1, Ark. Acts 1929. Ark. Stat. Ann. 80–1627, 80–1628

Daniel v. Waters & Steele v. Waters

Year: 1975

Place: Tennessee

Courts: Chancery Court, U.S. Court of Appeals, Sixth District and the Supreme Court of Tennessee

Citation: Daniel v Waters, 515 F.2d 485 (6th Cir. 1975)

Plaintiff: Joseph C. Daniel, Jr., Arthur Jones, Larry Wilder – biology teachers. And the National Association of Biology Teachers

Defendant: Tennessee State Textbook Commission and its chairman, Hugh Waters

Charges: The Tennessee statute requiring equal treatment of evolution and the Genesis account of creation in state textbooks is a violation of the First Amendment rights as granted by the Constitution.

Judgment for the Plaintiffs (pro-evolution)

Summary: In Daniels v. Waters, Tennessee biology teachers and parents and National Association of Biology Teachers sued Tennessee state textbook commission, including the chairman Hugh Waters challenging the constitutionality of the Tennessee statute, which required the equal treatment of evolution and the Chris-

tion creation story in state textbooks. Within the same time period, Harold Steele and two other members of Americans United for Separation of Church and State also filed suit, claiming that the Tennessee statute was in violation of the state and federal constitution. The Chancery Court ruled in 1974 in *Steele v. Waters* in favor of the plaintiffs, stating that the statute was in violation of the First and Fourteenth Amendments. The state of Tennessee appealed this ruling to the Supreme Court of Tennessee. In 1975, the US Court of Appeals, Sixth Circuit decided in *Daniel v. Waters* that the Tennessee statute was “patently unconstitutional.” In 1975, the Supreme Court of Tennessee ruled in favor of the plaintiffs in *Steele v. Waters* and also concurred with the *Daniel v. Waters* decision in its brief opinion.

Impact on education: This case clearly showed that equal-time legislation is in violation of state and federal constitution, but due to the limited jurisdiction the case did not stop creationist from continuing to champion similar equal-time statutes in other states until the US Supreme Court struck down Louisiana’s Balanced Treatment Act in 1987 in *Edwards v. Aguillard*.

Genesis Act* (1973): Any biology textbook used for teaching in the public schools, which expresses an opinion of, or relates a theory about origins or creation of man and his world shall 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 and 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 is recorded in other theories, including, but not limited to, the Genesis account in the Bible.

...Each 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 occult or satanical beliefs of human origin is expressly excluded from this Act.
*1973 Tenn. Pub. Acts, Chap. 377

Hendren v. Campbell

Year: 1977

Place: Indiana

Court: In the Marion Superior Court, NO. 5 (Marion county, Indiana)

Citation: *Hendren v Campbell*, Superior Court No. 5, Marion County, Indiana, 14 April 1977.

Plaintiffs: Jon Hendren – high school student, Robert Hendren – parent of Jon Hendren, E. Thomas Marsh – another student’s parent

Defendant: Glenden Campbell, Betty Crowe Harold H. Negley, Sterling N. Salton, Janet N. Wickersham, William Lyon, Betty Lou Jerrel – as individuals and in their official capacity as members of the Indiana Textbook Commission

Grounds for filing suit: The use of a textbook in a public school that promotes Creationism is a violation of a student's Constitutional rights.

Judgment for the plaintiff (pro-evolution)

Summary: This case involved the Indiana's Textbook Commission's approval of *Biology: A Search For Order In Complexity*. This was a "Creation Science" textbook was published by the Creation Research Society in 1970 and promoted through the Institute for Creation Research. This textbook was to be used in public school biology courses. The members of the commission, Campbell et al. were sued as individuals and in their capacity of commission members by a ninth-grade student, Jon Hendren, his father Robert Hendren, and E. Thomas Marsh, another student's parent. The ruling was made that it is unconstitutional to use a textbook in a public school that promotes the view of Creationism.

Impact on education: This case set a clear precedent that using a textbook, which promotes Creation Science, is unconstitutional. As Judge Dugan said, "The question is whether a text obviously designed to present only the view of Biblical Creationism in a favorable light is constitutionally acceptable in the public schools of Indiana. Two hundred years of constitutional government demand that the answer be no."

Product Description of Biology: A Search for Order in Complexity

Give your students a solid understanding of God's creation with this updated and improved Biology Text. Full-color photos, illustrations and charts throughout clearly display concepts discussed and help with visualization of terms and processes. From the scientific method to biochemistry to body systems and biogeography, each chapter looks at how God's plan and purposes are evidenced in creation. Scientifically accurate and true to a 6-day/young-earth creationism, Biology provides a scientific education that acknowledges God's role throughout. Review questions and suggestions for advanced study are included. Grades 10–12. 418 pages, hardcover, 2nd edition. www.christianbooks.com

Segraves v. California

Year: 1981

Place: California

Court: Superior Court of California

Citation: *Segraves v. California*, No. 278978 (Super. Ct. Sacramento County 1981)

Plaintiffs: Kasey Segraves, Jason Segraves and Kevin Segraves – students under 14 years of age, Kelly Segraves – students' father and head of Creation-Science Research Center, William Dannemeyer – politician (R), Michael D. Antonovich – politician (R), Eugene N. Ragle – State Board member and Creation Science Research Center

Defendants: State of California, Board of Education of the State of California, Department of Education of the State of California, Department of General Services, Wilson Riles – Superintendent, Kenneth Cory – politician (D), Jessie Unruh – politician (D).

Grounds for filing suit: The required teaching of evolution is a violation of a student's right to exercise their religion.

Judgment for the Defendant (pro-evolution)

Summary: Kelly Segraves sued the State of California Board of Education on behalf of his three schoolchildren arguing that his family's right to free exercise of religion was violated by the discussion of evolution in their public school. The judge ruled in favor of the Board of Education stating that the teaching of evolution cannot be considered the establishment of religion and that such infringements are prevented by State Board of Education's 1972 anti-dogmatism policy.

Impact on education: This ruling established that the teaching of evolution in science classes cannot be considered the establishment of religion or an infringement of the students' right to exercise their religious beliefs freely regardless of how objectionable evolution may be for some religious groups.

California State Board of Education's Anti-Dogmatism Policy

The domain of the natural sciences is the natural world. Science is limited by its tools – observable facts and testable hypotheses.

Discussions of any scientific fact, hypothesis, or theory related to the origins of the universe, the earth, and life (the how) are appropriate to the science curriculum.

Discussions of divine creation, ultimate purposes, or ultimate causes (the why) are appropriate to the history-social science and English-language arts curricula.

Nothing in science or in any other field of knowledge shall be taught dogmatically.

Dogma is a system of beliefs that is not subject to scientific test and refutation. Compelling belief is inconsistent with the goal of education; the goal is to encourage understanding.

To be fully informed citizens, students do not have to accept everything that is taught in the natural science curriculum, but they do have to understand the major strands of scientific thought, including its methods, facts, hypotheses, theories, and laws.

McLean v. Arkansas (McLean v. Arkansas Board of Education)

Year: 1982

Place: Arkansas

Court: US District Court (U.S. District Court for the Eastern Districts of Arkansas)

Citation: *McLean v Arkansas Board of Education*, 529 F.Supp. 1255, E.D Ark. (1982)

Plaintiffs: Reverend William McLean, Bishop Kenneth Hicks, Right Reverend Herbert A. Donovan, Most Reverend Andrew Joseph McDonald, Bishop Frederick C. James, Reverend Nathan Porter, Reverend George W. Gunn, Minister Dr. Richard B. Hardie, Reverend Earl B. Carter, Reverend George Panner, Minister Dr. John P. Miles – vice-chair of Americans United for Separation of Church and State, Reverend Jerry Canada, American Jewish Congress, American Jewish Committee, Union of American Hebrew Congregations, National Federation of Reform Jews, Frances

C. Roelfs – biology teacher, Charles Bowlus – father, Lon Schultz – father, Arkansas Education Association – teachers’ union, National Association of Biology Teachers, E.E. Hudson, biology professor, Mike Wilson – attorney and politician, National Coalition for Public Education and Religious Liberty

Defendants: Arkansas Board of Education and its members, the director of the Department of Education, and the State Textbooks and Instructional Materials Selecting Committee

Grounds for filing suit: It is unconstitutional for Creation Science to be taught in an equal and balanced manner with evolution in public school classrooms.

Judgment for the Plaintiff (pro-evolution)

Summary: The “Balanced Treatment for Creation-Science and Evolution-Science Act” was enacted in Arkansas in 1981 and required that equal time be given to both theories. Reverend William McLean (United Methodist Church) along with other clergy men, parents of children attending Arkansas public schools and a biology teacher challenged the constitutionality of the Act. The court declared that the Act violated the Establishment Clause of the First Amendment.

Impact on education: The ruling was not binding outside the jurisdiction of the court but the detailed decision, which also declared that Creation Science is not science, provided the foundation for future rulings involving the teaching of Creationism – most notably *Edwards v. Aguillard*.

Balanced Treatment for Creation-Science and Evolution-Science Act* (1981): “Public schools within this State shall give balanced treatment to creation-science and to evolution-science.” Section 4 Definitions, as used in this Act:

(a) “Creation-Science” is defined as scientific evidences for creation and related inferences that indicate: (1) Sudden creation of the universe, energy, and life from nothing; (2) The insufficiency of mutation and natural selection in bringing about development of all living kinds from a single organism; (3) Changes only within fixed limits of originally created kinds of plants and animals; (4) Separate ancestry for man and apes; (5) Explanation of the earth’s geology by catastrophism including the occurrence of a worldwide flood; and (6) A relatively recent inception of the earth and living kinds.

(b) “Evolution-Science” is defined as being scientific evidences and related inferences that indicate: (1) Emergence by naturalistic processes of the universe from disordered matter and emergence of life from nonlife; (2) The sufficiency of mutation and natural selection in bringing about the development of present living kinds from simple earlier kinds; (3) Emergence by mutation and natural selection of present living kinds from simple earlier kinds; (4) Emergence of man from a common ancestor with apes; (5) Explanation of the earth’s geology and the evolutionary sequence by uniformitarianism; and (6) An inception several billion years ago of the earth and somewhat later of life.

*Arkansas Act 590

Edwards v. Aguillard (Appeal of the ruling from Aguillard v. Treen)

Year: 1987

Place: Louisiana

Court: US Court of Appeals, 5th Circuit to the U.S. Supreme Court

Citation: Edwards v Aguillard, 482 U.S. 578 (1987)

Defendant-Appellant: Edwin W. Edwards – Governor of Louisiana

Plaintiff-Appellees: Don Aguillard – biology teacher

Grounds for filing suit: It is unconstitutional for Creation Science to be taught in an equal and balanced manner with evolution in public school classrooms.

Judgment for the Appellees (pro-evolution)

Summary: Louisiana's "Creationism Act" forbids the teaching of the theory of evolution in public elementary and secondary schools unless accompanied by instruction of "Creation Science." The constitutionality of this Act was challenged by a group led by Don Aguillard and twenty-six other organizations and individuals including parents, teachers, and religious leaders. The district court ruled that the Act was in violation of the Constitution and the defendants appealed the decision. The District Court granted summary judgment in favor of the Respondents, which was affirmed by the Fifth Circuit Court of Appeals. The US Supreme Court then ruled that the Act violated the Establishment Clause of the First Amendment. The decision was based on the three-pronged Lemon Test and the detailed ruling from *McLean v. Arkansas*.

Impact on education: The ruling affected all public schools in the United States by making it illegal to teach Creationism/Creation Science in public schools because it attempts to advance a particular religion. The ruling also spawned the birth of Intelligent Design and led to the editing of creationist textbook, *Of Pandas and People* (for more information see the Chapter on Intelligent Design).

The Balanced Treatment for Creation-Science and Evolution-Science Act * (1982):

"[P]ublic schools within [the] state shall give balanced treatment to creation-science and to evolution-science.

Balanced treatment of these two models shall be given in classroom lectures taken as a whole for each course, in textbook materials taken as a whole for each course, in library materials taken as a whole for the sciences and taken as a whole for the humanities, and in other educational programs in public schools, to the extent that such lectures, textbooks, library materials, or educational programs deal in any way with the subject of the origin of man, life, the earth, or the universe. When creation or evolution is taught, each shall be taught as a theory, rather than as proven scientific fact."

*Acts 1981, No. 685, §1.

Webster v. New Lenox

Year: 1989

Place: Illinois

Court: US District Court for the Northern District of Illinois

Citation: *Webster v New Lenox School District #122*, 917 F.2d 1004 (7th Cir. 1990)

Plaintiffs: Ray Webster – social studies teacher, Matthew Dunne – student, Philip and Helen Dunne – parents

Defendants: New Lenox School District No. 122, Alex M. Martino – Superintendent of New Lenox School District No. 122

Grounds for filing suit: Forbidding a teacher to speak about Creationism is a violation of that teacher's freedom of speech.

Judgment for the Defendant (pro-evolution)

Summary: Social Studies teacher, Ray Webster, sued the New Lenox School District for violating his 1st and 14th Amendment rights when he was prohibited from teaching his creationist beliefs in the classroom. The court found in favor of the defendant since a teacher does not have the right to express religious advocacy in the classroom. He was prohibited from teaching Creation Science, which has been found to violate the first Amendment and the prohibition was therefore constitutionally valid. Dunne argued that he had a right as a student to hear about Creationism or Creation Science to balance the teaching of pro-evolution statements. The court ruled that Dunne's desires to learn about Creation Science were outweighed by the district's obligation to avoid violating the Establishment Clause and other students' First Amendment rights.

Impact on education: This case highlighted the fact that teachers do not have an unlimited right to the freedom of speech and that they, too, are bound by the Constitution and are unable to promote a particular religious view in their classrooms.

Free Speech Rights of a Teacher Outside of School*

Teachers do not forfeit the right to comment publicly on matters of public importance simply because they accept a public school teaching position. Teachers cannot be fired or disciplined for statements about matters of public importance unless it can be demonstrated that the teacher's speech created a substantial adverse impact on school functioning. A teacher's off-campus statements are not acceptable bases for job discipline or termination.

Free Speech Rights of a Teacher Inside the Classroom*

A teacher appears to speak for the school district when he or she teaches, so the district administration has a strong interest in determining the content of the message its teachers will deliver. While courts sometimes protect the academic freedom of college and university professors to pursue novel teaching methods and curriculum, these principles do not apply with equal force to K-12 teachers. It does not violate a teacher's free speech rights when the district insists, for example, that she

teach physics and not political science, or that she not lead students in prayer – even though both have the result of limiting what the teacher says in the classroom.
*www.aclu.org

Peloza v. Capistrano

Year: 1994

Place: Orange County, California

Court: US District Court Central District of California to U.S. Court of Appeals, 9th Circuit

Citation: John E. Peloza v. Capistrano Unified School District, 37 F.3d 517 (9th Cir. 1994)

Plaintiff: John E. Peloza – biology teacher

Defendant: Capistrano Unified School District

Grounds for filing suit: Requiring a teacher to teach the “religion” of evolution is a violation to that teacher’s 1st and 14th Amendment rights.

Judgment for the Defendant (pro-evolution)

Summary: John E. Peloza sued the Capistrano Unified School District for forcing him to teach evolution as scientific fact and for prohibiting him from discussing his religious beliefs with students during instructional time. Peloza claimed that these policies violated his freedom of speech, freedom of religion, and rights to due process and equal protection (1st, 5th and 14th Amendment). As part of his case, he argued that “evolutionism” was part of the “religion of secular humanism.” The court ruled against Peloza on all accounts (1992). The court used a Balancing Test, which had been used by the US Supreme Court to decide whether a public employee’s speech is protected under the First Amendment. The US Court of Appeals upheld the dismissal of Peloza’s claim (1994).

Impact on education: This ruling upheld the decision that evolution is not a religion and therefore requiring a teacher to teach evolution as part of a science class curriculum does not violate the Establishment Clause. Also prohibiting a teacher from discussing his religious beliefs with his students is not an infringement upon his right of free speech but a protection of the students’ right to a secular education.

Secular Humanism as a religion

If a person were successful in being able to portray the teaching of evolution as the promotion of the religion of secular humanism, it would thus mean that evolution would count as religion, thus making the teaching of evolution a violation of the Establishment Clause.

Freiler v. Tangipahoa (Freiler v. Tangipahoa Parish Board of Education)

Year: 1997/2000

Place: Louisiana

Court: US District Court for Eastern District of Louisiana (1997) to US Court of Appeals for the Fifth Circuit (2000)

Citation: *Freiler v. Tangipahoa Parish Board of Education*, 185 F.3d 337 (5th Cir. 1999)

Plaintiffs: Herb Freiler – parent, Sam Smith – parent of Steven Smith, John Jones – parent

Defendants: Tangipahoa Parish Board of Education, Members of the School Board: E.F. Bailey; Robert Caves; Maxine Dixon; Leroy Hart; Ruth Watson; Donnie Williams, Sr.; Art Zieske, Ted Cason – Superintendent of Schools

Grounds for filing suit: Any policy that requires a disclaimer to be presented before any discussion of evolution is in violation of the Establishment Clause

Judgment for the Plaintiff (pro-evolution) 1997 & 2000

Summary: In 1994, the Tangipahoa Parish school board voted to have a disclaimer read before the topic of evolution was taught. In 1997, a group of parents sued the school board for violating the Establishment Clause of the First Amendment. The US District Court found in favor of the parents (1997). The school board appealed to the US Court of Appeals, where the decision was upheld (1999). The US Supreme Court declined to hear the case, thus allowing the lower court ruling to stand (2000).

Impact on education: This case set a precedent that the reading of disclaimers is a violation of the Establishment Clause and that a school board cannot require teachers to read such disclaimers. Since the case was not heard by the US Supreme Court, the impact of the judgment remained local.

Original Disclaimer from Tangipahoa

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.

LeVake v. ISD #656 (Rodney LeVake v. Independent School District 656, et al.)

Year of judgement: 2000

Place: Minnesota

Court: Minnesota State District Court

Citation: *LeVake v Independent School District No. 656*, 625 N.W.2d 502 (MN Crt Appl. 2000), cert. denied, 534 U.S 1081 (2002)

Plaintiff: Rodney LeVake – high school biology teacher

Defendant: Independent School District #656, Keith Dixon – Superintendent, Dave Johnson – principal, Cheryl Freund – Curriculum Director

Grounds for filing suit: Prohibiting a teacher from teaching the weaknesses of evolutionary theory is a violation of that teacher's freedom of speech.

Judgment for the Defendant (pro-evolution)

Summary: Rodney LeVake was a high school biology teacher. He refused to teach evolution unless he was able to teach “the difficulties and inconsistencies of the theory.” He was therefore reassigned to a ninth-grade general science course. LeVake sued (1999) to recover his original position, alleging that the reassignment violated his right to free exercise of religion, free speech, due process, and academic freedom (1st and 14th Amendment Rights). He also claimed that the district's teaching assignment policy was illegal under the United States and Minnesota Constitutions. The court ruled (2000) against LeVake on all accounts in favor of the school district's curriculum policy.

Impact on education: This ruling, similar to *Pelozo v. Capistrano* and *Webster v. New Lenox*, showed that teachers cannot use their claim to freedom of speech in order to teach their own religious beliefs and a school's responsibility to provide a secular education supersedes a teacher's right to free speech.

LeVake's Position Paper

“[N]either evolution or creation can be considered a science because neither are [sic] observable at the present.” “[P]roponents of either interpretation must accept it as a matter of faith.”

“The process of evolution itself is not only impossible from a biochemical, anatomical, and physiological standpoint, but the theory of evolution has no evidence to show that it actually occurred.”

LeVake claims the weaknesses as: lack of transitional forms in fossil record, theory of evolution violates the Second Law of Thermodynamics, natural selection is inadequate for producing macroevolution.

He also included examples of “incredible complexity” such as: bacterial flagella, woodpecker's tongue and shock absorber, metamorphosis of caterpillar to butterfly.

Kitzmiller v. Dover (Tammy Kitzmiller, et al. v. Dover Area School District, et al.)

Year of judgement: 2005

Place: Harrisburg, Pennsylvania

Court: U.S. District Court for the Middle District of Pennsylvania

Citation: *Kitzmiller v. Dover*, 400 F. Supp. 2d 707 (M.D. Pa. 2005)

Plaintiffs: Tammy Kitzmiller, Bryan Rehm, Christy Rehm, Deborah Fenimore, Joel Lieb Steven Stoug, Beth Eveland, Cynthia Sneath, Julie Smith, Aralene “Barrie” D.

Callahan, Frederick B. Callahan – parents of students in Dover Area School District (DASD)

Defendants: Dover Area School District and Dover Area School District Board of Directors
 Grounds for filing suit: Parents claimed that the DASD had violated their children's First Amendment Rights

Judgment for the Plaintiff (pro-evolution)

Summary: A group of parents sued the Dover Area School District when the school board required that a statement be read aloud in ninth-grade science classes when evolution was taught. The statement presented Intelligent Design as “an explanation of the origin of life that differs from Darwin's view” and referred students to copies of Creationist's textbook, *Of Pandas and People*, available at the school library. Plaintiffs were represented by the ACLU. The court applied the Lemon Test and the Endorsement Test and ruled that the teaching of Intelligent Design in public school biology classes violates the Establishment Clause of the First Amendment. They found that Intelligent Design is not science and “cannot uncouple itself from its Creationist, and thus religious, antecedents.”

Impact on education: This was the first case to test the teaching of Intelligent Design. Not only did the ruling show that the teaching of Intelligent Design is unconstitutional it also clearly stated that Intelligent Design is not a science making it difficult for all other future attempts of trying to get Intelligent Design taught in biology classrooms.

Original Statement from Dover

The Pennsylvania Academic Standards require students to learn about Darwin's theory of evolution and eventually to take a standardized test of which evolution is a part.

Because Darwin's Theory is a theory, it is still being tested as new evidence is discovered. The Theory is not a fact. Gaps in the Theory exist for which there is no evidence. A theory is defined as a well-tested explanation that unifies a broad range of observations.

Intelligent design is an explanation of the origin of life that differs from Darwin's view. The reference book, *Of Pandas and People*, is available for students to see if they would like to explore this view in an effort to gain an understanding of what intelligent design actually involves.

As is true with any theory, students are encouraged to keep an open mind. The school leaves the discussion of the origins of life to individual students and their families. As a standards-driven district, class instruction focuses upon preparing students to achieve proficiency on standards-based assessments. *Ibid.*

The following table is a summary of the court cases. It lists the plaintiffs, the defendants and the rulings. It is color coordinated to indicate what interests were represented by each side.

Tab. 15: Summary of cases from 1925 to 2005 (color coded to interest of party)

Cases from 1925 to 2005 including judgments and color-coded to depict creationist interests (red) or evolution education interests (green)		
Plaintiff	Defendant	Judgment
Tennessee – state	John Scopes – teacher	Defendant found guilty of violating Butler Act.
Epperson – teacher	Arkansas – state	Any statute that prohibits the teaching of evolution is in violation of the Constitution.
Daniel – teacher	Waters – textbook commission	Genesis Act (requiring balanced treatment) is in violation of the Constitution.
Hendren – parent	Campbell – textbook commission	Including a textbook that discusses Creationism in public schools is in violation of the Constitution.
Segraves – parent	California – state	Teaching evolution cannot be considered the establishment of religion and is therefore not in violation of the Constitution.
McLean – reverend	Arkansas – board of education	Balanced Treatment Act (requiring balanced teaching of evolution and Creation Science) is in violation of the Constitution.
Aguillard – teacher	Edwards – governor	Balanced Treatment Act (requiring balanced teaching of evolution and Creation Science) is in violation of the Constitution.
Webster – teacher	New Lenox – school district	A teacher's freedom of speech does not overrule a school district's obligation to protect a student's constitutional rights.
Pelozza – teacher	Capistrano – school district	Requiring a teacher to teach evolution instead of Creationism is not a violation of that teacher's constitutional rights.
Freiler – parent	Tangipahoa – board of education	Requiring a disclaimer to be read before teaching evolution is in violation of the Constitution.
LeVake – teacher	ISD #656 – school district	A teacher's freedom of speech does not overrule a school district's obligation to protect a student's constitutional rights.

Kitzmiller – parent	Dover – school district	Requiring a disclaimer to be read and any attempt to include Intelligent Design into the classroom is in violation of the Constitution.
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Red in the table represents in the interest of Creationism/Creation Science while green represents in the interest of evolution/secularism. As is clear from the table, all of the rulings were made in the interest of preserving secularism, i.e. public school science education free from religion except in the Scopes trial. The rulings in dark green indicate US Supreme Court rulings.

It is clear from the table that five of the cases were initiated by individuals with creationist interests. The majority of these cases (three of five), these were initiated by teachers who were interested in teaching Creationism rather than evolution: Webster, Peloza, and LeVake. In one case, it was initiated by the state of Tennessee and one was by a parent (Segraves).

Seven of the cases during this period of time were initiated by parties interested in keeping Creationism/Creation Science/Intelligent Design out of the classroom. Again three of these cases were initiated by teachers (Epperson, Daniel, Aguillard), three were initiated by parents (Hendren, Freiler, Kitzmiller), and one by a reverend (McLean). The cases initiated by the teachers and reverend were directed at challenging state legislation that prohibited the teaching of evolution or required the balanced treatment of evolution and Creationism, while the parent-initiated cases focused on textbook choice or the implementation of disclaimers.

Tab. 16: Cases from 1925 to 2005 according to state and year (color-coded)

Cases from 1925 to 2005 according to state, year and color-coded			
Case		Year	State
Tennessee	Scopes	1925	Tennessee
Epperson	Arkansas	1968	Arkansas
Daniel	Waters	1975	Tennessee
Hendren	Campbell	1977	Indiana
Segraves	California	1981	California
McLean	Arkansas	1982	Arkansas

Aguillard	Edwards	1987	Louisiana
Webster	New Lenox	1989	Illinois
Peloza	Capistrano	1992	California
Freiler	Tangipahoa	1997	Louisiana
LeVake	ISD #656	2000	Minnesota
Kitzmiller	Dover	2005	Pennsylvania

The table above again shows the list of the cases that was seen at the beginning of this section but now includes the color coordination of the interests of the parties involved with the winner of the case in bold. Now it is clear to see that both of the cases in California were initiated by creationist individuals while the two cases in Arkansas were initiated by secularist and the two cases in Tennessee were split. The winners of each case are in bold. Now that an overall view of the cases has been established, the next section will discuss the most important cases in greater detail.

An in-depth look at the most important cases

This section will take a closer look at four cases to better illustrate how the rulings in certain cases can change the orientation of creationist strategies. Each of the selected cases caused great shifts in policy and strategy. The selected cases are *Scopes (1925)*, *Epperson (1968)*, *Edwards (1987)* and *Kitzmiller (2005)*.

The State of Tennessee v. John Thomas Scopes (1925)

The *Scopes* trial is very interesting because it was the only case that was lost by the secular, pro-science education side. In other words, it was the only case that the Creationists have ever won outright. Moreover, it is a crucial case in that it affected the way textbooks were published for the next 30 years after the trial. This will be discussed in more detail in the next chapter.

The social and political climate at the time of this trial was also very different from the current state in the United States. Although the 1920s in America were modern in the sense of science, culture and invention a large organized political movement erupted against the teaching of evolution during this time. Some theories speculate this somewhat “sudden” onslaught on evolution was due to the rise in attendance to public high schools. At the turn of the century, only six of 100 American seventeen-year-olds attended high school, meaning that a very small

percent of the population was exposed to the teaching of evolution (Slawson, 2005). In the early 1900s there was a rapid expansion of public schools and attendance to these schools rapidly increased during the twentieth century meaning that a much larger portion of American minds were exposed to the ideas of evolution and this drew attention to the schools and teaching of evolution that was perceived as being inconsistent with Christian belief (Slawson, 2005).

One of the most active and influential individuals against the teaching of evolution was William Jennings Bryan, who toured the country denouncing Darwin and the geologists who claimed that the Earth was older than the Bible claimed (Humes, 2007). As a result of this political movement, multiple states began passing legislation that banned the teaching of evolution in their state (Numbers, 1998; Matzke, 2010; Scott, 2009). Over time, his circuit inspired anti-evolution legislation in more than two-thirds of the states (Humes, 2007).

Tennessee was the only state though that made teaching evolution a punishable criminal offense. The Butler Act was enacted by John Washington Butler, the governor of Tennessee and passed by the Tennessee legislature in 1925. The act made it unlawful “to teach any theory that denies the story of divine creation as taught by the Bible and to teach instead that man was descended from a lower order of animals” and any teacher caught teaching evolution was to be fined \$100 to \$500 (Humes, 2007).

Soon after this bill was passed, the American Civil Liberties Union (ACLU) became involved and announced that they were looking for someone to challenge the Butler Act (Humes, 2007). It was at this point that John Scopes offered to be the volunteer teacher. William Jennings Bryan volunteered to assist the prosecution while Clarence Darrow signed on as the defense lawyer for the ACLU. The case was a media circus, being the first trial to feature live radio broadcasts of the proceedings (Humes, 2007).

The chance of winning the case was very low to begin with, since the judge overseeing the case was a conservative Christian who would not allow Darrow to call any scientific experts to support the validity of the theory of evolution (Humes, 2007). This was a moot point during this trial. The ACLU was unconcerned with winning the case in Tennessee and each of the judge’s prejudicial rulings made the chance of appeal to the US Supreme court that much higher and this was the ultimate goal since it would allow anti-evolution statutes to be struck down or prevented at a national level (Humes, 2007).

Scopes was found guilty by the jury after only 9 minutes of deliberation and the judge fined Scopes \$100. The case was then appealed. The Tennessee Supreme Court did not see problems regarding the separation of church and state and thus upheld the guilty verdict. They did overturn the \$100 fine since it was decided by the judge and not the jury. The decision by the Tennessee Supreme Court prevented the ACLU of being able to bring the case to the US Supreme Court to test the constitutionality of the statute.

Thus, the case's only real impact was that it drew attention to the conflict and controversy surrounding the teaching of evolution and illustrated the polarized nature of the American population – one side rallying for the advancement of science and one trying to protect their idea of an inerrant bible. The case, though, did not change any legal or political aspects. It did have economic repercussions, in that publishers avoided the topic of evolution in subsequent years to assure that their books would be purchased in all US states (Matzke, 2007).

Epperson v. Arkansas (1968)

The Epperson case is closely linked historically to the Scopes trial since it challenged the constitutionality of an anti-evolution statute that was modeled after Tennessee's Butler Act and was passed in Arkansas a couple years after the Scopes ruling verified that such legislation was in fact "safe" to be passed (Numbers, 1998). Also similar to the Scopes trial was the fact that this case was also orchestrated by an agency that went about looking for a teacher to violate the state statute so that it could be struck down (Cartwright, 2004). In the 1960s, the Arkansas Education Association approached Susan Epperson to participate in their attempt. According to Epperson, they chose her because she was and "all-Arkansas" girl – white, southern and Christian (Cartwright, 2004).

The case was heard by the Arkansas State Court, who ruled in favor of Epperson and against the anti-evolution statute in Arkansas, yet when the state appealed the decision, the ruling was overturned by the Arkansas Supreme Court. Ultimately, the case was reheard by the US Supreme Court, which upheld the original decision of the Arkansas State Court thus making it unconstitutional for any state to have such anti-evolution legislation on its books.

The ruling by the US Supreme Court in favor for the plaintiff, Susan Epperson, established the precedent that a state curriculum could not "be tailored to the principles or prohibitions of any religious sect or dogma". This case brought to an end to the enforcement of "Scopes era" laws and prevented similar legislature that prohibited the teaching of evolution from being passed in the future⁶⁷. It thus led to the dawn of a new era of anti-evolution strategies.

Edwards v. Aguillard (1987)

This case is closely linked to the McLean case since both cases address almost identically written legislature – both in fact had the same name: Balanced Treatment for Creation Science and Evolution-Science Act, which passed in Arkansas in 1980 and in Louisiana in 1981. Yet, Edwards had a much larger impact because it was heard by the US Supreme Court and since the ruling was made by the US Supreme Court, it ended the era of Balanced Treatment strategies. The political and social environ-

⁶⁷ 'Epperson v. Arkansas'. *National Center for Science Education*. 17 Oct. 2008. (Accessed 11 January 2015)

ment during the time of this case had changed quite a bit since the Epperson case and at this point in time was marked by Creationist leaders such as Henry Morris and the presence of such institutes as Creation Research Society.

The Louisiana Balanced Treatment for Creation-Science and Evolution-Science Act was introduced by Bill Keith, who clearly proclaimed that evolution was contrary to his beliefs and he wanted to use “academic freedom” to require the development of curriculum guides for Creation Science. The act became law 1981 after it was signed by Governor Treen. The ACLU again became involved in another creation/evolution case and together with 26 organizations challenged the constitutionality of the Balanced Treatment Act in the case *Aguillard v. Treen* using the biology teacher Don Aguillard as the nominal plaintiff (Humes, 2007). The ACLU used the same successful strategy that they had used in *McLean v. Arkansas*, i.e. that the act advances religion (Numbers, 1998; Humes 2007). The trial was heard by the US District Court in New Orleans and it was ruled in 1985 that there was no valid secular purpose of the act.

The state appealed the decision to the Fifth Circuit Court of Appeals in the name of the new governor – *Edwards v. Aguillard*. The decision was upheld by the US Court of Appeals and was then moved on to the US Supreme Court, which ruled in 1987 that “it is unconstitutional to mandate or advocate creationism in public schools⁶⁸”. The ruling also pointed out that the attempt to have Creationism taught in a public school is an attempt “to employ the symbolic and financial support of the government to achieve a religious purpose⁶⁹”. Thus it became unconstitutional for states to pass legislation that either directly sought to prevent the teaching of evolution or that directly promoted the teaching of Creationism or Creation Science. And thus, once again, a new era of maneuvers began.

Kitzmiller v. Dover (2005)

This case was not heard by the US Supreme Court, but it did attract almost as much media attention as the Scopes trial and similar to the Scopes trial, it has had a lot of influence on the creationist community in that it made it clear that trying to promote or teach Intelligent Design in public schools was going to lead to economic losses in court (Humes, 2007).

In 2004, the school board in Dover, Pennsylvania adopted a policy that required science teachers to read a statement to their class, instructing students that evolution is a “theory” and not fact. It also informed students about an alternative theory existed known as Intelligent Design (ID) and that copies of the ID text, *Of Pandas and People* were made available for students in the school library. Eleven

⁶⁸ Edwin W. Edwards, Governor of Louisiana, et al., *Appellants v. Don Aguillard et al.* (482 U.S. 578)

⁶⁹ *Ibid.*

parents sued, claiming that the promotion of ID in public schools violated the constitution.

The Dover school board was defended by Thomas More Law Center (TMLC). TMLC refers to themselves as the “Sword and Shield of People of Faith” and was launched by the billionaire founder of Domino’s Pizza with the intention of returning religion “to the public square” (Humes, 2007). The parents were represented by Pepper Hamilton law firm from Philadelphia and were assisted by the Americans United for Separation of Church and State and the American Civil Liberties Union (ACLU), who had been involved in many other significant battles over evolution since the Scopes trial.

The case was tried as a bench trial in the US District Court for the Middle District of Pennsylvania in 2005. Judge John E. Jones III presided over the case, which led the defense to believe that they could win since Jones had recently been appointed as a Republican judge by George W. Bush (Humes, 2007). However, Jones surprised them by ruling for the plaintiffs. The *Kitzmiller* decision was based on the following six steps (Wexler, 2010):

Judge Jones’s Decision Process in his *Kitzmiller* Ruling

- (1) Jones used the Lemon Test and Endorsement Test in analyzing the school board’s actions,
- (2) he analyzed the historical development of ID movement, as well as religious language used by its supporters and concluded that an objective observer would see it as a religious strategy,
- (3) he asked himself how a reasonable student would view the policy and found that “an objective student would view the disclaimer as a strong official statement of religion or a religious view”,
- (4) and that reasonable parents would come to the same conclusion,
- (5) he concluded that ID is not science
- (6) and found that the policy was enacted for the primary purpose of advancing religion (Wexler, 2010).

*Fig. 11: Ruling process by Judge Jones in the *Kitzmiller* case*

The ruling in *Kitzmiller* thus caused creationists to turn away from trying to enact district wide policies and began moving toward encouraging individual teachers to bring up Intelligent Design as an alternative theory on their own. To support these measures, work also began to introduce legislation that would grant “academic freedom” to teachers in order for them to present criticisms of evolution” (Wexler, 2010). The trends that followed the *Kitzmiller* case will be discussed in more detail in later chapters.

The next part of this section will attempt to determine the reasoning for these temporal and physical trends. To begin, first the temporal patterns will be dissected.

Temporal patterns

Some writers have accredited the appearance and reappearance of evolution cases in the United States with trends in educational policy in the United States. In other words, there were not any debates about evolution education prior to the 1920s because most American schools were private and run by the church and then a movement began in the 1920s towards compulsory (secular) education provided by the government (Slawson, 2005). This movement towards compulsory education corresponded to the Progressive Era in the United States (1890 to 1930) and spawned a rapid expansion of schools and students served in America and by 1910 even the smaller towns began to build high schools (Herbst, 1996).

Given this expansion of schools, there was a larger percentage of the population who were being taught evolution and this led to a rash of anti-evolution legislation. Oklahoma passed the first anti-evolution legislation (1923) prohibiting the purchase of any copyright or adoption of any textbook that “teaches the ‘materialistic conception of history’ (i.e.) the Darwin theory of creation vs. the bible account of creation.” Three states then passed laws prohibiting the teaching of any doctrine, which stated that men man descended from lower animals such as Tennessee (1925) and Arkansas (1929). Mississippi also passed an anti-evolution legislative statute in 1926. The legislation in Tennessee was then challenged by the American Civil Liberties Union (ACLU) and led to the first evolution/creationism court case in 1925 (Tennessee v. Scopes). This was also the only case where an anti-evolution law was upheld as being constitutional and a teacher was found guilty for violating this law by teaching evolution in a public school.

Following the Scopes trial, in which the Butler Act was upheld, evolution disappeared from the textbooks for multiple decades (Humes, 2007) due to economic reasons that will be discussed in detail in chapter 5. Evolution did not reappear in high school textbooks until the late 1950s. This reappearance of evolution in high school text books was in reaction to the Soviets’ launching of Sputnik in 1957 and the subsequent revision of American textbooks by the Biological Science Curriculum Study (BSCS) (Matzke, 2007).

The connection between evolution education and the Soviets’ success in launching a satellite before the Americans has been made because it gave an impulse to the US government to improve the science education in the United States, as not to fall behind (Larson, 2003). As part of this plan, the National Academy of Science provided a grant to the American Institute of Biological Sciences in 1958 that was then used to establish the Biological Science Curriculum Study (BSCS). The BSCS decided in 1959, to target high school biology at the tenth-grade level and during the summer of 1960 new textbooks were developed for this purpose that went out for commercial publication in 1963 (Engelman, 2001). These textbooks placed particular focus on evolution as a major scientific theory since it had become one of the cornerstones of modern biology through the discovery of Mendelian genetics in the 1920s and 1930s, leading to the mod-

ern synthesis theory, which was bolstered by James Watson and Francis Crick's discovery of the DNA structure in 1953 (Blancke, 2014). This was a huge change in the high school curriculum because evolution had been largely omitted from high school textbooks since the 1920s following the Scopes trial (Grabiner and Miller, 1974).

The combination of the anti-evolution legislation still on the books in some states, like Arkansas, and the influx of new textbooks and curriculum standards promoting the teaching of evolution led directly to the Epperson case since the curriculum required her to teach evolution but the state anti-evolution statute meant she would lose her job if she did (Epperson, 1968). After Susan Epperson won her case with the backing of the ACLU and National Education Association (NEA) in 1968, all anti-evolution legislation became unconstitutional in the United States. Instead of that ending the evolution/Creationism conflict, it was actually just the beginning. Ever since 1968 there has been an evolution/Creationism related case in the United States at least every five years, yet they all addressed trends particular to their time.

As the popularity of Creation Science rose, anti-evolution legislation was written to support the teaching of this YEC proposition by declaring that if evolution was taught that "equal time" would have to be given to discussing Creation Science. This new type of "balanced treatment" legislation was addressed in McLean and Edwards, when it was ultimately ruled unconstitutional. For some, the Edwards ruling was seen to be the end of the creationist movement in the United States (Gould, 1987). However, with the abolishment of Creation Science in classrooms came the rise of strategies to get Intelligent Design taught in public schools as an alternative explanation, which ultimately led to the Kitzmiller case in 2005. Despite this loss, the creationist movement has not stopped, in fact, the number of cases that involve the opposition to the teaching of evolution has increased in frequency and complexity since 2005 as will be discussed in the last chapter.

The next section will look at the geographical clumping or patterns among the trials in order to discern whether or not, these trials tend to be found in a particular area of the United States or if they are a general phenomenon.

The geography of legal conflict and where the Americans stand

This section will examine the geography of legal conflict in order to determine whether these conflicts are dependent upon the historical, religious or political attributes of an area or if these types of conflicts are universal in the states and digress across all borders. Some studies have found that there is a larger amount of support for Creationism in the "Bible Belt"⁷⁰ states. For instance, People for the American

⁷⁰ The *Bible Belt* is an informal term used to describe the south-eastern to south-central parts of the US. This region is characterized by a large socially conservative evangelical population, which plays a

Way conducted a poll in 2000 in response to the science standards changes in Kansas. They asked Americans the following question: “The Kansas State Board Of Education has recently voted to delete Evolution from their new state science standards. Do you support or oppose this decision?” They found that the majority of Americans were in opposition to such changes.

Tab. 17: Response to removal of evolution from science standards

Response to the Kansas State Board of Education’s removal of evolution from science standards	
Support the decision	28%
Oppose the decision	60%
Not sure	12%

They then examined the responses and examined the characteristics of two groups, i.e. the supporters and those in opposition. They found that those who were in support of the decision were mainly from the south and were less educated than those who were in opposition to the Kansas decision. They also found that the supporters described themselves as being either evangelical or religious.

Tab. 18: Characteristics of those who opposed/support science standard changes

Characteristics of individuals who are either opposed to or in support of the Kansas science standard changes	
Groups most OPPOSED to ruling:	Groups in SUPPORTIVE of ruling:
Better educated Younger Residents of the Northeast	Less educated Older Self-described as very religious/ Evangelical Residents of the South, Central and “Bible Belt” states

The demographic trend exemplifies the assumption that most individuals make about anti-evolutionists – that they are uneducated and from the South – as depicted by the 1960 film *Inherit the Wind*, which was based on the Scopes trial that took place in Tennessee, and this depiction led evangelicals all over the nation to believe that they were not welcome in mainstream America (Larson, 2012). This section will

therefore look at the geography of the cases to see whether this is in fact a true statement regarding the geography of legal conflict. In order to determine whether or not there are any geographical trends, location of the cases will be depicted using US maps which depict certain zones, territories or regions in the United States.

In order to assess whether there is a religious, historical or political trend regarding the geography of legal conflict, three maps will be used: the first portrays the importance of religion by state, i.e. are there more cases in states where religion plays a larger role. The second map shows the historical division between confederate and union states, in order to determine if there are more or fewer cases in states dependent on historical or cultural markers. In addition, the third map depicts the political division between red (Republican) and blue (Democrat) states in order to see if a geographical clumping can be determined along party lines.



Fig. 12: Location and prevalence of cases from 1925 to 2005

The first figure simply shows the general US map without any differentiations. As can be seen in this figure, there are multiple cases in some states (California, Tennessee, Arkansas, Louisiana), while the other states only have a single case. During the first half of the 20th century, there was only one case and that was the Scopes trial in Tennessee. Although this case exemplified a very typical image of the conservative, religious South, it can be seen in the figure that the trials did not remain confined to this demographic area forever.

The next figure will look at whether or not the religiosity of a region leads to more creationist conflict. The data used for the figure are based on the results from a Gallup Poll in 2009 that found that overall 65% of Americans say that religion plays an important part of their daily lives (Newport, 2009). The figure

that resulted the data from the poll shows the concentration of those individuals who say that religion is very important in their lives versus those who say that religion plays a relatively small role in their lives.

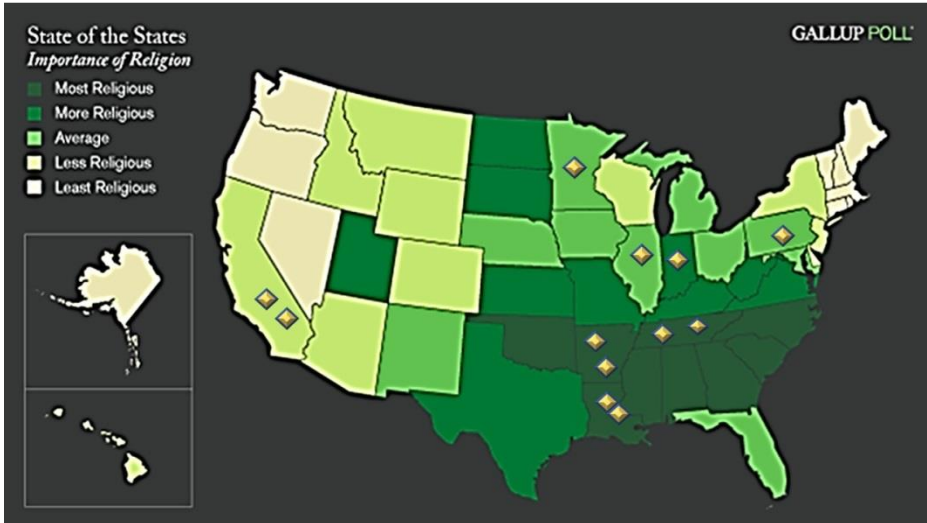


Fig. 13: Prevalence and location of cases in relation to the religiosity by state

As can be seen in the figure above, there are cases present in states that are “most religious”, “more religious,” “average” and “less religious”. Here, although, there is a spread of cases throughout almost all of the categories, there are in fact no cases present in “least religious” states, while the majority of the cases (50%) do take place in the “most religious” states.

This trend may be due to the fact, that a certain amount of religious importance must be present in a state for either (1) a state to pass religiously motivated legislation, (2) a school board to propose religiously motivated policies, (3) a teacher to choose to teach about Creationism or refuse to teach evolution, or (4) a parent to object to the teaching of evolution because it opposes their religious beliefs. So it would seem logical that in states where religion is generally “least important” that there would not be enough individuals present to start a conflict about a religious matter.

The next figure looks at the historical division of the United States based on Confederate and Union states. This old division still represents historical and cultural differences in the United States, that range for worldviews to culinary preferences.

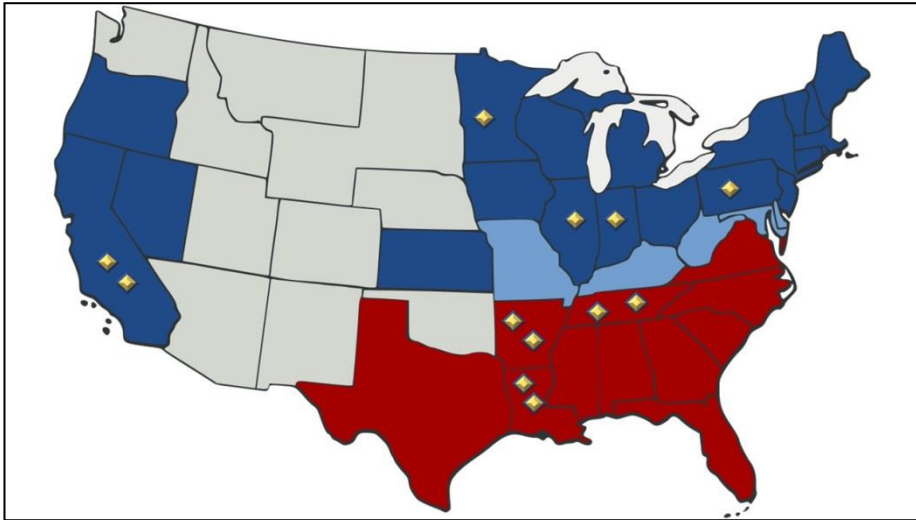


Fig. 14: Prevalence and location of cases relative to historical division of Union and Confederate States.

By looking at the figure, it is clear that the cases are absolutely equally divided among former confederate states and former union states. Thus, one could not say that the prevalence of cases in a state is dependent on the history of that state or the cultural legacy left by the Civil War.

The only difference that could be made would be that in three of the six cases that took place in former confederate states, the opposition to anti-evolution legislation did not come from the local community but was instead organized by a national organization from outside of the state. For example, the ACLU actively sought an individual in Tennessee to challenge the Butler Act, leading to *Tennessee v. Scopes* in 1925. The ACLU and the National Education Association were largely responsible for orchestrating the case of *Epperson v. Arkansas* in 1968 to challenge the prohibition of the teaching of evolution in Arkansas, which had been on the books since the 1920s.

The next figure will look at the prevalence of cases based on whether that state is “red” or “blue”. This color designation is based on the majority of votes placed in that state and whether that majority goes to the conservative Republican Party, “red”, or to the more liberal Democratic Party, “blue”.

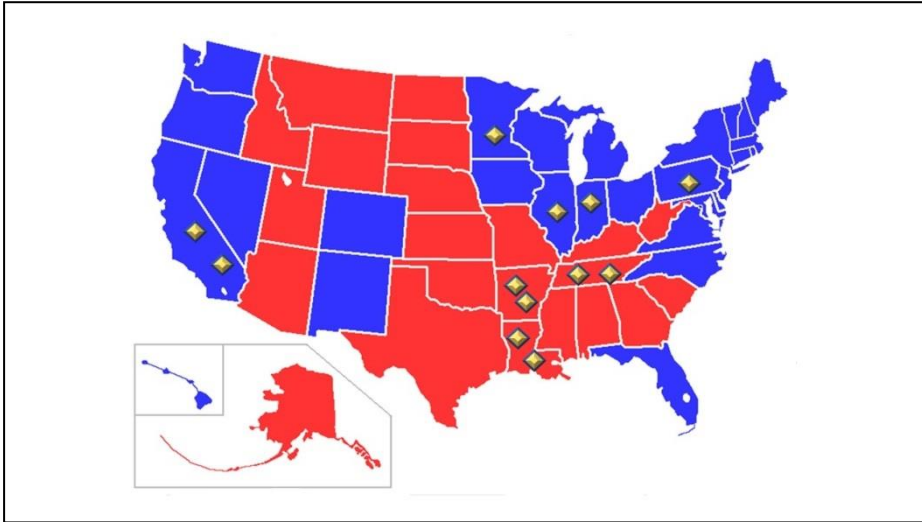


Fig. 15: Prevalence and location of cases relative to Republican and Democrat majority states⁷¹

As can be seen in this figure, there is another 50/50 split with half of the cases taking place in “red” states and the other half in “blue” states. From these three maps, it can thus be seen that legal battles are equally present in highly religious and less religious states, in both former confederate states and union states and in both “red” and “blue” states pointing to the fact that these conflicts are not relegated to just one certain religious, political or historical geographical area. The only geographical places where these cases seem not to occur (yet) are in those states described as “least religious”.

Yet just because there is not apparent geographical clumping when it comes to legal battles, it does not necessarily mean that there are not geographical trends in general when it comes to supporting the teaching of Creationism. To have a dispute, two different sides must be represented. In other words, if a community is homogeneously pro-Creationism and anti-evolution and a school in that community decides to teach Creationism instead of evolution, then there would not likely be a legal conflict if there is not anyone present to protest the policy.

⁷¹ Map: McCarthy, Erin. “Where Did The Idea Of ‘Red States’ and ‘Blue States’ Come From?” *Mental_floss*, 7 Nov. 2012. (Accessed 15 June 2015)

Summary

As was discussed in this chapter, there have been many cases that have been heard at both state and national level concerning the teaching of Creationism or restrictions placed on the teaching of evolution between 1925 and 2005. All of the cases heard were decided based on whether or not a policy was in violation of the first amendment rights as set forth by the Constitution of the United States. Of all of these cases, only one was won in the name of Creationism. What also became apparent through the different sections was the active role that particularly the ACLU has taken in trying to dismantle pro-creationist legislation and policies. Moreover, it could be shown that these conflicts appear in all parts of the United States (with the exception of the least religious states) and that since 1968 these cases have occurred in regular intervals. Most importantly, it could be shown how the legal conflicts affect the creationist movement and in particular, how each of the larger rulings has caused strategic shifts within the creationist community. This strategic mutation was most clear after the Epperson, Edwards and Kitzmiller rulings.

The next section will move away from the legal system and take a closer look at the education system in the United States. A particular focus will be placed on newer strategies, such as how Darwin-doubters are actively trying to effect change at the state and district level in order to weaken the teaching of evolution in public schools through changes in state science standards and textbook content.

Examining the conflict and its effect on education

This chapter will be devoted to first looking at how the American education system is organized and will then go into detail about how curriculum standards are decided and how textbooks are adopted. The chapter will also provide a detailed description of the different strategies that are used to undermine evolution education within the classroom by affecting the quality of state science standards and textbook content. Information will also be provided about educational context of general strategies such as: Equal Time/Balanced Treatment, Textbook Disclaimers, Teaching the Weaknesses, Alternative Theories and Intelligent Design (information about the legal aspects of each of these strategies can be seen in detail in the previous chapter, which describes the details of each of these cases and the legal outcome of many of the attempts).

The organization of the American education system and curriculum standards

The American school system is a mono-linear school system that is referred to as K-12, in other words, beginning with Kindergarten and culminating with the 12th grade. All students are required to attend school by law but the age range of compulsory education differs state to state. The longest amount of compulsory educa-

tion requires children to attend school from the age of 5–18 (Connecticut, New Mexico, Oklahoma, Virginia, District of Columbia) and the shortest amount of time is between the ages of 7–16 (Wyoming, North Dakota, North Carolina, Minnesota, Indiana, Idaho, Alaska), while the other states fall somewhere in between, e.g. Texas and California with a compulsory education age range of 6–18. In order to pursue a college degree or admission to a technical school, a student must successfully complete the 12th grade. High school dropouts may take the General Educational Development (GED) to achieve a high school equivalency credential. The average dropout rate in the United States is just below 10%⁷² in 2014 meaning that over 90% of all Americans typically complete the full school program.

Tab. 19: Overview of education system in the United States (K-12)

Compulsory education in the United States: K through 12			
School		Grade	Age
Elementary School	Elementary School	Kindergarten ⁷³	5–6
		First	6–7
		Second	7–8
		Third	8–9
		Fourth	9–10
		Fifth	10–11
Junior High School	Middle School	Sixth	11–12
		Seventh	12–13
High School	High School	Eighth	13–14
		Ninth/ Freshman	14–15
		Tenth/ Sophomore	15–16

⁷² According to the National Center for Education Statistics. www.ncse.ed.gov (Accessed 18 May 2015)

⁷³ The ages marked by italics are not compulsory in all states.

		Eleventh/ Junior	16–17
		Twelfth/ Senior	17–18

As can be seen from this figure, all American students attend all levels of school together. This chapter will focus on public schools in the United States, specifically at the high school level. High schools are more relevant than middle schools or elementary school since evolution is taught at a high school level, normally during the 10th grade. Public high schools are more relevant than private high schools because public schools are considered a government entity since they are funded by taxes and are thus required to maintain a separation of church and state – in other words, they cannot promote any religious belief such as creationism (Bird, 1987). Furthermore, the curricula for public schools are determined through state educational standards that are established by elected government representative and mandate the content of standardized tests in the public school system. In contrast, private schools are generally free to establish their own curriculum and are most often religiously affiliated (Saul, 2012) and the majority of home schooling parents claim religious freedom as their main motivation for home schooling⁷⁴.

Thus, private schools and home schooling families can legitimately teach creationism instead of evolution without any legal problems, meaning that they have no need to utilize any particular strategy to sneak creationism into the classroom or subtly undermine evolution. Thus, public high schools are the target for most classroom-level creationist strategies to undermine evolution or replace evolution with either creationism or Intelligent Design. Moreover, as can be seen in the table below, the majority of American students attend public school.

Tab. 20: Percentage of students in public, private or home school.

Distribution of students in the United States in 2007 according to school type ⁷⁵ .	
Public schools	85.6%
Private schools	11.4%
Home schooled	2.9%

⁷⁴ According to the Home Schooling Legal Defense Association (HSLDA) www.hslda.org (Accessed 18 May 2015)

⁷⁵ According to the National Center for Education Statistics. www.ncse.ed.gov (Accessed 21 May 2015)

Unlike other countries, the American public school system is not regulated by the national government but is instead largely dictated by state-level decisions, which means that public education in the United States varies greatly state to state since the lack of a nationally centralized curriculum or education standards means that each state has the ability to determine its own standards (USNEI, 2008). Of course, these standards are similar in some aspects but can differ greatly when it comes to controversial subjects like evolution (Padian, 2010).

The decision about curriculum is made by committees and boards of elected individuals (USNEI, 2008). The fact that these decision-making individuals are elected, and thus have responsibilities to represent the desires of their constituents, means that local individuals can get involved in helping determine the state standards through political activity. The ability for individuals to affect change to the education system is particularly relevant for science education in the United States since polls have shown that one in three American adults rejects the theory of evolution as a suitable explanation for life on Earth (Miller et al., 2006). The next section will examine the levels of organization of public education in order to shed light on how the curriculum and science standards are decided and influenced by different parties and individuals at different levels.

Local level of organization

According to the U.S. Network for Education Information (USNEI), “The local level of control is the heart of the U.S. education system at the primary and secondary levels⁷⁶. Local communities operate schools, implement and enforce state laws and policies, develop and implement their own educational policies, hire and supervise professional teaching staffs, and raise money to pay for schools (usually through property taxes plus special bond issues)” (USNEI, 2008). At the local level, there are two main points of influence and control. The lowest level (politically but not necessarily influentially) is the parental involvement. Parents in the United States have the capability to speak directly to the teachers at school Parent Teacher Association (PTA) meetings. There are also state level and national level organizations that provide parents with resources and opportunities to take collaborative action to change or enact regulations.

Secondary public schools are governed by the school districts and their boards. There are over 14,000 different school districts in the entire United States (USNEI, 2008). Each of these school districts is governed by a school board, which is comprised of elected citizens who reside within the school district. The school board exercises broad policy oversight of operations, budgets, and staff, and may oversee local school curricula within state guidelines.

To understand how the local level of control can affect evolution education, one can look at examples such as the *Kitzmiller vs. Dover* case. In the *Kitzmiller*

⁷⁶ Primary level refers to grades K through 8, while secondary refers to grades 9–12.

case, it was a group of parents who sued the school district because the school board had enacted a policy that required that a pro-ID statement be read to all ninth-grade students in secondary science classes before evolution was taught. Moreover, as discussed in the first chapter, the Christian Coalition was a grass-roots political movement that tried to mobilize and organize evangelical individuals and decided to target school boards in order to gain power over school policy (Balmer, 2012).

State level of organization

It could be argued that the state level of control is the most powerful level when it comes to affecting education because the state has the right to set regulations that will dictate educational standards in all schools within that state. The state exercises direct oversight over most aspects of education, performing political, administrative and fiscal functions (USNEI, 2008). Some of the most important tasks performed at the state level that have the greatest impact on science education are:

- *Providing oversight and guidance to local school boards;*
- *Setting broad policies for school-level curricula, textbooks, standards, and assessments;*
- *Electing or appointing some or all of the members of the governing boards of public higher education institutions and state boards of education (USNEI, 2008).*

To understand how state level organization can directly have a large impact on science education, one can look at some of the state statutes that were passed in the United States that were subsequently challenged by teachers or parents as being unconstitutional. Some state statutes such as the Butler Act, passed in Tennessee in 1925, outlawed the teaching of “any theory that denies Story of the Divine Creation of man as taught in the Bible, and to teach instead that man descended from a lower order of animals”. This state law was challenged in the Scopes trial but remained on the books until 1967. Act 590, passed in 1981, was another state level decision that affected science education in the entire state of Arkansas by stating, “Public schools within this State shall give balanced treatment to creation-science and to evolution-science.”

Thus, it is apparent that the state legislation has the power to create laws that will affect all school districts and thus affect how science is taught in the entire state. It is also a level at which a great deal of influence can be made if the statewide curriculum standards can be manipulated. A detailed overview of state curriculum standards will be provided in the next section.

Federal level of organization

As stated earlier, the United States does not have a centralized curriculum or national control of curriculum. The federal level of education does however play an important role in that it is there to enforce civil rights laws as they pertain to education, e.g. in order to protect against any violations of a student's first amendment right to religious freedom (USNEI; 2008). For example, students or teachers can challenge the constitutionality of a state statute based on federal civil rights laws, as was done in cases like *Edwards vs. Aguillard* in which a group of parents and teachers challenged the constitutionality of Louisiana's Balanced Treatment for Creation Science and Evolution-Science Act, passed in 1982. The US Supreme Court ruled that the Act did indeed violate the Establishment Clause of the First Amendment and was thus judged unconstitutional and removed from the books.

Tab. 21: Educational responsibilities at local, state and national level

Distribution of Responsibilities	
Local level	School curricula, staffing, budget, operations
State level	Overall educational standards, textbook selection, assessments (standardized testing)
National level	Provides leadership, guidance and oversight of civil rights

The other manner in which the federal government can affect education is by exercising leadership in education policy and providing education statistics (USNEI, 2008). There has been one attempt made at a federal level to affect the teaching of evolution and that was made by former U.S. Senator, Rick Santorum, who proposed an amendment to the No Child Left Behind bill which stated that:

(1) good science education should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science; and

(2) where biological evolution is taught, the curriculum should help students to understand why this subject generates so much continuing controversy, and should prepare the students to be informed participants in public discussions regarding the subject.

This amendment did not become law. If it had come into effect, it could have opened a loophole for local school districts to “teach the strengths and weaknesses of evolutionary theory” or to “teach the controversy” – a classroom strategy used to undermine evolution. This strategy will be discussed in detail later in this chapter.

Now that a general structure of the United States education system has been presented, the next section will look more closely at how curriculum is decided at a state level and how textbooks are adopted for public secondary schools.

Curriculum (Science) standards

Science standards have a huge impact on the manner in which evolution is taught in American classrooms since these standards dictate how much time and what points have to be dedicated to the subject in order to prepare students for statewide assessments. Due to a lack of a national curriculum standard in the United States, science standards are determined at the state-level through a political process meaning that each state is able to create their own science standards and local school districts within the state are able to make decisions about the curriculum within the standards set by the state (Watts, et al., 2016). Due to the political nature of the adoption procedure of standards, there are many opportunities for interested individuals to get involved in the process of affecting these fundamental elements of science education since the political nature of these processes requires elected representatives to cater to the interests of their constituents (Watts et al, in press).

The creation of state science standards arose in the 1980s and early 1990s as a national movement to bring more accountability to education (Wallis, 2005). Yet because these standards are decided through political processes and not by central scientific agencies, it provided anti-evolutionists with a new way to affect the teaching of evolution (Watts, et al., 2016). Darwin-doubters have in fact grabbed at this relatively new opportunity to affect statewide influence over science standards as Glenn Branch of the National Center for Science Education describes, “Savvy creationists are focusing their efforts on this relatively new arena” (2005). And they are succeeding – the Fordham Institute published a report in 2012 about state science standards in the United States and found that the most important weakness in the science standards is how evolution is undermined and presented as a weak scientific theory in many states. They further found that although some states are teaching evolution better than they did in the past, the increasing pressure from anti-evolution groups continues to pose a serious threat to science standards in the United States (Chester, et al., 2012). This attempt to weaken the teaching of evolution by trying to emphasize the weaknesses and gaps in evolution is in essence the crux of the intelligent design movement (Wallis, 2005). This threat to science education is particularly relevant in the United States, since studies have shown that 69% of American students failed to meet the ACT’s college readiness benchmarks for science (ACT; 2012).

To understand, just how fast and wide spread the effects of these political decisions can be, one can simply look at what happened in Kansas in 1999 when the State Board of Education voted to completely remove evolution from the state

science standards and pursue a science curriculum that omits evolution (Cunningham, 1999). Although the omission from the science standards does not prohibit the teaching of evolution, by removing it from the state curriculum and thus from state assessment tests, it may discourage school districts from investing any time or money in teaching the subject (Belluck, 1999). The decision was protested by the scientific and education communities (Good et al., 2001). In 2001, the power of the citizens of Kansas was again evident when they were given the opportunity to elect different representatives and the newly-seated Kansas State Board of Education voted to restore the teaching of evolution to the state science standards, a decision that was applauded by the American Association for the Advancement of Science, the National Academy of Sciences and National Research Council, and the National Science Teachers Association (NCSE, 2001). This situation illustrates how much influence the citizens have in affecting the science standards and thus science education within their state through their ability to vote for representatives that will reflect their interests in either direction.

Thus, the Americans' views on evolution have a direct effect on science education in the United States through their ability to vote for representatives and to lobby to directly affect decisions regarding science standards as Wallis points out, "The decision-making bodies involved in approving state science standards tend to be small, not particularly knowledgeable and, above all, elected, so it's a good opportunity for political pressure to be applied" (2005). For that reason, it is important to understand where the Americans stand regarding the teaching of evolution. In 2000, the People for the American Way conducted a survey following the Kansas decision in 1999 and found that "Americans have traditionally favored local decision making when it comes to education. However, this issue is a clear exception. Most Americans (two thirds) agree that there needs to be a national approach regarding whether or not to teach Evolution and/or Creationism in the public schools" (PFAW, 2000).

One of the difficulties of trying to create a national approach to science curriculum in the United States is that the population is very divided regarding the teaching of evolution and that there is geographical clumping (PFAW, 2000). The survey conducted by The People of the American way in 2000 and found the following results:

Survey results regarding the teaching of evolution vs. creationism

- 20% believe public schools should teach evolution only;
- 16% believe public schools should teach creation only;
- 29% believe public schools should teach evolution in science class but can discuss Creationism there as a belief;
- 13% believe public schools should teach both evolution and Creationism in science class;
- 17% believe public schools should teach evolution in science class and religious theories elsewhere;
- 4% believe public schools should teach both but are not sure how;
- 1% had no opinion.

Fig. 16: Results of Survey "Evolution and Creationism in Public Education"

As is evident by this survey, only 20% of the Americans believe that only evolution should be taught in science classrooms. If the 17% that believe that evolution belongs in the science classroom and religious theories should be taught elsewhere were combined to the 20% who are for a pure science education, then one could say that 37% of the population is interested in preserving science education as thus and not including any mention of the supernatural. Only 16% believe that public schools should teach only Creationism, but if that group is combined with the group who believe that it is OK to mention Creationism (29%) and those who believe that both should be taught (13%) we have a total of 58% who would be against teaching purely evolution or would not protest if Creationism was taught in the science classroom. So generally one could say that 37% of the population is for pure science education (evolution only – no Creationism), while 58% is in favor of including Creationism/ID at least in part of the science education along with evolution or instead of evolution.

Tab. 22: American opinion on teaching Creationism in science classes

American Citizens' Views on Teaching Creationism and Evolution in Science Classes ⁷⁷	
Only evolution/no Creationism in science class	37%
Creationism/ID with or instead of evolution in science class	58%
Unsure or no opinion	5%

It is important to note here the very small percentage of people who either do not have any opinion (1%) or are unsure of how the subject should be dealt with (4%). Meaning that 95% of the American population has a specific opinion about how evolution should or should not be taught in public schools.

This is an important factor to consider since as mentioned above, state standards and textbook selections are decided by groups of elected individuals who are responsible for representing their constituents' opinions. By creating standards that strongly emphasize evolution, they would thus run the risk of alienating large portions of the population, and vice versa. Of course, not all Americans who have an opinion are necessarily so passionate about the subject that they will get involved in politics. As discussed in the past chapters, there is a continuum between Young Earth creationist and atheist evolutionary believers and within this spectrum, there is also a wide spectrum of how active individuals are in promoting their beliefs. On one side, there are the milder supporters of creationism who have

⁷⁷ According to The People for the American Way 2000 survey – Evolution and Creationism In Public Education: An In-depth Reading Of Public Opinion

simply stated: “I find it academically dishonest not to include a statement that acknowledges the possibility of the work of a Supreme Being at the beginning of Creation and throughout the evolutionary process” (Hamilton, 2005). While others are willing to fight tooth and nail to water down the teaching of evolution and bring in as much of the creation story and presence of a Supreme Being as possible. Among those individuals who believe that creationism does not belong in the classroom, there will be those who are willing to act and those who are not.

For those who want to actively decide what is taught in public schools, they have a chance to participate in public forums at the local, state or national level. The greatest power over this domain can be taken by influencing the decision regarding the science standards for the entire state and which textbooks will be used in those classrooms (Watts et al., 2016).

This section will examine how curriculum guidelines are decided in the United States. The following section will then look at how textbooks are adopted and how this process directly contributes to what publishers include in the textbooks – again affecting the curriculum within the classroom. It is of value to pay attention to the political and economic nature of these decisions and actions. Furthermore, due to the large differences between states, not only in their curriculum standards but also in the general structure of their state education department, this section will use two states as main examples: Texas and California⁷⁸.

More specifically, this section will look at science curriculum and science standards. The first major difference between states in the United States is the total number of required years of science education. Depending on the state, a student may be required to take between 2 and 5 years of science⁷⁹. Furthermore, some states specify what type of science classes are required, i.e. chemistry and biology, while other states refrain from such requirements, allowing students to choose freely from the offered science courses. Here it is important to note that general graduation requirements may differ from recommended courses for university admission.

⁷⁸ Texas and California were chosen as example states for multiple reasons: (1) they are the two largest continental states having more electoral votes than any other state which puts them in a position to influence the political direction of the entire country, (2) both are textbook adoption states and due to their large populations have a large influence on textbook publishers in establishing norms and (3) both active creationist communities as is evident through public trials regarding creationism. See chapter on legal battles for more information.

⁷⁹ State requirements for high school graduation, in Carnegie units: 2004. National Center for Educational Statistics. nces.ed.gov (Accessed 26 May 2015)

Tab. 23: High school science standards in California and Texas

High School Science Requirements in California and Texas		
State	Required for Graduation	Recommended for University
California ⁸⁰	2 years – must include biology and another physical science	3 years – courses should be in biology, chemistry and physics and include labs
Texas ⁸¹	2 years – must include biology and integrated physics and chemistry	4 years – should include biology, chemistry, physics and another lab-based physical science

After determining how many years of science a student is required to attend to meet graduation requirements, the state is then mandated to create standards that are to be taught within those classes (Blackwell et al., 2003). Some of the national associations have created projects to assist states in creating science curriculum standards. The American Association for the Advancement of Science (AAAS) for instance has developed a long-term research and education initiative called “Project 2061⁸²” that is focused on increasing science literacy in the United States.

Part of this project was the creation of the Next Generation Science Standards (NGSS) that are based on the Framework for K-12 Science Education⁸³ as put forth by the National Research Council. The NGSS were formed through collaborative work between states, as they say on their website: “For States, By States” (www.nextgenscience.org). The NGSS provide clear guidelines about what is recommended for education about evolution. The fourth section of High School Life Science (HS-LS) is Natural Selection and Evolution for High Schools; this section describes what a student should understand about evolution and provides a clear description of what students should be able to do after learning about natural selection and evolution.

⁸⁰ According to the California Department of Education. <http://www.cde.ca.gov> (Accessed 21 March 2015)

⁸¹ According to the Texas Education Agency. <http://tea.texas.gov> (Accessed 21 March 2015)

⁸² The name of the project is based on the orbit of Haley’s comet, which will be visible again in 2061.

⁸³ K-12 refers to Kindergarten to 12th grade. Although there are many differences among the states, these are normally the years of compulsory education in the United States.

Tab. 24: Next Generation Science Standards

Sample taken from Next Generation Science Standards	
Students who demonstrate understanding of Natural Selection and Evolution can ⁸⁴ :	
HS-LS4-1.	Communicate scientific information that common ancestry and biological evolution are supported by multiple lines of empirical evidence. [Clarification Statement: Emphasis is on a conceptual understanding of the role each line of evidence has relating to common ancestry and biological evolution. Examples of evidence could include similarities in DNA sequences, anatomical structures, and order of appearance of structures in embryological development.]
HS-LS4-2.	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment. [Clarification Statement: Emphasis is on using evidence to explain the influence each of the four factors has on number of organisms, behaviors, morphology, or physiology in terms of ability to compete for limited resources and subsequent survival of individuals and adaptation of species. Examples of evidence could include mathematical models such as simple distribution graphs and proportional reasoning.] [Assessment Boundary: Assessment does not include other mechanisms of evolution, such as genetic drift, gene flow through migration, and co-evolution.]
HS-LS4-3.	Apply concepts of statistics and probability to support explanations that organisms with an advantageous heritable trait tend to increase in proportion to organisms lacking this trait. [Clarification Statement: Emphasis is on analyzing shifts in numerical distribution of traits and using these shifts as evidence to support explanations.] [Assessment Boundary: Assessment is limited to basic statistical and graphical analysis. Assessment does not include allele frequency calculations.]
HS-LS4-4.	Construct an explanation based on evidence for how natural selection leads to adaptation of populations. [Clarification Statement: Emphasis is on using data to provide evidence for how specific biotic and abiotic differences in ecosystems (such as ranges of seasonal temperature, long-term climate change, acidity, light, geographic barriers, or evolution of other organisms) contribute to a change in gene frequency over time, leading to adaptation of populations.]

⁸⁴ According to the New Generation Science Standards (NGSS).

HS-LS4-5.	Evaluate the evidence supporting claims that changes in environmental conditions may result in: (1) increases in the number of individuals of some species, (2) the emergence of new species over time, and (3) the extinction of other species. [Clarification Statement: Emphasis is on determining cause and effect relationships for how changes to the environment such as deforestation, fishing, application of fertilizers, drought, flood, and the rate of change of the environment affect distribution or disappearance of traits in species.]
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Here it should be emphasized that the guidelines do not only specify what points should be taught (i.e. natural selection, heredity, etc.) but specifically delineate what abilities a student should obtain (e.g. ability to explain, communicate, evaluate, etc.). Yet, as great as these guidelines are, they are still relegated to suggestions made by science agencies and not mandatory for states to accept or use. To encourage states to use the NGSS, the AAAS within the framework of Project 2061 also offers assessment services and workshops to help states create science standards that are in line with the AAAS recommendations. But again, this is ultimately up to the states. Furthermore, the NGSS website explicitly points out that the standards should be adopted as a whole and not in pieces and that states would then need to over assistance to the local school districts in order to help them implement the science standards into the district's curricula⁸⁵. As they state, quality science education is based on standards that are rich in both content and practice and curricula that are aligned to these standards (NGSS, 2013).

Tab. 25: Review and revision process of Texas Essential Knowledge and Skills

Process for Review and Revision of Texas Essential Knowledge and Skills (TEKS) ¹	
Step	Activity
1	Texas Education Agency (TEA) staff notifies public of review process via ListSers and presentations including deadline for applications to serve on TEKS review committees. TEA contacts organizations such as the Texas Association of School Boards (TASB) for assistance in providing information to non-educators.
2	State Board of Education (SBOE) members make SBOE TEKS review committee nominations to include educators, parents, business and industry leaders, and employers. [TEC §28.002(c)] The role of committees is to aid the SBOE in meeting their statutory requirements.

⁸⁵ New Generation Science Standards Implementation www.nextgenscience.org (Accessed May 29,2015)

3	TEA notifies SBOE members of the placement of nominees on a TEKS review committee and notifies TEKS review committee members of their appointment. There will be representation from all board members.
4	SBOE may designate up to seven expert reviewers. A board member may not nominate more than one expert. To be designated, the expert must be qualified to be on the panel. To be qualified, the expert must have (1) a minimum of a bachelor's degree from an accredited college or university, (2) demonstrated his or her expertise in the subject area in which he or she is being appointed, and (3) either taught or worked in such field. If qualified, and such expert is nominated by two or more board members, the expert shall be placed on the expert review panel. The board office shall transmit the nominations and any supporting materials to all board members as soon as possible.
5	TEA sends current TEKS to expert reviewers for initial feedback and recommendations.
6	The SBOE provides the charge to the TEKS review committees based on expert recommendations to: -use the current TEKS as the foundation document; -consider the general course of study, not what might be covered in an Advanced Placement course; -consider College and Career Readiness Standards (CCRS) when revising the TEKS; -ensure revisions are in compliance with all related statutes; -provide justification for all suggested revisions; -track all revisions to show what has been changed; -ensure that the student expectations are content driven; and -carefully consider the amount of time necessary for students to develop mastery of the content and ensure that all student expectations reasonably can be taught within the amount of time typically allotted for the subject or course prior to the end of the school year or a state end-of-course assessment required by TEC, §39.023, as applicable. Any and all documents must be left with TEA staff.
7	TEKS review committee members work face-to-face (which is the preferred method of meeting) or by videoconference if face-to-face is not possible. TEA staff, with direction from the SBOE, determines the number of work days needed for 1) review and revision of the TEKS, 2) ensuring vertical alignment of the TEKS across all K-12 grade levels, and 3) horizontal alignment of the TEKS under review with related TEKS previously adopted or under review. Work completed at the conclusion of each meeting will automatically be sent to SBOE members.
8	TEA staff prepares draft documents that reflect TEKS review committee recommendations to be posted online for informal feedback.

9	Experts review proposed revisions to TEKS and provide feedback and recommendations.
10	Experts and one representative from each TEKS review committee provide invited testimony regarding first draft recommendations at the SBOE meeting prior to the meeting at which SBOE discussion of the TEKS occurs. SBOE members provide additional guidance and direction to committees before they prepare final recommendations at the final TEKS review committee meeting.
11	TEA staff receives and compiles informal feedback.
12	TEA staff sends compiled informal feedback and expert recommendations to SBOE members.
13	TEKS review committees reconvene to make additional revisions to TEKS based on expert recommendations and informal feedback. Experts may be invited to this meeting.
14	Final recommendations for revisions to the TEKS are sent to experts for review, posted on the TEA website, and provided to the SBOE. Experts review final draft recommendations and provide specific recommendations for additional changes to specific student expectations.
15	SBOE discusses comments received from TEKS review committee members, and expert reviewers and directs TEA staff to prepare draft rule text with any requested revisions/edits.
16	SBOE holds a public hearing and completes first reading and filing authorization. (for 30 day official public comment period – Texas Register).
17	SBOE holds second public hearing prior to the end of the 30 day public comment period.
18	TEA summarizes public comments and provides summaries to the SBOE prior to the second reading and final adoption.
19	SBOE members review comments and work on proposed amendments.
20	SBOE members share proposed amendments with one another prior to second reading and adoption.
21	A member wishing to amend any TEKS being considered for second reading and final adoption shall submit the possible amendment in writing to the staff no later than 5:00 p.m. or two hours following adjournment of the Committee of the Full Board, whichever is later, on the day prior to the amendment be-

	ing considered by the board in accordance with rules adopted by the board relating to the TEKS adoption process. All amendments shall be made available to the public to the extent. This rule may be suspended by a 2/3 vote of the members of the board present and voting, with the motion to suspend being debatable.
22	SBOE discusses and completes second reading and adoption of the TEKS with a specified implementation date. The implementation date may not occur prior to a legislative appropriation for such instructional materials having been deemed sufficient by the Commissioner.

In theory, a state could easily adopt the entire NGSS as their state science standards, yet despite the accessibility of these centralized guidelines that are defined by central science associations, science standards still differ greatly state to state. The reason for the heterogeneous nature of science standards rests upon the fact that these standards are created through political processes and not through centralized scientific agencies. The adoption process for such standards is excessively complex in some states and involves many different steps and government entities, while allowing citizens of the state to voice their opinions and to bring forth “pertinent” information. To better understand how standards are determined; a closer look will now be taken at the actual standard adoption process in Texas.

The Texas Education Agency (TEA) has published the review process for their state educational standards, called the Texas Essential Knowledge and Skills (TEKS), online⁸⁶. It is a complicated process consisting of 22 steps involving the cooperation between the public, the TEKS review board, the State Board of Education (SBOE), Texas Association of School Boards (TASB) and the Texas Education Agency (TEA).

It is noteworthy how many steps are involved in the process and the amount of information that is provided to the public in order for them to offer their feedback to the state agencies. It is also very noteworthy that there is no specific mention of requesting feedback or guidance from any to the national level associations or centralized science institutions or any reference to NGSS. Again, this points to how much state standards are driven by local populations and not by science authorities.

After a state like Texas has completed their selection process, the new standards go into effect for the coming school year and provide the basis for curriculum in all public schools in Texas. Below is an example of the current TEKS for science.

⁸⁶ Texas Education Agency: <http://tea.texas.gov> (Accessed 29 May 2015)

Tab. 26: Texas science standards for evolution

Texas Science Standards for Evolution ⁸⁷
<p>[...] (7) Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:</p> <p>(A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental;</p> <p>(B) analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record;</p> <p>(C) analyze and evaluate how natural selection produces change in populations, not individuals;</p> <p>(D) analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;</p> <p>(E) analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species;</p> <p>(F) analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination; and</p> <p>(G) analyze and evaluate scientific explanations concerning the complexity of the cell.</p>

Point (7) in this figure refers to the seventh point in a total of 12 points in the category of biology. Other sections include science concepts regarding genetic mechanisms and environmental systems. For a full version of the biology TEKS see appendix. In order to understand how much state standards may differ from one another, the next table provides an overview of the California Science Standards that pertain to evolution. Here it is important to notice two main differences to the Texas standards: (1) the amount of text and details and (2) the language used when describing what students should be able to do. For instance, the Texas standards use the obscure phrase “analyze and evaluate” whereas California standards explicitly state, “students know why”.

⁸⁷ Source: Chapter 112. Texas Essential Knowledge and Skills (TEKS) for Science Subchapter C. High School, specifically §112.34. Biology, Beginning with School Year 2010–2011 (One Credit). The provisions of §112.34 were adopted to be effective August 4, 2009, 34 TexReg 5063.A full list of all TEKS can be found at <http://ritter.tea.state.tx.us/rules/tac/chapter112/ch112c.html#112.34> (Accessed 18 July 2016).

Tab. 27: California science standards for evolution

California Science Standards for Evolution ⁸⁸
<p>...] (7) The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. Students know why natural selection acts on the phenotype rather than the genotype of an organism. b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool. c. Students know new mutations are constantly being generated in a gene pool. d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions. e. Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature. f. Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.
<p>8) Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:</p> <ol style="list-style-type: none"> a. Students know how natural selection determines the differential survival of groups of organisms. b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment. c. Students know the effects of genetic drift on the diversity of organisms in a population. d. Students know reproductive or geographic isolation affects speciation. e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction. f. Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships. g. Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

Points (7) and (8) from this figure belong to the subcategory entitled “Evolution” in the California science standards. In addition to evolution, there are three other subcategories within biology, namely: cell biology, physiology and ecology with a total ten points divided among these four categories. For a full version of the category of biology, see appendix. Once one has compared the language and content of the

⁸⁸ *Science Content Standards for California Public Schools Kindergarten Through Grade Twelve*. Online 2009 pg 54–55 Adopted by the California State Board of Education in 1998, published in 2000, reprinted in 2008 and reposted online in 2009. PDF available at <http://www.cde.ca.gov/be/st/ss/documents/sciencestnd.pdf> (Accessed 24 April 2016)

state standards from these two states, it is very clear how different the standards can be and how the language of the standards reflects the amount of importance and authority the topic is given. It is clear that evolution will be presented as a fact or well established theory that should be studied and understood. Whereas students in Texas will be provided some information about evolution and they will be given the opportunity to “evaluate and analyze” the presented information. Although this “evaluate and analyze” approach is often defended as a sound means of teaching students critical thinking, it is important to note that this type of language is used only in the evolution section and not in other science sections such as physics or computer science.

The next table shows a direct comparison between the suggested Next Generation Science Standards and the California and Texas science standards. Although both states do cover many of the recommended topics, the language about what is expected from the students is very decisive. While the NGSS and California standards expect the students to understand evolution as a truth, the Texas standards state simply that the students should evaluate the principles for the “scientific explanation for the unity and diversity of life.” This ambiguous language allows school boards in Texas to have more flexibility when determining their school curriculum and thus a higher level of heterogeneity regarding the quality of science education within the state. The detailed California standards, on the other hand, do not allow as much leeway but instead require all school boards in the state to fulfill these guidelines, which should lead to higher scientific literacy in all Californian public high schools.

Tab. 28: Comparison of science standards

Comparison of Standards	
NGSS	Construct an explanation based on evidence that the process of evolution primarily results from four factors: (1) the potential for a species to increase in number, (2) the heritable genetic variation of individuals in a species due to mutation and sexual reproduction, (3) competition for limited resources, and (4) the proliferation of those organisms that are better able to survive and reproduce in the environment.
California	8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept: a. Students know how natural selection determines the differential survival of groups of organisms. b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment. c. Students know the effects of genetic drift on the diversity of organisms in a population.

	d. Students know reproductive or geographic isolation affects speciation.
Texas	(7) Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to: (C) analyze and evaluate how natural selection produces change in populations, not individuals; (D) analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;

The differences in the standards between Texas and California can be traced back to the selection process of the standards. As seen in the table above, the TEKS are decided through local government agencies and place a strong emphasis on gaining with the feedback of the local populations. The California State Board of Education on the other hand clearly incorporated the information provided by the National Science Education Standards and the information they gathered from local community meetings and public hearings standards as they have described:

“The California State Board of Education and the Academic Standards Commission reviewed the National Science Education Standards, the Benchmarks for Science Literacy, and science standards and frameworks from numerous local school districts in California, from around the country, and from other nations with successful science education programs. In addition, hundreds of pages of written recommendations and hundreds of hours of testimony were considered. The Academic Standards Commission hosted nine community meetings, and the State Board of Education held five public hearings throughout California. Families, educators, and business and community leaders participated and helped define key issues. Expert reviewers around the nation submitted formal comments on the drafts and also participated in invited public testimony. Their ideas contributed substantively to the final standards adopted by the State Board of Education.”

The Fordham Institute published a report that provided a grading of the science standards in 2012 and based on their reviews they awarded California with an “A” and Texas with a “C”. The grades were based on two categories: Content & Rigor (7 points) and Clarity & Specificity (3 points). California scored 10/10 points, the highest of all states and the only state to score an “A” in 2012. Six states, including California, scored an “A” in the 2005 report but the other five states received lower grades in 2012. Texas on the other hand had scored an “F” in 2005 and worked itself up to a “C” in 2012, well above many states, which scored a “D” or an “F” in 2012 (Chester, et al., 2012). For a full review, see “The State of State Science Standards 2012” by the Thomas B. Fordham Institute. The

following table provides a brief look at the reasoning behind the grades given to the California and Texas standards.

Tab. 29: Fordham's evaluation of California and Texas Science Standards

State of State Science Standards 2012 Fordham Review		
	California	Texas
Overall grade	A (10/10)	C (6/10)
General assessment	The California science standards are truly excellent. The standards themselves are reasonably succinct yet quite comprehensive.	Texas has produced a set of science standards with areas of strengths – including a particularly well-done sequence for earth and space science – but also with weaknesses that cannot be overlooked. These include a tendency across nearly all disciplines to pay lip service to critical content with vague statements, and, somewhat less often, the presence of material that's well below grade level.
Content & Rigor	The authors of the California standards knew what was important to cover and how to set it down in cogent prose. The material is suitably rigorous throughout, with few, if any, gaps. (7/7)	Systematic progress is evident from grade to grade, but in several disciplines the content statements are poorly developed, leaving too much to the imagination. Bringing a bit more detail to the document would go a long way toward improving the Texas standards. (5/7)
Clarity & Specificity	Not only are statements set forth clearly and cogently, with very few exceptions, but the entire document shows a solid sense of interconnection. One topic flows into another in transparent fashion, showing that the writers knew their subject matter well. (3/3)	The chief problem with the Texas standards is the lack of a red pencil. There are many clear and specific standards, but these are choked by thickets of wordy and repetitious language. In addition, the standards are sometimes confusing and frustratingly vague. (1/3)

In the end, the flexibility offered by the ambiguous language seen in the TEKS allows a higher amount of control at the local level since the larger amount of flexibility gives school boards more leeway in creating district wide curricula and enables

the school boards to respond to the local requests of their constituents. While the NGSS has provided states with support to create superior science standards, the Discovery Institute, a think-tank in Seattle that supports the promotion of Intelligent Design, is providing materials for individuals to use in local forums to accomplish the exact opposite. These documents that the Discovery Institute provides are “scientifically abstruse, jargon-heavy documents” that make it hard for the average citizen to follow, but since the people who make up the decision committees tend to be small and from non-science backgrounds, this is an optimal place to use smoke and mirrors to affect political decisions (Basel et al., 2013; Wallis, 2005; Williams, 2015).

Another way that classroom curriculum can be affected at the state level is through the adoption of state legislation in the form of bills. According to the National Center for Science Education over forty “Academic Freedom” bills have been brought before 13 different state legislatures from 2004 to 2011⁸⁹. So far, they have all been shot down, except in Louisiana. To assist this new trend in curriculum manipulation, the Discovery Institute published a sample bill⁹⁰ that could be used by states wishing to introduce an academic freedom bill. The main goal of the bill is to provide teachers protection from disciplinary action if they choose to present “scientific information pertaining to the full range of scientific views regarding biological and chemical evolution”. Notice that there is no mention of Creationism or Intelligent Design in the bill and that section 7 deliberately states that this bill in no way should be seen as promoting or discriminating against any particular religious belief.

Tab. 30: Discovery Institute’s sample Academic Freedom bill

Discovery Institute’s Sample Academic Freedom Bill
MODEL ACADEMIC FREEDOM STATUTE ON EVOLUTION [version: 9/7/2007]
<p>SYNOPSIS: Existing law does not expressly provide a right nor does it expressly protect tenure and employment for a public school teacher or teacher at an institution of higher education for presenting scientific information pertaining to the full range of scientific views regarding biological and chemical evolution. In addition, students are not expressly provided a right to positions on views regarding biological and chemical evolution.</p> <p>This bill would expressly provide rights and protection for teachers concerning scientific presentations on views regarding biological and chemical evolution and students concerning their positions on views regarding biological and chemical evolution.</p>
A BILL TO BE ENTITLED AN ACT

⁸⁹ National Center for Science Education. www.ncse.com (Accessed 30 May 2014).

⁹⁰ Available at: www.academicfreedompetition.com/ (Accessed 29 May 2015)

Providing teacher rights and protection for a public school teacher or a teacher at an institution of higher education to present scientific information pertaining to the full range of scientific views regarding biological and chemical evolution in applicable curricula or in a course of learning; providing employment and tenure protection and protection against discrimination for any public school teacher or teacher at a public institution of higher education related to the presentation of such information; and providing student protection for subscribing to a particular position on views regarding biological or chemical evolution.

BE IT ENACTED BY _____:

Section 1. This law shall be known as the "Academic Freedom Act."

Section 2. The Legislature finds that existing law does not expressly protect the right of teachers identified by the United States Supreme Court in *Edwards v. Aguillard* to present scientific critiques of prevailing scientific theories. The Legislature further finds that existing law does not expressly protect the right of students to hold a position on views regarding biological or chemical evolution. The Legislature further finds that the topic of evolution has generated intense controversy, lawsuits and threats of lawsuits, where some lower courts such as *Kitzmiller et al. v. Dover Area School Board*, have created confusion about the rights of teachers and students to hold differing views about scientific controversies and express those views without fear of adverse employment or academic consequences. Finally, the Legislature finds that school districts and school administrators should not bear the primary burden of defending the academic freedom of teachers and students to discuss the topics of biological or chemical evolution. It is the intent of the Legislature that this act expressly protects those rights.

Section 3. Every K-12 public school teacher or teacher or instructor in any two-year or four-year public institution of higher education, or in any graduate or adult program thereof, in the State of _____, shall have the affirmative right and freedom to present scientific information pertaining to the full range of scientific views regarding biological and chemical evolution.

Section 4. No K-12 public school teacher or teacher or instructor in any two-year or four-year public institution of higher education, or in any graduate or adult program thereof, in the State of _____, shall be terminated, disciplined, denied tenure, or otherwise discriminated against for presenting scientific information pertaining to the full range of scientific views regarding biological or chemical evolution in any curricula or course of learning, provided, with respect to K-12 teachers, the [insert official title of state's science standards] has been taught as appropriate to the grade and subject assignment.

Section 5. Students may be evaluated based upon their understanding of course materials, but no student in any public school or institution of higher education shall be penalized in any way because he or she may subscribe to a particular position on any views regarding biological or chemical evolution.

Section 6. The rights and privileges contained in this act apply when the subject of biological or chemical origins is part of the curriculum. Nothing in this act shall be construed as requiring or encouraging any change in the state curriculum standards in K-12 public schools, nor shall any provision of this act be construed as prescribing the curricular content of any course in any two-year or four-year public institution of higher education in the state.

Section 7. Nothing in this act shall be construed as promoting any religious doctrine, pro-

moting discrimination for or against a particular set of religious beliefs, or promoting discrimination for or against religion or non-religion.

Section 8. This act shall become effective on the first day of the third month following its passage and approval by the Governor, or its otherwise becoming law.

These types of bill that would grant immunity to teachers would make it easier for school boards to introduce curricula that includes Intelligent Design, since it could be argued to be an alternative explanation and thus legally suitable according to the state legislation. Moreover, it allows Intelligent Design proponents the opportunity to target teachers as the direct providers of creationist teaching and bypass the school boards completely.

It is also interesting to notice how different the wording is in this state bill versus the bills that were passed in the 1920s such as the Butler Act (Tenn. HB 185, 1925) which stated “That it shall be unlawful for any teacher in any of the Universities, Normals and all other public schools of the State which are supported in whole or in part by the public school funds of the State, to teach any theory that denies the Story of the Divine Creation of man as taught in the Bible, and to teach instead that man has descended from a lower order of animals”. The current bills are written with much more subtlety. Two such bills have been put forth in Texas, the bill authored in 2009 reads as follows:

By: Christian

H.B. No. 4224

A BILL TO BE ENTITLED

1 AN ACT

2 relating to the teaching of science in public schools.

3 BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF TEXAS:

4 SECTION 1. Subchapter A, Chapter 28, Education Code, is

5 amended by adding Section 28.0027 to read as follows:

6 Sec. 28.0027. STUDY OF SCIENCE. (a) As part of the

7 essential knowledge and skills of the science curriculum under

8 Section 28.002(a)(1)(C), the State Board of Education by rule shall

9 establish elements relating to instruction on the scientific

10 hypotheses and theories for grades 6-12.

11 **(b)** Instructional elements for scientific processes: the
 12 student uses critical thinking and scientific problem solving to
 13 make informed decisions. The student is expected to analyze,
 14 review, and critique scientific explanations, including hypotheses
 15 and theories, as to their strengths and weaknesses using scientific

16 evidence and information;

17 **(c)** Students may be evaluated based upon their
 18 understanding of course materials, but no student in any public
 19 school or institution shall be penalized in any way because he or
 20 she subscribes to a particular position on scientific theories or
 21 hypotheses;

22 **(d)** No governmental entity shall prohibit any teacher in a
 23 public school system of this state from helping students to
 24 understand, analyze, review, and critique scientific explanations,

H.B. No. 4224

1 including hypotheses and theories, as to their strengths and
 2 weaknesses using scientific evidence and information.

3 SECTION 2. This Act applies beginning with the 2009-2010
 4 school year.

5 SECTION 3. This Act takes effect immediately if it receives
 6 a vote of two-thirds of all members elected to each house, as
 7 provided by Section 39, Article III, Texas Constitution. If this
 8 Act does not receive the vote necessary for immediate effect, this
 9 Act takes effect September 1, 2009.

Fig. 17: Academic Freedom bill proposed in Texas (2009)

It is again very important to notice two aspects of this bill. First, much of the language is similar or identical to the TEKS, “the student uses critical thinking and scientific problem solving to make informed decisions. The student is expected to analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weakness using scientific evidence and information”. Second, this bill is exceedingly different from the former anti-evolution bills and in

its appearance does not seem to be promoting a particular religious belief but instead discusses only the science education standards, “No governmental entity shall prohibit any teacher in a public school system of this state from helping students to understand, analyze, review, and critique scientific explanations, including hypotheses and theories, as to their strengths and weaknesses using scientific evidence and information”.

Some may argue that this type of flexibility and emphasis on critical thinking would increase a student’s education but all of these forms of ambiguity allow a grey zone in which suggested alternatives like Creation Science and Intelligent Design may find a legally protect foot hold in the public science classroom and that is not an educational advantage for any student’s science education. These type of state-level bills are becoming more prevalent and the National Center for Science Education (NCSE) has provided a Chronology of ‘Academic Freedom’ Bills on their website to keep track of this legislative trend⁹¹.

Similar bills have also been proposed at the national level. The Santorum Amendment, as described earlier, was introduced at the national level to the US Senate in 2001 but failed. This bill was also orchestrated by the Discovery Institute. Phillip E. Johnson, Godfather of the Intelligent Design movement, even claims to have written the text himself and been a personal adviser to Santorum (Johnson, 2002). The amendment read as follows:

Santorum Amendment

It is in the sense of the Senate that (1) good science should prepare students to distinguish the data or testable theories of science from philosophical or religious claims that are made in the name of science; and (2) where biological evolution is taught, the curriculum should help students understand why this subject generates so much continuing controversy and should prepare the students to be informed participants in public discussions regarding the subject.

Fig. 18: Santorum Amendment

Santorum argued as he introduced the amendment to the Senate that “It is a sense of the Senate that deals with the subject of intellectual freedom with respect to the teaching of science in the classroom, in primary and secondary education. It is a sense of the Senate that does not try to dictate curriculum to anybody; quite the contrary, it says there should be freedom to discuss and air good scientific debate within the classroom. In fact, students will do better and will learn more if there is this intellectual freedom to discuss”. He emphasizes in his argument why this amendment is good for education and encourages free thought. After introducing the amendment, he continued to explain the importance of such:

⁹¹ Chronology of “Academic Freedom” Bills. National Center for Science Education. February 7, 2014. <http://ncse.com/creationism/general/chronology-academic-freedom-bills> (Accessed 1 June 2015)

“It simply says there are disagreements in scientific theories out there that are continually tested. Our knowledge of science is not absolute, obviously. We continue to test theories. Over the centuries, there were theories that were once assumed to be true and have been proven, through further revelation of scientific investigation and testing, to be not true. One of the things I thought was important in putting this forward was to make sure the Senate of this country, obviously one of the greatest, if not the greatest, deliberative bodies on the face of the Earth, was on record saying we are for this kind of intellectual freedom; we are for this kind of discussion going on; it will enhance the quality of science education for our students⁹².”

It is quite interesting to notice the manner in which Santorum argues for this bill – appealing to the sense of patriotism and beloved American freedom that fits with the trends discussed in the first part of this chapter regarding the historical trend in the United States to meld religiousness righteousness with political action. Santorum was successful and the amendment to the bill was accepted as part of the education funding amendment by the Senate in 2001 with a vote of 91–8. The Discovery Institute saw this as a major victory over Darwinism as they stated in an email newsletter “Undoubtedly this will change the face of the debate over the theories of evolution and intelligent design in America...It also seems that the Darwinian monopoly on public science education, and perhaps the biological sciences in general, is ending.” However, the bill died on the floor of the House of Representatives. Although it did not become part of legislation, nor does it carry any legal weight, it is still included in the Conference Report as an explanatory text about the legislative history and purposes of the bill. The Conference Report for the No Child Left Behind Act of 2001 mention of Santorum’s idea reads as follows:

“The Conferees recognize 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

⁹² Santorum also quotes David DeWolf who said, “Several benefits will accrue from a more open discussion of biological origins in the science classroom. First, this approach will do a better job of teaching the issue itself, both because it presents more accurate information about the state of scientific thinking and evidence, and because it presents the subject in a more lively and less dogmatic way. Second, this approach gives students greater appreciation for how science is actually practiced. Science necessarily involves the interpretation of data; yet scientists often disagree about how to interpret their data. By presenting this scientific controversy realistically, students will learn how to evaluate competing interpretations in light of evidence—a skill they will need as citizens, whether they choose careers in science or other fields. Third, this approach will model for students how to address differences of opinion through reasoned discussion within the context of a pluralistic society.” David DeWolf is interestingly not a biologist or any other type of scientist, but a law professor and a Senior Fellow at the Discovery Institute (DI). Congressional Record June 13, 2001 (Accessed 14 March 2014)

such topics may generate controversy, and how scientific discoveries can profoundly affect society.” p 703 of the Conference Report

One of the most interesting points to come out of this is to see that the Creationism/Intelligent Design advocates have come a long way from their Bible-wielding predecessors. They are calculated, organized, and legally educated. They are willing and able to debate at a legislative level about science in order to get their message into the classroom. In addition, their newer, subtler maneuvers may prove to be more successful since state science standards have a huge influence on the way in which evolution (and other scientific subjects) is presented to students in the United States.

Ultimately, high school biology teachers cannot be expected to research all aspects of biology from scholarly journals in order to prepare for their classes and thus they must rely upon the tools provided to them by governmental agencies. While well-written science standards and comprehensive curricula can be an extraordinary asset for a biology teacher and thus a blessing to science students, this is not the case in all states (Schilders et al., 2009; Tshuma and Sanders, 2015).

In some states, despite the efforts to create quality science standards, the increasing amount of political pressure from anti-evolutionists has led to the introduction of obtuse language into the standards. This obtuse language allows more leeway for schools to omit evolution from the curriculum or teach alternative creationist theories. This is detrimental to science education in general as students are denied the chance to understand one of the most fundamental scientific theories that allows us to understand the foundations of the living world (Good et al., 2000).

The next section will be devoted to discussing another way classroom education can be influenced/manipulated and that is through the adoption of textbooks. The curriculum may dictate what should be taught, but it does not mandate from which authority or in what light or quality of which it should be taught. That is left to the textbooks.

Textbook Adoption

The textbook adoption process has been a feature of American education since Reconstruction, when former Confederate states issued guidelines for school materials that reflected their version of the Civil War. In the present day, special interest pressure groups from the politically correct left and the religious right exert enormous influence on textbook content through bias and sensitivity guidelines and reviews that have dumbed down textbook content in an attempt to render them inoffensive to every possible ethnic, religious, and political constituency. Textbook adoption is a fundamentally flawed process: it distorts the market, entices extremist

groups to hijack the curriculum, and papers the land with mediocre instrumental materials. (The Mad, Mad World of Textbook Adoption⁹³)

In 1920, John Scopes was found guilty of violating the Butler Act in Tennessee by teaching evolution in the classroom. The controversy created around the Scopes trial affected the content and sale of textbooks for decades to follow – in fact, a study of textbooks before and after the trial showed that the subject of evolution disappeared from the curriculum and was not taught for decades (Blancke, 2014; Grabiner & Miller, 1974; Shermer, 2006).

While curriculum standards dictate what must be covered in a classroom, how this subject is depicted is largely dictated by the textbooks used in the classrooms. Textbooks play a central role in classroom education and Yager in fact found that “over 90% of all science teachers use a textbook 95% of the time; hence the textbook becomes the course outline, the framework, the parameters for students’ experience, testing, and a worldview of science” (1993). Because textbooks are so widely used in the United States and because they define and support curricula in the classroom, textbooks have become the focus of the anti-evolution movement’s efforts to influence education (Miller, 2010).

Miller believes that textbooks are the most visible part of a curriculum and the hardest to change at a local level (2010). They originate from large, national corporations and the only way to change them is through economic pressure and political action. As Shermer stated, one case – the Scopes trial – was able to change what appeared about evolution in textbooks for multiple decades (2006). In the end, these textbook corporations are like any other company trying to sell a product – they look at supply in demand and want to ensure that they are meeting the needs and desires of their target audiences (Miller, 2010). Thus if a topic is causing strife or controversy in multiple states, then it is in the interest of the textbook corporations to lessen the coverage of the topic in order to avoid alienating any potential customers (Shermer, 2006).

According to the National Association of State Textbook Administrators (NASTA), the process of textbook adoption began officially in 1930 to standardize the specifications for the print of textbooks. There are now 22 states that belong to the association (2010). The major textbook adoption states in the US are California, Florida and Texas. Textbook adoption committees in textbook adoption states review textbooks and create state guidelines that either mandate which books a school, must use or provide a list of approved textbooks from which a school must choose.

States adopt one or more content areas per year and assures that the content is in line with the state’s education standards. According to NASTA, adoption cycle

⁹³ This report was put forth by the Thomas B. Fordham Institute, which is a nonprofit organization that conducts research, issues publications, and directs action projects in elementary/secondary education reform at the national level and in Dayton, Ohio. www.edexcellence.net/institute (Accessed 1 June 2015)

lengths differ state to state but are about 6 years in length. There is the state-level adoption process and the local adoption process (2010). The state-level adoption process usually begins in January with a publisher information meeting. Then reviewers conduct evaluation of samples submitted by the publishers over the summer and by the fall there is then a committee deliberation and recommendation, which leads to the State Board approval. The local adoption process follows the following year in January where publishers who have had their material approved by the State Board can then make presentations to the school districts. After these presentations, the school districts use the summer to make their selections and pre-order books. By the beginning of the school year (August), the newly adopted material can enter the classrooms.

The next section will take a detailed look at Texas since it is one of the three major textbook states and most “Texas-vetted” textbooks appear in public schools in most other states according to Steven Schafersman, president of Texas Citizens for Science (www.texscience.org). The Texas adoption process runs much like the general process described above. The State Board of Education (SBOE) lists education standards and then requests bids from the publishers. Publishers then submit complete copies of textbooks to the Texas Education Agency (TEA) as well as to various regional service centers for public review and state review panels. The state education commissioner then prepares a preliminary report for the SBOE based on the results from the TEA and the state’s review panels. All Texas residents may file written comments about the textbooks and may testify at the SBOE’s public hearing before final adoption occurs. Publishers agree or disagree to any revisions. Then the SBOE votes which books will be rejected or accepted. Any textbook that is placed on the state’s official adoption list can be used by any school in Texas and the school may acquire these books for free by using state funds to purchase those books (www.tfn.org, Accessed 3 January 2014). According to the Texas Citizens for Science, it has also recently become possible for Texas schools to use books that are not on the official state list, but the state will only partially fund those books, meaning that the school district would be personally responsible for the remaining costs (Schafersman, 2003).

For many years there were censorship proponents who worked hard to influence the process of textbook adoption in Texas, so in an effort to curb this problem, the State Legislature removed the majority of the State Board of Education’s (SBOE) power over textbook approval. This new law came into power in 1995 and allowed SBOE members to reject a textbook, if and only if it: (1) failed to meet the state’s curriculum standards, (2) included factual errors, and/or, (3) did not meet manufacturing standards (www.tfn.org, Accessed 3 January 2014). Here is again another example of how important state science standards are since they also directly influence the adoption of state textbooks.

Thus, despite Texas’ attempts to curb the SBOE’s power; the SBOE still ultimately decides what will appear in classrooms in Texas. It is also important to

note that the SBOE in Texas has been known to be overwhelmed by conflicting views regarding how evolution is presented in science textbook – receiving input from scientists, creationists and other non-scientist citizens – and although most board members have little or no knowledge of science, their political position empowers them to edit (i.e., censor) science textbooks on the basis of their own ideological, political, and religious beliefs (Schafersman, 2003).

Moreover, the Texas SBOE members indirectly determine what materials are available for most other states since Texas “is clearly one of the most dominant states in setting textbook adoption standards” according to Stephen Driesler, the executive director of the American Association of Publishers’ school division. Texas has an annual budget of \$570 million for textbooks. Thus the Texas SBOE has the power to compel publishers to revise their scientific content since the majority of publishers are willing to comply with demands made by the SBOE in order to not be rejected and thus lose the potential of taking a part of the \$570 million for themselves; in fact, many publishers have gone even farther in an attempt to mitigate problems and appease the conservative State Board by engaging in a large amount of self-censorship (Schafersman, 2003).

According to Schafersman, there is a history of scientifically inferior textbooks in Texas and poor classroom education causing Texas students to score among the lowest of all states on standardized science exams (2003). Texas responded with the aforementioned 1995 legislature, as well as by instituting a state school curriculum (TEKS) and mandatory state proficiency exams that must be passed for grade promotion and graduation (TAKS). However, Schafersman fears that these amendments are not enough, at the end of the day, it is ordinary citizens that make up the SBOE and not scientists and they have their own ideological, political and religious beliefs. Even though the 1995 legislature requires that the SBOE can only reject a book based on “factual errors” the debate remains open to what counts as “factual errors” (2003).

In 2003, the Texas Board received input from the Discovery Institute, who created “A Preliminary Analysis of the Treatment of Evolution in Biology Textbooks⁹⁴” which examines eleven biology textbooks that were being considered for adoption and failed all of them but one (which passed with a C-) by examining four specific evolutionary topics: Miller-Urey abiogenesis experiment, Cambrian explosion, Haeckel’s drawings of vertebrate embryos and the Peppered Moths and industrial melanism (Schafersman, 2003). This document from the DI could provide the SBOE enough material to claim that the books do in fact contain “factual error”.

⁹⁴ This document of 55 pages is largely based on *Icons of Evolution* by Jonathan Wells, which has been reviewed and found to be a “paragon of pseudoscientific misrepresentation, specious arguments, flawed reasoning, and misunderstood scientific concepts. Well’s book is marketed at individuals who are largely ignorant of evolutionary science and thus easily misled by superficial arguments.” (www.texscience.org, (Accessed 3 January 2014))

The next section will look at a specific textbook to allow for a more detailed look at the hurdles that textbook authors and publishers face when trying to have their book adopted by SBOEs. The specific textbook is Biology by Kenneth Miller and Joseph Levine. Dr. Kenneth Miller is a professor of biology at Brown University and Joseph Levine is a professor at Boston College. Miller's expertise is cellular and molecular biology while Levine's expertise is evolutionary biology and ecology. This book was chosen because it is now (in)famous due to its role in the 2005 Kitzmiller case as it was repeatedly accused of being "laced with Darwinism" (400 F. Supp. 2d 707 (M.D. Pa. 2005)). Miller and Levine had their first edition of Biology ready for publishing in 1990 and then became part of the textbook adoption ordeal. Miller described how he traveled to Austin, Texas to attend the state hearings about which textbooks should be adopted. As Miller states "We faced persistent pressure from editorial and sales personnel to limit or deemphasize our coverage of evolution in advance of state hearings. The authors of a competing text added a paragraph on creation, placing pressure on us to follow suit" (Miller, 2010).

A decade later in another cycle of textbook adoptions, they were met with further hurdles fueled by the creationist movement (Miller, 2010). Despite the previously mentioned attempts of the Texas Legislature to curb the SBOE's power, in 2003, the Texas Board of Education insisted that biology textbooks highlight the "strengths and weaknesses" of scientific theories (Miller, 2010). This was the year after the school board in Georgia began placing disclaimer stickers on the biology textbooks stating, "This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered⁹⁵."

Despite pressures from publishers and SBOEs, Miller and Levine refused to include any mention of Intelligent Design or Creationism in their textbook. Some school boards, such as the Dover School Board in 2005, have thus chosen to voluntarily provide "supplemental" literature for the students. The Dover School Board specifically chose to accept a donation of 60 copies of an Intelligent Design textbook *Of Pandas and People* and placed these in the school library and referred to the availability of these books in the statement read to students before being taught about evolution in their biology classes⁹⁶.

The next textbook that will be discussed is *Of Pandas and People*. Unlike Miller and Levine's textbook, *Pandas* has never been adopted by a state textbook board, so this section will focus on how it has made its way into American classrooms by bypassing all state textbook adoption processes. This book is of particular interest because it (1) it is the main textbook used by ID proponents (2) it was also an integral part of the Kitzmiller case and (3) brought forth written proof that

⁹⁵ More information about these disclaimers and their relationship to the First Amendment can be seen in *Selman v. Cobb County Board of Education* in Examining the Legal Conflict chapter.

⁹⁶ *Tammy Kitzmiller, et al. v. Dover Area School District, et al.* (400 F. Supp. 2d 707, Docket no. 4cv2688)

Intelligent Design is simply a new name for Creationism. *Of Pandas and People* is a school-level textbook written by Percival Davis and Dean H. Kenyon and was published in 1989 by Hought Mifflin Co. Funding for the publishing came, interestingly enough, from the Texas-based organization, Foundation for Thought and Ethics (FTE).

Although the marketing strategy behind the books promotes it as an Intelligent Design supplemental school book, there was a very early mention of this book in a creationist student newspaper from 1981 according to Nick Matzke from the National Center for Science Education (NCSE) who found a minuscule article announcing that an “Unbiased Biology Textbook Planned”. The article further stated that Charles Thaxton would be working on this book that would “both evolution and creation”⁹⁷.

Barbara Forrest examined multiple subpoenaed early drafts of this textbook as part of the *Kitzmiller* case in 2005. She made a very important find that in *Pandas* the text originally read “Creation means that various forms of life began abruptly, through the agency of an intelligent creator, with their distinctive features already intact: fish with fins and scales, birds with feathers, beaks and wings, et cetera.” This was the text found in the book prior to the *Edwards v. Aguillard* case in 1987. This case deemed the teaching of creationism or Scientific Creationism unconstitutional. After the 1987 case, the text in *Pandas* now read, “Intelligent design means that various forms of life began abruptly through an intelligent agency, with their distinctive features already intact: fish with fins and scales, birds with feathers, beaks, et cetera”. Providing very clear evidence that Intelligent Design was nothing more than a re-branding of Creationism in response to a court ruling (400 F. Supp. 2d 707 (M.D. Pa. 2005)).

After the book’s re-publication in 1989, the FTE began a lengthy campaign to get the book into American classrooms. Many previous creationist attempts had relied on trying to take a “top-down” approach, trying to influence politics to change curriculum standards. This book allowed creationists to try a new “bottom-up” approach. Although Kevin Padian has stated that *Pandas* is “wholesale distortion of modern biology”, Christian groups wanted it to become part of school curriculum and began to try to persuade school boards and individual teacher to adopt the book or to get themselves elected to school boards and local educational committees (1989). The FTE’s efforts were also supported by other organizations such as the Institute for Creation Research, which sells the book through its online store and catalog (Times-Picayune, 1995).

This book did not follow the typical textbook adoption cycle; instead, its movement into science classrooms was a product of grassroots efforts made by local residents to get this book into the public schools. As stated above, there are public debate forums where public citizens are encouraged to speak their opinion.

⁹⁷ Video testimony of this account can be seen on *Judgement Day: Intelligent Design on Trial* or read in the film’s transcripts.

In an attempt to create changes that would allow for Intelligent Design/Creationism to be included in school curricula, many citizens in multiple states began taking action. In Alabama, 11,800 people signed a petition to the state textbook committee endorsing Intelligent Design (Wall Street Journal, 1994). A public campaign also followed in Idaho in 1990. In 1993, members of the school board in Vista, California tried to include the book in the curriculum. In 1994, residents in Ohio voted to have the book adopted into their curriculum. In 1994, school officials in Florida distributed the books to school libraries to be used as a resource. In 1994, the Wall Street Journal stated that over 22,000 copies of *Pandas* had been sold and fifteen school districts had ordered enough to indicate classroom use (Wall Street Journal, 1994). In 1995, it was proposed as supplemental material to the existing course materials in Texas. By 1996, Time magazine reported that school boards in Washington and Ohio were considering adopting *Pandas* as a school textbook. In 1997, the school board in Chesapeake, Virginia bought books for all the school libraries in the district. In 1999, *Pandas* was rejected by the Idaho state textbook committee. In 2000, *Pandas* was selected by the curriculum director in West Virginia. In most of these cases, *Pandas* was ultimately not included in classroom curriculum for fear of litigation.

The book, although heralded by the creationist community, has of course been deemed a “wholesale distortion of modern biology” to quote Dr. Kevin Padian (1989). Padian did not try to sugarcoat his thoughts about this book as he further stated “It is hard to say what is worst in this book: the misconceptions of its subtext, the intolerance for honest science, or the incompetence with which science is presented. In any case, teachers should be warned against using this book” (1989). A full report of Padian’s review can be read on the NCSE’s website: <http://ncse.com/creationism/analysis/gross-misrepresentation>. Of *Pandas* and *People* enjoyed its own sequel in 2007 entitled *The Design of Life: Discovering Signs of Intelligence in Biological Systems*, which was written by William Dembski and Jonathan Wells and also published by the FTE in Texas. This textbook is twice as long as *Pandas* and describes to the reader that there have been numerous advancements of ID over the past 20 years. *Design of Life* and emphasizes the many peer-reviewed scientific papers, scientific books, and laboratory studies completed by ID theorists. The book avoids all mention of Creationism and focuses on the main ID pillars such as irreducible complexity, specified complexity and more complex issues such as the “irreducible core”. The book contains over 100 pages of footnotes and provides large amounts of data to support their “scientific arguments” in support of the idea that “the source of that functional information is a designing intelligence”⁹⁸. The well-executed book with the shiny veneer of scientific pursuits will surely confuse students and possibly convince

⁹⁸ A full description of the claims made about this book can be found on the DI website at <http://www.discovery.org/a/17751> (Accessed 9 May 2016).

students if this work is presented in a science classroom by a science teacher as a scientific piece of work.

Summary

In the end, textbooks have a tremendous amount of power within a classroom. As stated earlier, they are the most visible part of the curriculum and the majority of teachers rely upon them for the majority of their teaching. For many students (and teachers) textbooks represent the only scientific literature that they will come in contact with, meaning that they do not have any other sources of information to allow them to question what is stated or omitted in the textbooks provided to them by the state.

Yet due to the political nature of textbook adoption and the economic interests of the publishers, the content of textbooks more often reflects the desires of the SBOE and not the current stand of science. While the adoption process for state textbooks is a grueling affair for all members involved, the ID proponents have been able to create supplemental textbooks that have been introduced into schools from a bottom-up approach. The newest ID schoolbook poses a real threat to science education as it is thickly enshrouded with scientific veils that could easily confuse both high school students and teachers alike.

Miller believes that the only way to amend this situation and assure for quality scientific textbooks that present the current knowledge available to the scientific world is scientists to become involved at the political level in order to oppose the anti-evolution efforts present in many states (2010). Miller suggests that scientists could serve on textbook committees or lobby for professional review of textbooks by the scientific community. Moreover, he suggests that professional researchers and university scientists offer their expertise and support to educators at the high school level (Miller, 2010). The science community is obviously at a disadvantage in this political arena as they face off with evangelicals who have been involved in political action for decades.

Classroom Strategies

In general, the classroom strategies are also closely linked to the results of court case decisions just like the large level strategies. The link between creationist strategies and legal decisions is highlighted by large number of lawyers or legally educated individuals (Bird, DeForrest, DeWolf) assisting in the publication of creationism materials and occupying leadership roles within the intelligent design movement, such as Phillip E. Johnson. Any of the court cases that made it to the Supreme Court were able to determine what is legal and illegal within an American public school classroom in all states. Legally savvy creationist leaders are able to dissect these legal decisions and find the legal loopholes where they may make renewed

efforts to move creationism into the classroom. Therefore, the different classroom strategies can basically be broken down into three categories based on major case decisions and the subsequent strategic alterations: the 1920s to 1960s clear assault on evolution⁹⁹, the 1960s, 70s and 80s focused on Creation Science and the post-1987 strategies involving Intelligent Design and post 2005 a focus on subtler strategies mostly perpetuated by the Discovery Institute (Matzke, 2010).

They can be broken down in this way because the 1968 case, *Epperson v. Arkansas*, invalidated the Arkansas statute that had made the teaching of evolution illegal. In addition, the 1987 case, *Edwards v. Aguillard*, was a Supreme Court case in which the teaching of Creationism and/or Creation Science was declared to be unconstitutional. Therefore, all each of these epochs had a different amount of flexibility in their support of the Genesis and their disdain for evolution. For instance, pre-1968 strategies could clearly state that their purpose was to support Creationism while all post-1987 strategies had to be certain to avoid all mention of God, Genesis and creation. Here is a brief coverage of the strategies of the past and a closer look at the current trends.

Prohibit the teaching of evolution: The earliest of strategies (1920s) was the outright prohibition of the teaching of evolution (Matzke, 2010; Larson, 2003). This occurred not only at a classroom level but was reinforced by laws passed at the state level such as the Butler Act in Tennessee. The various state laws forbade the teaching of evolution or the use of textbooks, which included Darwin's theory. John Scopes, for instance, went on trial for violating this law in Tennessee. These type of prohibitions ended at the end of the 1960s when they were declared unconstitutional in 1968 in *Epperson v. Arkansas* and a new type of strategy was born.

Scientific Creationism/Creation Science and evolution: Following the ruling in 1968, fundamentalist could no longer try to pass policies that protected the story of Genesis while prohibiting the teaching of evolution. The strictness of this ruling was seen again in 1977 in *Hendren v. Campbell* when the Indiana Textbook Commission was sued by a ninth-grade student for the adoption of a creationist textbook for use in public schools. The decision in this case in favor of the student highlighted the fact that not only was it illegal to ban the teaching of evolution, but it was also unconstitutional to promote the teaching of creationist doctrines (Larson, 2003). Following the *Hendren* ruling, Wendell Bird, a Yale Law School student, devised a legal strategy that was published in the influential *Yale Law Journal* in 1978. Bird argued that requiring students to learn only about evolution was in violation of the Free Exercise Clause of the Constitution, since it undermined religious beliefs held by students and required them to conform to principle contrary to these personal beliefs (Bird, 1978). Bird also asserted that if classrooms incorporated a form of scientific creationism in combination with

⁹⁹ This period has also been broken down into two different categories: outlawing evolution 1920–1925 & enforcing the law 1925–1960 (Larson, 2003).

evolution, they could not only avoid violating the Free Exercise Clause, but they would also not be in violation of the Establishment Clause. Instead, they were forced to come up with a new Creationism that appeared to be a scientific endeavor (Bird, 1979; Larson, 2003). A new strategy was created that attempted to find scientific evidence for the Genesis story so that it could be included within a science classroom. Following law school, Bird joined Morris at the ICR. Morris had been working on the promotion of flood geology and creation science since the early 1960s. However, in a post-Epperson world Scientific Creationism as well as a general Youth Earth creationist viewpoint began to take over the former creationist trends focused on outlawing evolution. With the help of Bird, Morris was able to move the promotion of Scientific Creationism to the next step by drafting equal-time resolutions that could be used by school boards who were interested in teaching this new brand of constitutionally valid creationism along with evolutionary theory (Larson, 2003).

Equal Time/Balanced Treatment: Although Bird and Morris had written equal-time resolutions to be used at the school board level, these resolutions found quick appeal among state legislations (Larson, 2003). This legislative strategy focused on getting Scientific Creationism in the classroom by passing legislation and policies that required that equal time would be given in the classroom to Scientific Creationism/Creation Science and evolution. This strategy was focused on the amount of teaching time and the textbook usage allotted to the theory of evolution. For instance, if evolution was taught, then Scientific Creationism must also be taught and if a teacher refused to teach Scientific Creationism, then they must also refrain from teaching evolution. Equal time legislation, which required the teaching of Creation Science whenever evolution was taught was adopted at the state level in Tennessee as the Genesis Act and as the Balanced Treatment Act in Louisiana. An example of such legislation can be seen in this act from Tennessee, "Any biology textbook used for teaching in the public schools, which expresses an opinion of, or relates a theory about origins or creation of man and his world shall [give] . . . an equal amount of emphasis on . . . the Genesis account in the Bible". (Public Acts of Tennessee, 1973, Chapter 377, cited in LaFollette, 1983, p.80). This legislative strategy was popular in the 1970s and 1980s following the 1968 Epperson case but it was aborted, though, after the Supreme Court ruled in the Edwards case in 1987 making it illegal to teach Creation Science in any American public school.

Direct introduction of Intelligent Design: Following the 1987 Edwards case there was a movement away from the term Creationism, Scientific Creationism, Creation Science as well as any reference to Genesis or any direct attacks on evolution and instead a new focus arose on a dubious scientific concept known as Intelligent Design. There was an attempt made to create textbooks (Of Pandas and People) and other materials to get this concept into the classrooms. The Foundation for Thought and Ethics Books (an imprint of the Discovery Institute)

even published a book entitled *Intelligent Design in Public School Science Curricula: A Legal Guidebook* in 1999, written by David K. DeWolf (former law professor), Stephen C. Meyer (director of the Center for Science and Culture at the DI), and Mark E. DeForrest (law professor). The book has an entire chapter dedicated to the *Edwards v. Aguillard* case and gives specific ways to circumvent the problem¹⁰⁰. As the book states:

“the Court was careful to point out that its decision [Edwards v. Aguillard] in nowise excluded the teaching of other theories about biological origins. Likewise, the Court left the door open to scientific critiques of evolution. In an illuminating section of the majority opinion, the Court even stated that teaching a variety of scientific theories about origins ‘might be validly done with the clear secular intent of enhancing the effectiveness of science instruction.’...The Court even went so far as to assert that academic freedom requires that alternative theories about origins be permitted in public school science classrooms. In particular, academic freedom includes a science teacher’s right to teach scientific alternatives to the dominant Darwinian approach to biological origins. As a legitimate scientific theory about biological origins and development, design theory passes every test set by the Court for inclusion in public school science curricula.

Nothing in the Supreme Court’s decision in Edwards forces local school districts, the states, or the federal government to bar teaching about design theory. The Court explicitly stated in Edwards that it is constitutionally lawful for teachers and school boards to expose students to the scientific problems with current Darwinian theory as well as to any scientific alternatives. In Edwards v. Aguillard far from placing its imprimatur on Darwinism, the Supreme Court actually defended the principle of openness in science education.”

The Discovery Institute was very clever in their legal examination of the *Edwards* case in trying to show that the Court was trying to encourage the inclusion of new theories. The book also takes time to thoroughly discuss why Intelligent Design is NOT Creation Science (see the section on Intelligent Design for the detailed example). Yet, despite their best efforts, the *Kitzmiller* case in 2005 stopped this strategy by directly prohibiting the teaching of Intelligent Design in public school classrooms and thus the creationists were back to the drawing board.

“Subtle” undermining of evolution/promotion of alternative theories: The newest strategy and current strategy can be seen in trying to discredit evolution by either trying to teach the weaknesses/controversy, by adding textbook disclaimers or by promoting academic freedom to criticize the theory of evolution (Forrest, 2007). The main focus of these strategies is to maintain a degree of ambiguity, i.e. there is not direct prescription of what should or should not be taught and the proponents are not overtly pro-Intelligent Design, nor do they mention Creation-

¹⁰⁰ A copy of this book is available for free at http://www.arn.org/arnproducts/php/book_show_item.php?id=130 (Accessed 25 February 2014).

ism, Genesis or God. Instead, many active participants in this strategy put on an air of interest in science and education. They act as though they are truly concerned with science education. They attempt to portray evolution as “just a theory” in the sense of colloquial English, i.e. just an educated guess or point out that the theory has many weaknesses that should be critically analyzed and examined, or that alternative (non-named) theories may provide better quality of evidence.

They accomplish this by either adding textbook disclaimers, which warn students about the nature of the theory as in *Freiler v. Tangipahoa* or by drawing attention to the “weaknesses” of the theory or the “controversy” surrounding the theory. An example of such a disclaimer can be seen in the 2006 *Selman v Cobb* case, which read, “This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered”. The disclaimer issue was dealt with fairly clearly in the *Selman* case, but the teaching of the weakness strategy is ingenious in that it is very difficult to fight.

This strategy of undermining evolution is much like a color-changing octopus, every time you think you have it cornered, it changes color and shape. This concept has been known as teaching the weaknesses/teaching the controversy/critical analysis of evolution and will undoubtedly have many other faces in the future, such as the Academic Freedom Bill attempts to protect persecuted teachers who dare to criticize Darwin as discussed in the previous sections. Many of these have been organized by campaigns from the Discovery Institute and encouraged by books such as Jonathan Wells’ book, *Icons of Evolution*, which discusses the “many” weaknesses of the theory of evolution and by such movies as *Expelled: No Intelligence Allowed*. These books, films and other attempts at discrediting Darwin can be seen in a later chapter, which discusses the free choice educational material.

It should be noted that the struggle between creationism and evolution could occur within the classroom for years or decades without seeing the light of day. That is because these struggles only become public affairs or legal cases if the struggle is actively moved beyond the classroom – i.e. if a parent, student, or teacher challenges the teaching or standards in a classroom. For this reason, the teaching of Creationism or the undermining of evolution can occur undisturbed unless a concerned parent takes action, such as some of the parents that were discussed in the chapter regarding Examining the Legal Conflict who took it upon themselves to sue the teacher, school or school board because they believed that the material or manner of teaching is in violation of their child’s constitutional rights.

Some of these struggles will never come to the light of day though and will continue to influence the supply minds of the American student. For instance, if a teacher is teaching only Creationism to his biology students and they live in a predominantly Christian, fundamental community, then it is possible that none of the

students will complain to their parents. Or even if the students do complain to their parents it does not necessarily mean that these parents will take action by complaining to the school board or if the school board would respond to the parents' complaints if they did approach the school board in a homogeneously Christian community as will be discussed in the Lane v. Sabine Parish School Board case in the next chapter.

Summary

American classrooms are the forefront of influential power. It is a direct and powerful way of educating but also of misleading masses of supple minds. There is a vast amount of protection around public school curriculum, yet because of the lack of a national curriculum and because the textbook industry is essentially just conglomerate trying to make a buck, there is still plenty of room for creationists to get their foot in the door. They have been attempting to hijack high school minds since the beginning of the 20th century and with every loss that they suffer in the courtrooms they continue to bounce back with newly adopted strategies such as directly targeting the amendment of science standards or the adoption of school textbooks.

Basically state science standards and textbook selection have a huge influence on the way in which evolution (and other subjects) are presented to students and while well-written science standards, excellent textbooks and comprehensive curricula can be an extraordinary asset for a biology teacher and thus a blessing to science students, there is an increasing amount of pressure from Darwin doubters to introduce obtuse language into the standards in order to allow for the teaching of alternative creationist theories. This obtuse language and intentional vagueness may serve anti-evolutionist in their aim to open a legal loophole to introduce ideas such as Intelligent Design into the science classroom.

Beyond Borders: post-Kitzmiller, free-choice learning and creationism outside the US

This thesis has focused on the teaching of Creationism in American schools between 1925 and 2005. This chapter will be devoted to looking at what is beyond this scope by looking at what legal cases occurred after 2005, how Intelligent Design and Creationism are advocated outside of the classroom and what is the situation in another country – specifically Germany. To begin, the first section will discuss what has happened since the Kitzmiller ruling.

A Look at the conflict after Kitzmiller – Creationist movement post 2005

This section will look at what has happened since the Kitzmiller case in 2005. As mentioned before, the creationist movement continues to evolve and this continual change within the movement is usually sparked by court case rulings. The Kitzmiller ruling dealt a major blow to Intelligent Design by showing that it was not a science but instead as equally religiously motivated as the creationist attempts in the past. By revealing the religious nature of Intelligent Design within a legal ruling, it has made

it difficult for any other legislation or policy to be supported that would make it possible to teach ID in the public school classrooms.

This section will take a detailed look at some of the many cases that have taken place since *Kitzmiller*. These cases illustrate that the conflict continues to occur at the grassroots level, i.e. that individual parents or teachers or school boards will continue to attempt to make Creationism a part of the required learning, while there have not been any state level cases since 2005.

Legal Cases post-Kitzmiller

Here is a brief summary of the cases that have occurred since 2005, including the judgment, summary and general effect that the case has had on education. In the time between *Epperson* and *Kitzmiller* there was an average of one legal battle every four years. The post-*Kitzmiller* legal landscape, however, is marked by numerous battles in one year and many cases being filed in one state (in particular in California). Like the cases discussed in the earlier chapter, these more recent cases are also scattered between the two coasts and are not limited to a certain geographical or demographical region, as can be seen in the table below.

Tab. 31: List of cases post 2005

Evolution/Creationism cases post-Kitzmiller		
Case	Year	State
Hurst v. Newman	2006	California
Selman v. Cobb County	2006	Georgia
Caldwell v. Roseville	2005/2007	California
Caldwell v. Caldwell et al.	2006	California
C.F. v. Capistrano	2007–2011	California
ACSI v. Stearns	2008	California
Comer v. Scott and Texas Education Agency	2009/2010	Texas
Doe v. Mount Vernon Board of Education et al.	2010	Ohio

ICR v. Paredes	2010	Texas
Pamela Hensley v. Johnston County Board of Education	2010	North Carolina
AFA v. CSC	2011	California
Lane v. Sabine Parish School Board	2014	Louisiana

All cases between 2005 and 2015 will now be discussed in detail in chronological order. Each of the cases will be summarized using the same layout that was used in chapter 4 to discuss the cases between 1925 and 2005. This layout includes the year, location, court level, plaintiffs, defendants, charges, ruling, summary and the cases specific effect on education. When relevant, the object of the charges, such as the legislation or policy will also be included. This sleek design allows a thorough overview of the cases in a simplified and organized manner so that the reader can (1) quickly recognize the key components of the case, which allows the reader to (2) understand how many cases are built upon one another, (3) see how the results of these cases cause creationists to change strategies in order to avoid further legal problems, (4) glimpse at the complexity of the problem for parents, students and teachers.

Hurst v. Newman

Year: 2006

Place: California

Court: U.S. District Court, Eastern District of California

Citation: 06–036 – Kenneth Hurst, Et Al. v. Steve Newman, et al.

Plaintiffs: Kenneth Hurst, Joan Balcome, Kirk Roger Tingblad, Philip Jones Thomas, Barry S. Goldberg, Sophie Goldberg, Jeannie Parent, Ken and Jody Valmassy, Anne and Richard Howard – parents

Defendant: Steve Newman, Paula Regan, Stacey Gustafson, Kitty Jo Nelson, Phyllis Throckmorton – members of the El Tejon Unified School District; John Wight – Superintendent of El Tejon Unified School District; Dan Penner – principal of Frazier Mountain High School; Sharon Lemburg – teacher

Charges/Grounds: Offering a course that promotes Creationism and ID while undermining evolution is in violation of the Constitution.

Judgment for the Dismissal with prejudice (This means that the plaintiff may not refile for the same claim.), court order in favor of the plaintiff (pro-evolution).

Summary: The Americans United for Separation of Church and State filed suit against the school board, superintendent, and a teacher in the El Tejon School District on behalf of eleven parents in response to an offered course that advocated

Creationism and Intelligent Design and undermined evolution education. The El Tejon School District settled the lawsuit in 2006 by agreeing to cancel the course and never again offer any course “entitled ‘Philosophy of Design’ or ‘Philosophy of Intelligent Design’ or any other course that promotes or endorses Creationism, Creation Science, or Intelligent Design.”

Impact on education: This case served as a warning to other school districts might contemplate offering similar courses.

Course Description

Philosophy of Intelligent Design: This class will take a close look at evolution as a theory and will discuss the scientific, biological, and Biblical aspects that suggest why Darwin’s philosophy is not rock solid. This class will discuss Intelligent Design as an alternative response to evolution. Topics that will be covered are the age of the earth, a worldwide flood, dinosaurs, pre-human fossils, dating methods, DNA, radioisotopes, and geological evidence. Physical and chemical evidence will be presented suggesting the earth is thousands of years old, not billions. The class will include lecture discussions, guest speakers, and videos. The class grade will be based on a position paper in which students will support or refute the theory of evolution.

Selman v. Cobb County

Year: 2006

Place: Georgia

Court: U.S. District Court Northern District of Georgia to U.S. Court of Appeals for the 11th Circuit

Citation: 449 F.3d 1320 (11th Cir. 2006)

Plaintiffs: Jeffrey Michael Selman, Kathleen Chapman, Jeff Silver, Paul Mason, Terry Jackson – parents

Defendants: Cobb County School District, Cobb County Board of Education

Charges/Grounds: A disclaimer warning students about evolution is in violation of the Constitution

Judgment for the Plaintiff (pro-evolution)

Summary: The school district of Cobb County began the process of textbook adoption in 2001. A group of parents was concerned with the strengthened teaching of evolution and complained that the teachers should be teaching Creationism. In 2002, the school board thus decided to insert a disclaimer into the textbooks to accommodate the religious views of the parents. In 2004, Jeffrey Selman sued the school board for violating the Constitution. In 2005, the judge found that the use of the disclaimer, since it had been paid for using public funds, was in violation of the Georgia State Constitution which states “No money shall ever be taken from the public treasury, directly or indirectly, in aid of any church, sect, cult, or religious denomination or of any sectarian institution” (Article 1, paragraph 2, section 7). The

court also found that the use of disclaimers violated the Establishment Clause of the 1st Amendment. The case was appealed and settled in 2006.

Impact on education: This case showed that the usage of disclaimers in textbooks is unconstitutional.

Textbook Disclaimer

This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered.

*Approved by Cobb County Board of Education Thursday, March 28, 2002

Caldwell v. Roseville

Year: 2005/2007

Place: California

Court: U.S. District Court Eastern District of California

Citation: 05–061 – Caldwell v. Roseville Joint Union High School District

Plaintiff: Larry Caldwell

Defendant: Roseville Joint Union High School District; James Joiner, R. Jan Pinney – Board of Trustees; Tony Monetti – Superintendent; Steven Lawrence – Assistant Superintendent; Donald Genasci – Deputy Superintendent; Ronald Severson – Principal of Granite Bay High School

Charges/Grounds: The plaintiff claimed that his freedom of speech and religion were violated when he was prevented from promoting and discussing his educational policies.

Judgment for the Defendant (pro-evolution) – case dismissed

Summary: Larry Caldwell sued the Roseville School District for violating his right of free speech and freedom to practice religion after the school district rejected his proposed “Quality Science Education Policy”, which would require teachers to teach the “scientific strengths and weaknesses” of evolution. Caldwell’s policy followed Caldwell’s failed attempt at the prevention the use of the Holt Biology Textbook, which in his opinion is not accurate, objective or current. The court dismissed all of Caldwell’s claims in 2005 and again in 2007 denying that the school district had violated any Caldwell’s constitutional rights.

Impact on education: This case impacted public school education by providing a precedent that a person cannot claim that their right of freedom of speech is being denied if a certain educational proposal is not granted and illustrates the school district’s power in determining curriculum standards.

The Quality Science Education Policy

Because ‘nothing in science or in any other field of knowledge shall be taught dogmatically’ and ‘scientific theories are constantly subject to testing, modification, and refutation as new evidence and new ideas emerge’ (1), teachers in the Roseville Joint Union High School District are expected to help students analyze the scientific

strengths and weaknesses of existing scientific theories, including the theory of evolution.”

ACSI v. Stearns

Year: 2008

Place: California

Court: U.S. District Court of Central California to Ninth Circuit Court of Appeals

Citation: No. CV 05-6242 SJO (MANx); Case 2:05-cv-06242-SJO-MAN

Plaintiffs: Association of Christian Schools, Calvary Chapel Christian School; T. Taylor, C. Young, D. Brodmann, K. Shean, D. Ono, W. Lotherington – parents

Defendants: Roman Stearns – Special Assistant to President; Susan Wilbur – Director of Undergraduate Admissions; Dennis J. Galligani – Associate Vice President for Student Academic Services; Robert Dynes – President of the University of California (UC); Office of the President of UC; Michael Brown – Chair of Board of Admissions; Regents of UC

Charges/Grounds: Plaintiffs claimed that they were religiously discriminated against when of five high school courses were rejected as college preparatory instruction.

Judgment for the defendant (pro-evolution)

Summary: UC has a policy of rejecting certain biology classes from Christian private schools due to the “inconsisten[cy] with the viewpoints and knowledge generally accepted in the scientific community”. The ACSI, et al. filed a lawsuit against the UC officials in 2005 claiming that the university’s policy violated applicants’ constitutional rights. The original lawsuit against the university officials was dismissed in 2006, but the judge allowed the case against the university system to continue. In 2008, the judge ruled that the policy was proper and constitutional. The plaintiffs appealed the case. The decision was upheld by the Ninth Circuit Court of Appeals in 2010. The U.S. Supreme Court declined to review the case.

Impact on education: This case impacts public school education in an indirect top-down manner by highlighting the power that university systems have in their science requirements. This thus impacts how high schools plan their science curriculum in order to best prepare their students for admission to university. By rejecting certain biology classes from Christian private schools, the universities are able to put pressure on the high schools to provide a science curriculum free of religious alternatives such as Creationism and Intelligent Design.

Amici Curiae Brief

The proper resolution of this case is a matter of substantial concern to amici due to the impact it will likely have on religious education in California and across the country. Amici urge this Court to rule in Plaintiffs-Appellants’ favor because the First Amendment prohibits the religious discrimination that is pervasive in the University of California’s selective scrutiny of the curriculum of religiously affiliated private schools. California students should be considered for admission to a state university without regard to their religious worldviews.

C.F. v. Capistrano

Year: 2007–2011

Place: Orange County, California

Court: U.S. District Court for Central California to Federal Ninth Circuit Court of Appeals

Citation: 647 F. Supp. 2d 1187 (C.D. Cal. 2009)

Plaintiffs: Chad Farnan – minor; Bill and Teresa Farnan – parents

Defendants: Capistrano Unified School District, Dr. J. Corbett – teacher

Charges/Grounds: Hostile remarks about Creationism made by a teacher are a violation of a student’s First Amendment rights.

Judgment for the Defendant (pro-evolution)¹⁰¹

Summary: Chad Farnan’s parents sued the Capistrano Unified School District, for remarks made by one of its history teachers, James Corbett. Corbett described Creationism as “superstitious nonsense”. Chad’s parents claimed that Corbett’s statements violated their son’s First Amendment rights as they were an “exhibition of hostility toward religion and endorsement of irreligion in a public school classroom”. The District Court used the Lemon Test to determine the constitutionality of Corbett’s remarks and found that his comment about Creationism did not have a secular purpose and sends a message of disapproval of religion and Creationism. The District Court although finding Corbett’s comment about Creationism was constitutionally impermissible, denied Farnan’s request for an injunction against Corbett or the Capistrano Unified School District. The Court of Appeals upheld Corbett’s immunity and declined to rule on the constitutionality of his remarks stating that the issue was resolved “on [the] basis [of qualified immunity] alone”.

Impact on education: This case illustrates the active role that parents are taking to protect their children’s religious rights and the problems that a teacher can face by speaking poorly of Creationism.

District Court Ruling

Corbett states an unequivocal belief that creationism is “superstitious nonsense”. The Court cannot discern a legitimate secular purpose in this statement, even when considered in context. The statement therefore constitutes improper disapproval of religion in violation of the Establishment Clause.

Comer v. Scott and Texas Education Agency

Year: 2009/2010

Place: Texas

Court: U.S. District Court, Western District of Texas to U.S. Court of Appeals, 5th Circuit

¹⁰¹ This is only a partial ruling for the defendant since the District Court ruled that Corbett’s remarks about Creationism were impermissible, but he was granted immunity and thus the injunction against him and the school district were dismissed making it a technical win for the defense.

Citation: *Comer v. Scott*, 610 F. 3d 929 – Court of Appeals, 5th Circuit 2010.

Plaintiff: Christina Comer – Director of Science for curriculum at TEA

Defendant: Robert Scott – commissioner of the Texas Education Agency (TEA); Texas Education Agency

Charges/Grounds: Requiring an employee to remain neutral regarding their concerns about Creationism and evolution is a violation of that person’s First Amendment rights.

Judgment for the Defendant (pro-Creationism)

Summary: In 2008 Christina Comer filed suit against Robert Scott, the commissioner of the Texas Education Agency claiming that the agency’s “neutrality” policy in regard to teaching Creationism as science in public schools violates the Establishment Clause as it has the purpose and effect of promoting religion by crediting Creationism as a valid scientific theory. Comer worked as the Director of Science for the Curriculum Division at the agency for over 10 years and was then fired when she failed to remain “neutral” by sending an email to science educators about a lecture addressing Creationism and evolution. The lawsuit was dismissed in 2009. Comer appealed the decision, but the decision of the lower court was upheld in 2010.

Impact on education: This ruling shows the effectiveness of neutrality policies. By instating a neutrality policy, an agency is essentially sending the message that Creationism is as valid as evolution as a scientific theory. Furthermore, according to this ruling state agency employees do not enjoy Establishment Clause protection in these type of cases, although public school teachers and students should still have such protection from the establishment of religion.

Fifth Circuit Ruling

“Upon review of the record and applicable law, we cannot conclude that TEA’s neutrality policy has the ‘primary effect’ of advancing religion. The fact that Comer and other TEA employees cannot speak out for or against possible subjects to be included in the curriculum ... does not primarily advance religion, but rather, serves to preserve TEA’s administrative role in facilitating the curriculum review process for the Board. ... Thus, we find it hard to imagine circumstances in which a TEA employee’s inability to publicly speak out for or against a potential subject for the Texas curriculum would be construed or perceived as the State’s endorsement of a particular religion”.

Caldwell v. Caldwell et al.

Year: 2006

Place: California

Court: US District Court for the Northern District of California, 9th Circuit Court of Appeals

Citation: 3:05-CV-04166-PJH

Plaintiff: Jeanne Caldwell – citizen

Defendants: Roy Caldwell, David Lindberg – professors at UC Berkeley; Michael Piburn – Program Director for the National Science Association

Charges/Grounds: Statements claiming that there is no conflict between evolution and religion are in violation of the Constitution.

Judgment for the case dismissed due to defendant's lack of taxpayer status

Summary: Jeanne Caldwell¹⁰² filed against UC professors, Roy Caldwell and David Lindberg, for violating the 1st and 14th Amendment by creating and posting an "Understanding Evolution" website (<http://evolution.berkeley.edu/>) in which certain religious beliefs were allegedly endorsed while other religious beliefs were repelled. The defense responded by pointing out that the purpose and effect of the website was not to promote religion but was designed to help K-12 teachers teach evolution. The specific pages mentioned by the plaintiff were designed to debunk the misconception that evolutionary theory and religion are incompatible. The judge did not rule on the merit of the constitutionality of the case, since the plaintiff was unable to prove her taxpayer status or a concrete injury. The case was dismissed.

Impact on education: This case addressed actions at the university level and thus did not directly impact public high school policy. It does however highlight how sensitive people have become to the general topic of evolution, which indirectly causes teachers to be less willing to address the subject in fear of legal action being taken against them.

Misconception: Evolution and religion are incompatible.

Correction: Because of some individuals and groups stridently declaring their beliefs, it's easy to get the impression that science (which includes evolution) and religion are at war; however, the idea that one always has to choose between science and religion is incorrect. People of many different faiths and levels of scientific expertise see no contradiction at all between science and religion. For many of these people, science and religion simply deal with different realms. Science deals with natural causes for natural phenomena, while religion deals with beliefs that are beyond the natural world.

Of course some religion beliefs explicitly contradict science (e.g., the belief that the world and all life on it was created in six literal days does conflict with evolutionary theory); however, most religious groups have no conflict with the theory of evolution or other scientific findings.

--from "Understanding Evolution" <http://evolution.berkeley.edu>

Doe v. Mount Vernon Board of Education et al.

Year: 2010

Place: Ohio

Court: U.S. District Court for the Southern District of Ohio, Eastern Division

Citation: 2:08-cv-00575-GLF-NMK

¹⁰² This was the second case involving the Caldwell family (see Caldwell v. Roseville).

Plaintiff: Doe – anonymous family

Defendants: Mount Vernon Board of Education, Stephen Short – Superintendent; William White – Principal, John Freshwater – teacher

Charges/Grounds: It is in violation of the Constitution for a teacher to promote their religious beliefs in a classroom or to teach Intelligent Design.

Judgment for the Plaintiff (pro-evolution)

Summary: An anonymous family, Doe, filed a lawsuit against the Board of Education of the Mount Vernon City School District, the district's superintendent, the principal of Mount Vernon City School, and against an eighth grade science teacher, John Freshwater. They claimed that Freshwater had violated the First Amendment by attacking evolution, displaying religious objects, leading a prayer session and teaching Intelligent Design. He had also branded the Doe's son with the sign of the cross. There was a court settlement in favor of the Doe family. Freshwater was fired and has since filed a lawsuit against the Mount Vernon School Board for unfair dismissal.

Impact on education: This case once again illustrates that the promotion of religious beliefs whether it be in the form of attacking evolution or teaching of Intelligent Design will not be tolerated in public schools.

ICR v. Paredes

Year: 2010

Place: Texas

Court: U.S. District Court for Northern District of Texas, U.S. District Court for the Western District of Texas

Case No.: A-09-CA-382-SS

Plaintiff: Institute for Creation Research Graduate School (ICR)

Defendants: Raymund Paredes – CEO of the Texas Higher Education Coordinating Board (THECB); Lyn Bracewell Phillips, Joe B. Hinton, Elaine Mendoza, Laurie Bricker, A.W. Riter, Brenda Prejovich, Robert Shepard – THECB officers.

Charges/Grounds: THECB violated the ICR's 1st and 14th Amendment rights by preventing them from issuing Master's degrees.

Judgment for the defendants (pro-evolution)

Summary: The Institute for Creation Research (ICR) claimed that Paredes, the CEO of the Texas Higher Education Coordinating Board (THECB), and other officers of the board violated the ICR's 1st and 14th Amendment rights by denying it the authority to issue Master's degrees in science education. The decision was made in favor of the defendants after plaintiffs were unable to provide material evidence.

Impact on education: This affects science education in public school because the Master's degree program was targeted at middle and high school teachers. It also shows the top-down control of the state boards in preventing such actions.

Institute for Creation Research Master's Degree Program

The Institute for Creation Research now gives science teachers a new opportunity to learn about the scientific evidence for creation and how to teach those truths, while earning a master's degree.

Last month, a unique online master's degree in science education—with a biblical creation emphasis—had its debut. The program—offered by one of the world's oldest and most-respected creation groups, the Institute for Creation Research—now gives science teachers a new opportunity to learn about the scientific evidence for creation and how to teach those truths, while earning an accredited master's degree. Each online course approaches the content the same way ICR's scientists approach the study of origins: if an idea, scientific or otherwise, is contrary to God's Word, it is false.

It is ICR's conviction that if this generation of young people is taught the truth and develops an eagerness for scientifically confirming God's creation, the next generation of American scientists could see a turnaround in the creation-evolution debate. Teachers, however, must be provided the tools to discern the truth, teach the truth, make science exciting to learn—and also present science as a dynamic profession for Christians.

The online program prepares science teachers to communicate the truths of biblical creation to middle school and high school students, and some college instructors may also find the degree helpful.

Nason, Patricia. One-of-a-Kind Creation School Launches Online Master's Program. April 20, 2005. www.answersingenesis.org (Accessed 10 March 2015)

AFA v. CSC (American Freedom Alliance v. California Science Center)

Year: 2011

Place: California

Court: Superior Court for the State of California, County of L.A. – Central District

Case No.: BC 423867

Plaintiff: American Freedom Alliance

Defendant: California Science Center

Charges/Grounds: Cancelling the viewing of a film due to content is a violation of the 1st and 14th Amendment rights.

Judgment: case dismissed

Summary: The American Freedom Alliance (AFA) sued the California Science Center (CSC) after the CSC canceled a screening of the film *Darwin's Dilemma – The Mystery of the Cambrian Explosion*. The film promotes Intelligent Design and the AFA thus claimed that the cancellation was based on the content of the film and therefore a violation of their First Amendment right. The case was dismissed and the parties settled out of court. Neither party accepted any fault or liability. Yet AFA claimed that it was a free speech case win for the ID movement since the CSC paid

\$110,000 to the AFA¹⁰³. It was later discovered that the Discovery Institute was working in coordination with the AFA in order to increase the controversy and provoke a cancellation¹⁰⁴.

Impact on education: This case does not have any direct effect on classroom education but does highlight the DI's attempts to win a court battle in favor of ID and to promote free-choice education venues in favor of ID.

Darwin Debates

The question of life's origins may seem an issue relevant primarily to scientists. But the answers to the inquiries about the beginnings of life on earth have far reaching political, social, cultural and psychological implications for humanity. This important series of film screenings, debates, and insights from both sides of the divide between evolutionary theory and intelligent design.

All residents of Southern California, regardless of political persuasion, religious beliefs, philosophical stance or scientific conviction, are invited to join us in these vital discussion on who we are and where we came.

www.americanfreedomalliance.org (Accessed 15 March 2015)

Pamela Hensley v. Johnston County Board of Education

Year: 2010

Place: North Carolina

Court: U.S. District Court for the Eastern District of North Carolina

Case No.: 5:07-CV-231

Plaintiff: Pamela Hensley

Defendants: Johnston County Board of Education, Anthony L. Parker – Superintendent

Charges/Grounds: Demoting a teacher based on the expression of personal opinions and the refusal to apologize violates that teacher's freedom to speech.

Dismissal with prejudice in favor of: defendant (anti-evolution)

Summary: In 2004, Pamela Hensley was teaching her 8th grade science class about evolution when a lively debate took place. In 2005, parents of one of the students complained that Hensley had been rude to their daughter by saying that the Bible was not to be read literally and allegedly punished her for her religious view by giving her a poorer grade. Hensley was reprimanded by the principal. In 2005 the same father met with the School Board and demanded that Hensley publicly admit that she had demonstrated "unconstitutional hostility against the beliefs of the Christian students in the classroom by questioning the literal content of the Bible and by teaching her theological position that the Bible contains errors", and that she be

¹⁰³ California Science Center Pays \$110,000 to Settle Intelligent Design Discrimination Lawsuit. Evolution News and Views. August 29, 2011. www.evolutionnews.org. (Accessed 15 March 2015)

¹⁰⁴ California Science Center Foundation's Statement Regarding Resolution of Legal Dispute with AFA. PR News Wire. August 29, 2011. www.prnewswire.com (Accessed 9 March 2015)

transferred out of the North Johnston school district and that she be assigned to teach a subject other than science. Hensley was transferred to a remedial arts school a couple of weeks later. In 2007, Hensley filed suit against the School Board claiming the transfer violated her Constitutional rights. In 2010, the court granted the defendants Movement to Dismiss Hensley's claims regarding the Constitutional violations.

Impact on education: This cases draws attention to the fact of how careful teachers must be when discussing evolution in a classroom and that even by stating that the Bible should not be read literally may put a science teacher's job at risk.

Lane v. Sabine Parish School Board

Year: 2014

Place: Louisiana

Court: U.S. District Court Western District of Louisiana

Case No.: 5:14-cv-00100-EEF-KLH

Plaintiff: Scott and Sharon Lane – parents

Defendant: Sabine Parish School Board, Sara Ebarb – Superintendent, Gene Wright – Principal, Rita Roark – teacher.

Charges/Grounds: Continual promotion and teaching of Christian belief in public schools while simultaneously punishing students for not participating is in violation of that student's constitutional rights.

Consent Decree: Plaintiff (pro-evolution/pro-secularism)

Summary: C.C. Lane, a Thai Buddhist, enrolled in Negreet in the 6th grade where he was quickly harassed and polystetised by his science teacher, Rita Roark, who continually promoted her Christian beliefs including statements such as "Isn't it amazing what the _____ has made!!!!" as a compulsory question requiring students to fill in "Lord" on all the science class quizzes. The Lane family complained to the Superintendent who informed them that they were in the Bible Belt and would have to accept being polystetised by teachers such as Roark, who told C.C. that Buddhism was stupid and that he should conform to Christianity or go to another school where there are more Asians. The plaintiffs were offered a Decree of Consent, which they accepted stipulating that the district-wide promotion of religion would be in violation of the Establishment Clause if proved. The Board was also required to bus Lane to another school for the remainder of his education.

Impact on education: This case shows how the widespread promotion of Christian beliefs are accepted in religiously homogenous communities and how hard it is for a minority individual to fight for their Constitutional rights in such a community.

ORDER BY THE CONSENT OF THE PARTIES, IT IS HEREBY ORDERED, ADJUDGED, AND DECREED:

1. Some of the Board's District-wide practices and customs alleged in the Complaint, if proven, would violate the Establishment Clause of the First Amendment to the U.S. Constitution. Some of the Board's practices and customs (a) endorse and

promote religion, (b) have the purpose or effect of advancing religion, and/or (c) coerce religious exercise either directly or indirectly.

2. The Clerk shall enter judgment in favor of the Plaintiffs. In adopting this Consent Decree, the Court has ensured that it comports with the First Amendment to the U.S. Constitution.

In the following table, it becomes apparent that there is a tremendous clumping of cases in California. In fact, half of the post-Kitzmiller cases occurred in California. As discussed, California is very different politically, historically and religiously from Tennessee. While the first evolution/creationist case was held in a religious, conservative, former slave state, the majority of the cases now take place in a liberal, moderate, former union state. Once again illustrating the universality of this clash within the US.

Tab. 32: List of cases post 2005

Evolution/Creationism cases post-Kitzmiller		
Case	Year	State
Hurst v. Newman	2006	California
Selman v. Cobb County	2006	Georgia
Caldwell v. Roseville	2005/2007	California
Caldwell v. Caldwell et al.	2006	California
C.F. v. Capistrano	2007–2011	California
ACSI v. Stearns	2008	California
Comer v. Scott and Texas Education Agency	2009/2010	Texas
Doe v. Mount Vernon Board of Education et al.	2010	Ohio
ICR v. Paredes	2010	Texas
Pamela Hensley v. Johnston County Board of Education	2010	North Carolina

AFA v. CSC	2011	California
Lane v. Sabine Parish School Board	2014	Louisiana

Another major shift that is visible after Kitzmiller is that there is an obvious sensitivity that has arisen around the subject of evolution and Creationism. While the cases pre-Kitzmiller were largely focused on district-wide or even state-wide legislation that deeply affected science education, it is now apparent that even dubious comments made by individual teachers to individual students could develop into another legal battle.

To better illustrate the differences, the following two tables describe the parties and judgements made in the two different groups of cases.

Tab. 33: Court rulings on cases between 1925 and 2005

Court rulings between 1925 and 2005		
Plaintiff	Defendant	Judgement
Tennessee – state	John Scopes – teacher	Defendant found guilty of violating state's Butler Act.
Epperson – teacher	Arkansas – state	Any statute that prohibits the teaching of evolution is in violation of the Constitution.
Daniel – teacher	Waters – textbook commission	Genesis Act (requiring balanced treatment) is in violation of the Constitution.
Hendren – parent	Campbell – textbook commission	Including a textbook that discusses Creationism in public schools is in violation of the Constitution.
Segraves – parent	California – state	Teaching evolution cannot be considered the Establishment of Religion and is therefore not in violation of the Constitution.
McLean – reverend	Arkansas – board of education	Balanced Treatment Act (requiring balanced teaching of evolution and Creation Science) is in violation of the Constitution.

Aguillard – parent	Edwards – governor	Balanced Treatment Act (requiring balanced teaching of evolution and Creation Science) is in violation of the Constitution.
Webster – teacher	New Lenox – school district	A teacher’s freedom of speech does not overrule a school district’s obligation to protect a student’s constitutional rights.
Peloza – teacher	Capistrano – school district	Requiring a teacher to teach evolution instead of Creationism is not a violation of that teacher’s constitutional rights.
Freiler – parent	Tangipahoa – board of education	Requiring a disclaimer to be read before teaching evolution is in violation of the Constitution.
LeVake – teacher	ISD #656 – school district	A teacher’s freedom of speech does not overrule a school district’s obligation to protect a student’s constitutional rights.
Kitzmiller – parent	Dover – school district	Requiring a disclaimer to be read and any attempt to include Intelligent Design into the classroom is in violation of the Constitution.

Now notice how almost all of these cases during this era are led by and/or aimed at direct participants of education, i.e. teachers, school districts, etc. Moreover, it is important to note that most all are focused on policies, whether that be state legislation like the “Butler Act” or school board policies such as disclaimers. All of these cases were also clear wins for the secular/evolution side, with the exception of the Scopes trial.

Now see the next table and note that in addition to parents, teachers and school boards the trial participants now include think tanks, creationist graduate schools, university professors, etc. In other words, the net is much wider. Moreover, it is important to notice that although some cases do address policies such as disclaimers, many are focused on singular comments, individual courses and decisions. Many of the cases that occurred post-2005 also have multiple trial date years or year spans due to numerous successful or failed attempts at appeals. In general, the post-Kitzmiller cases seem to much more complex and to exist in a greyer zone than the pre-Kitzmiller cases. Here, too, the judgements are not all in favor

of the secular party and some wins are only partial wins, which could be attributed to this complexity and inability for judges to discern – what is really secular and what is religiously motivated?

Tab. 34: Court rulings on cases post 2005

Court rulings post 2005		
Plaintiff	Defendant	Judgment
Hurst – parent	Newman – school district	The school district may not offer any courses promoting Creationism or Intelligent Design.
Selman – parent	Cobb – school district	A use of a disclaimer to warn students about evolution is in violation of the Constitution.
Caldwell – parent	Roseville – school district	It is not a violation of the Constitution if a policy proposed by a parent is not granted by a school district.
ACSI – school	Stearns – university	Rejecting courses from Christian private schools on the basis of scientific merit is not a violation of the Free Exercise Clause of the Constitution.
C.F. – student & parents	Capistrano – school district & teacher	It is not constitutionally permissible for teachers to make hostile remarks about religion or Creationism in the classroom.
Comer – curriculum director	Scott – textbook commission	Neutrality clauses regarding employees' treatment of Creationism and evolution are not in violation of the Constitution since they do not advance nor inhibit religion.
Caldwell – citizen	Caldwell – professor	Dismissed because defendant could not prove taxpayer status or concrete injury.
Doe – family	Mount Vernon – Board of Education	Settled outside of court. Financial reimbursement for the family and the teacher in question was fired.
ICR – creationist graduate school	Paredes – Texas Higher Education Coordinating Board (THECB)	Summary Judgement in favor of THECB due to lack of evidence brought forth by the ICR.

AFA – think tank	CSC – state science center	Settle outside of court. Neither party accepted any liability. CSC paid \$110,000 in damages to AFA.
Hensley – teacher	Johnston County Board of Education	Plaintiff claims of constitutional violation were dismissed since free speech is not granted to teachers in an official capacity.
Lane – parent	Sabine Parish School Board Consent	Decree in favor of the plaintiff. The Board's actions of promoting religion if proved would be in violation of the Establishment Clause of the Constitution.

What can be learned from this information is that the Kitzmiller case may have made it clear that pro-intelligent design policies at a district level are likely to fail legal scrutiny, but it did not discourage creationist from trying to affect change at the classroom level. There also seems to be almost an eagerness to go to court in the past decades in a manner that is reminiscent of a stirred up ant bed. While in the 1950s anti-evolution legislation remained on the books for decades without challenge, the current situation in the United States is that even a single comment disrespecting a student's choice to read the Bible literally is enough to land a teacher in court.

While the Scopes trial led to a volunteer censorship of evolution from textbooks to avoid legal disputes, the Kitzmiller case may have led to an era where teachers are careful to censor themselves and their pro- or anti-evolution views as not to jeopardize their employment.

General Strategies following Kitzmiller

As mentioned numerous times, the creationist movement evolved throughout the past 90 years largely in order to avoid legal problems. Following Kitzmiller, it seemed as though even their extraordinarily well dressed Trojan horse (Intelligent Design) had been exposed and deemed religious and thus unconstitutional. Since that point, the movement has progressed even away from the direct mentioning of Intelligent Design to a much subtler approach of readdressing evolution as theory full of gaps, misinformation and weaknesses.

Many of these new approaches are being orchestrated and organized by the Intelligent Design think tank, the Discovery Institute (DI). Yet, they are well aware of the pitfalls of trying to teach ID after their involvement in the Kitzmiller case and have made a public statement expressing this:

“As a matter of public policy, Discovery Institute opposes any effort to require the teaching of intelligent design by school districts or state boards of education. Attempts to mandate teaching about intelligent design only politicize the theory and will hinder fair and

open discussion of the merits of the theory among scholars and within the scientific community. Furthermore, most teachers at the present time do not know enough about intelligent design to teach about it accurately and objectively¹⁰⁵.

Now the trend has gone to a point that anti-evolutionist are camouflaging their motives as individuals interested in science education. Many of the newest attempts focus on teaching “critical thinking” or “strengths and weaknesses” or most subtly as “analysis of the theory”. This new move can be seen again in the statement made by the DI:

“Instead of mandating intelligent design, Discovery Institute seeks to increase the coverage of evolution in textbooks. It believes that evolution should be fully and completely presented to students, and they should learn more about evolutionary theory, including its unresolved issues. In other words, evolution should be taught as a scientific theory that is open to critical scrutiny, not as a sacred dogma that can’t be questioned.

Discovery Institute believes that a curriculum that aims to provide students with an understanding of the strengths and weaknesses of neo-Darwinian and chemical evolutionary theories (rather than teaching an alternative theory, such as intelligent design) represents a common ground approach that all reasonable citizens can agree on¹⁰⁶”.

A major focus is being placed at the classroom level. On the one side, the DI is promoting the passing of Academic Freedom legislation that would protect teachers in the classroom who would like to teach evolution “critically”. The DI has also begun to disseminate flyers for students with suggestions about questions they can ask their teachers to promote a “healthy” in-class debate about the strengths and weakness of evolution. In both of these strategies, the outward motivation is the supposed interest in promoting science education and they are careful not to mention terms like Creationism, Creation Science or even Intelligent Design.

The following table provides an overview of the 10 questions that were produced by Jonathan Wells, a senior fellow at the Discovery Institute. The National Center of Science Education has since published a list of suggested answers to support biology teachers who are confronted with these questions.

¹⁰⁵ Discovery Institute’s Science Education Policy (Institute, 2012)

¹⁰⁶ Ibid.

Tab. 35: 10 questions designed to disrupt evolution education at the classroom level

10 Questions to Ask Your Teacher by Jonathan Wells
ORIGIN OF LIFE. Why do textbooks claim that the 1953 Miller-Urey experiment shows how life's building blocks may have formed on the early Earth – when conditions on the early Earth were probably nothing like those used in the experiment, and the origin of life remains a mystery?
Darwin's TREE OF LIFE. Why don't textbooks discuss the "Cambrian explosion," in which all major animal groups appear together in the fossil record fully formed instead of branching from a common ancestor – thus contradicting the evolutionary tree of life?
HOMOLOGY. Why do textbooks define homology as similarity due to common ancestry, then claim that it is evidence for common ancestry – a circular argument masquerading as scientific evidence?
VERTEBRATE EMBRYOS. Why do textbooks use drawings of similarities in vertebrate embryos as evidence for their common ancestry – even though biologists have known for over a century that vertebrate embryos are not most similar in their early stages, and the drawings are faked?
ARCHAEOPTERYX. Why do textbooks portray this fossil as the missing link between dinosaurs and modern birds – even though modern birds are probably not descended from it, and its supposed ancestors do not appear until millions of years after it?
PEPPERED MOTHS. Why do textbooks use pictures of peppered moths camouflaged on tree trunks as evidence for natural selection – when biologists have known since the 1980s that the moths don't normally rest on tree trunks, and all the pictures have been staged?
Darwin's FINCHES. Why do textbooks claim that beak changes in Galapagos finches during a severe drought can explain the origin of species by natural selection – even though the changes were reversed after the drought ended, and no net evolution occurred?
MUTANT FRUIT FLIES. Why do textbooks use fruit flies with an extra pair of wings as evidence that DNA mutations can supply raw materials for evolution – even though the extra wings have no muscles and these disabled mutants cannot survive outside the laboratory?
HUMAN ORIGINS. Why are artists' drawings of ape-like humans used to justify materialistic claims that we are just animals and our existence is a mere accident – when fossil experts cannot even agree on who our supposed ancestors were or what they looked like?
EVOLUTION A FACT? Why are we told that Darwin's theory of evolution is a scientific fact – even though many of its claims are based on misrepresentations of the facts?

These types of questions and the dissemination of pamphlets promoting the use of such questions illustrate this new focus on “teaching the strengths and weakness”, “teaching the controversy” or “critical analysis” of evolution. This strategy has become so prevalent after ID failed to pass legal scrutiny in Dover that in 2009 that Dr. Eugenie Scott from the National Center for Science Education began a bi-national tour to address this issue¹⁰⁷. As Eric Rothschild (the prosecution lawyer in the Kitzmiller case) stated, “When you see ‘critical analysis of evolution,’ you really need to look at what’s behind that. Who? Why? Why is there this need for critical analysis of evolution? Why is there no call for critical analysis of plate tectonics (Candisky, 2006)?” When an individual does ask these questions, one finds the same individuals who promoted ID prior to 2005 and who were in favor of Creation Science in the early 1980s. This focus on criticizing evolution is just another legal maneuver, trying to find a constitutionally valid approach to influencing students and an attempt to sway them away from the “altar of science” and back to the belief in special creation.

Summary

Despite the apparent blow to the Intelligent Design movement after the Kitzmiller ruling, the number of cases involving Intelligent Design strategies has not decreased since 2005 but has gained speed instead. The cases post 2005 occur more frequently than in the period before Kitzmiller. The strategies have also become much more ambiguous and complex. The post-Kitzmiller legal landscape is marked by cases that represent subtle strategies and sensitive parties on both sides. The willingness to go to court over this issue only seems to have increased during the past decade and has spread from cases involving only public high schools to also include university policies and state board employee policies. The next chapter will take a further look at the development of this movement as it transgresses the school zone and offers a plethora of free-choice learning materials.

Conflict Outside the Classroom – The Power of Free-Choice Learning

The spread of creationism has generated a large anti-evolution enterprise which produces books, websites, films, museums, etc. (Blancke, 2014). This section will examine the effects of this by examining a specific type of education known as free-choice learning or informal learning that is defined as the attainment of knowledge outside formal classrooms through sources such as books, magazines, videos, blogs etc. as well as visits to venues such as zoos, museums, conferences, etc.

¹⁰⁷ Scott, Eugenie. Talk: Strategies for Defending Evolution Education. North American Paleontological Convention. University of Cincinnati. Cincinnati, OH. June 25, 2009.

There are two very important aspects about this type of learning. First of all, it has been found that these informal educational activities such as watching a documentary or visiting a museum have a greater impact on the public's understanding of science than what is actually taught in the science classroom (Dickerson, Dawkins, & Penick, 2007). Meaning that what goes on outside the classroom can have an incredible influence on the general public's perception of the validity of evolution and creationism. It thus also has a direct influence on education that what occurs in the classroom as has been seen in previous sections that an individual's perspectives and beliefs are the impetus behind curriculum reform, legislation and legal action. Moreover, the thoughts that a student brings with them into the classroom will affect their willingness and ability to understand and accept scientific theories such as evolution (Blancke, 2014). In other words, if people can be convinced through documentaries, blogs, books etc. that Intelligent Design is a valid theory and that evolution is a theory full of inadequacies, then they will fight harder to have the "strengths and weakness" of evolution taught in their state's schools and be resistant to learning about Darwin and his "weak" theory.

The second aspect of this type of learning that is particularly important is that unlike state curriculum or peer-reviewed publications, there is absolutely no control what is "taught" at such events and institutes or what can be stated as a "fact" in books, on websites, in films, etc. In other words, a 90-minute documentary aimed at high school students or parents of high school students can proclaim again and again that there is absolutely no evidence of evolution or that Intelligent Design is valid scientific theory. All of these types of materials produced for the general public lack the peer-review process found in scientific literature or the transparency of curriculum standards. Basically, anyone can publish anything they can afford or find financial support to publish.

To illustrate what is available for the general public in the United States, this section will take a detailed look at the books and films that have been created for the free-choice learning. The main source used for this analysis was amazon.com since it is the largest Internet-based retailer in the United States and thus accessible to all Americans, regardless of state of residency (Jopson, 2011).

Books

The first point that was analyzed was the sheer volume of material available on the subject. The following table shows the results in the category "Books" on Amazon.com on March 13, 2015. One can see that the topic of "Creationism" is less often included in book titles than "Intelligent Design". The term "Evolution" is only slightly more prevalent than the term "Intelligent Design", while "Darwin" is almost twice as popular a subject. In addition, when one looks at the broader umbrella terms, "Christianity" as a subject is almost twice as common as "Biology." In

general, it is also very clear that there is a plethora of books available on this subject with almost 800,000 books in total for the public to choose from¹⁰⁸.

Tab. 36: Overview of products available according to keyword search

Search Term	Number of Products	General Total
Intelligent Design	10,988	462,543
Creationism	2,099	
Christianity	449,456	
Darwin	19,002	324,412
Evolution	13,970	
Biology	285,440	

Yet the search word alone, such as “Darwin” or “Intelligent Design”, does not necessarily represent the true nature of the content of the book but only the prevalence of the subject. In other words, just because a book has the word “evolution” in its title, it is not necessarily written with the aim of increasing knowledge about evolution or vice versa. For example, many evolutionary biologists write books with Creationism or Intelligent Design in the title, such as Eugenie Scotts’ *Not in Our Classrooms: Why Intelligent Design Is Wrong for Our Schools* (2006), while pro-ID authors write books with Darwin in the title such as Stephen C. Meyer’s *Darwin’s Doubt* (2014). What can be seen through the prevalence of these search terms is the sheer volume of books currently available on the subject which shows that it is a current topic that is being actively represented by both sides and depicted in the media. Meaning the general public has ready access to numerous books on the subject. The question is which one they choose.

The next section will examine a selected group of books by some of the proponents from each side and the popularity of these books with the general public as seen through customer reviews on the Amazon site. The customer reviews have been included in this table to show two things (1) the current status of the

¹⁰⁸ This number only continues to increase as seen by a check conducted in May 2016, which should that there are now over 12,000 books available on the subject of Intelligent Design, more than 2,200 on Creationism and over 535,000 on Christianity. While books on Darwin increased slightly to over 20,000, and books available on biology actually decreased to just over 280,000 – the number of books on evolution increased exponentially to over 130,000.

book/film, i.e. the general reception of the books/films and how many readers/viewers are leaving reviews, (2) the possible future trends of the books/films, since a recent study found that 90% of buyers are positively influenced by other positive reviews – meaning that if a book or film has hundreds of positive reviews, it is more likely to be purchased in the future than a book with less positive reviews.

Pro-Intelligent Design or Creationism

To begin here is an abbreviated list of books addressing the evolution/Creationism conflict written by some of the current proponents of Creationism/Intelligent Design, most of whom have already been mentioned in this thesis. All prices, ratings and number of reviews are based on data from Amazon.com from March 13, 2015.

Tab. 37: Overview of creationist literature

Author	Book Titles	Price	Stars of 5	# Reviews
Phillip Johnson	Darwin on Trial: Deluxe Edition (2010)	\$15	3.5	192
	The Wedge of Truth: Splitting the Foundations of Naturalism (2000)	\$11	3.5	61
	An Easy-to-Understand Guide for Defeating Darwinism by Opening Minds (1997)	\$13	3.0	125
Michael Behe	Science and Evidence for Design in the Universe (2013)	\$12	3.5	47
	The Edge of Evolution: The Search for the Limits of Darwinism (2007)	\$14	4.0	152
	Darwin's Black Box: The Biochemical Challenge to Evolution (1998/2006)	\$14	3.5	714
William Dembski	The Design Revolution: Answering the Toughest Questions about Intelligent Design (2004)	\$18	3.5	73
	Uncommon Dissent: Intellectuals Who Find Darwinism Unconvincing (2004)	\$13	4.0	46
	Intelligent Design: The Bridge Between Science & Theology (2002)	\$18	3.5	78
Stephen Meyer	Darwin's Doubt: The Explosive Origin of Animal Life and the Case for Intelligent Design (2014)	\$13	4.5	625
	Signature in a Cell (2009)	\$14	4.5	488

Jonathan Wells	The Myth of Junk DNA (2011)	\$12	4.5	41
	The Politically Incorrect Guide to Darwinism And Intelligent Design (2006)	\$20	3.5	133
	Icons of Evolution: Science or Myth?	\$15	3.5	238
	Why Much of What We Teach About Evolution Is Wrong (2002)			
Henry Morris	The Genesis Flood: 50th Anniversary Edition (2011)	\$13	4.5	33
	Biblical Creationism (2001)	\$12	4.0	17
	The Long War Against God: the history and impact of the creation/evolution conflict (1989)	\$13	4.5	41
	Scientific Creationism (1985)	\$12	3.5	61
Ken Ham	Six Days: The Age of the Earth and the Decline of the Church (2013)	\$11	4.5	48
	The Lie: Evolution (revised and expanded) (2012)	\$12	4.0	70
	Darwin's Plantation: Evolution's Racist Roots (2012)	\$12	3.0	12

One of the first most notable aspects about the points in this table is the sheer volume of reviews that these authors have received. Out in front by far is Stephen C. Meyer, who has written relatively few books but has a huge following (over 1000 reviews for two books and these numbers continue to climb steadily). While Henry Morris wrote 24 books over more than four decades before his death in 2006 but has not been able to achieve the same amount of readership as Meyer in the current American population (none of his books received over 100 reviews). Interestingly, some of Morris' books have come out after his death as anniversary editions and have enjoyed greater readership in their updated forms than the original publications also available on amazon.com. Another point of great interest is that the Discovery Institute now has its own publishing house, Discovery Institute Press, that has the capabilities of publishing and marketing not only masses of free-choice learning materials, but textbooks as well that promote creationist doctrines (discoveryinstitute.com).

One of the most shocking points has to do with the Amazon's Best Seller lists available according to category. The most notable surprise in this regard was that Darwin's Doubt: The Explosive Origin of Animal Life and the Case for Intelligent Design¹⁰⁹ (2014) written by Stephen C. Meyer (Founder and Director for the Center for Science and Culture at the Discovery Institute) received so many positive

¹⁰⁹ Meyer's book also made it onto the New York Times Best Seller list in 2013.

reviews for his book that it is now the #1 Best Seller on amazon.com in the category for “Organic Evolution” and Behe’s Darwin’s Black Box is number five in that same category (as of March 13, 2015).

The next part will look at the books written about this topic but from the other side, i.e. books written promoting the understanding of evolution as a science and attempting to dispel the scientific claims of Creationism or Intelligent Design.

Pro-Evolution

To begin, here is an abbreviated list of books addressing the evolution/Creationism conflict written by some of the current proponents of science education free of Creationism, most of whom are evolutionary biologists or science historians. Again all current prices, ratings and number of reviews based on data from amazon.com on March 13, 2015 have been included in the table.

Tab. 38: Overview of evolutionary literature aimed at the general population

Author	Titles	Price	Stars of 5	# Reviews
Eugenie Scott	Evolution vs. Creationism: An Introduction (2009)	\$22	4	53
	Not in Our Classrooms: Why Intelligent Design Is Wrong for Our Schools (2006)	\$6	4	14
Barbara Forrest	Creationism’s Trojan Horse: The Wedge of Intelligent Design (2007)	\$19	4	54
Kenneth Miller	Only a Theory: Evolution and the Battle for America’s Soul (2008)	\$14	4	178
	Finding Darwin’s God: A Scientist’s Search for Common Ground Between God and Evolution (2007)	\$12	4	85
Richard Dawkins	The Greatest Show on Earth: The Evidence for Evolution (2010)	\$11	4.5	564
	The God Delusion (2009)	\$11	4	2,815
	The Selfish Gene (2006)	\$13	4.5	596
	The Ancestor’s Tale: A Pilgrimage to the Dawn of Evolution (2005)	\$13	4.5	256
	The Blind Watchmaker (1996)	\$13	4	442
Ronald Numbers	Galileo Goes to Jail and Other Myths about Science and Religion (2010)	\$18	4	18
		\$26	4.5	26

	The Creationists: From Scientific Creationism to Intelligent Design, Expanded Edition (2006) Darwinism Comes to America (1998)	\$33	4	2
Michael Ruse	But Is It Science? The Philosophical Question in the Creation/Evolution Controversy, Updated Edition (2008) Darwin and Design: Does Evolution Have a Purpose? (2004) The Evolution Wars: A Guide to the Debates (2001)	\$13 \$23 \$25	4 3.5 4.5	13 12 8
Bill Nye	Undeniable: Evolution and the Science of Creation (2014)	\$17	4.5	282
Jerry Coyne	Why Evolution is True (2010) Faith Versus Fact: Why Science and Religion Are Incompatible (2015)	\$11 \$21	4.5 4.5	361 171
Michael Shermer	The Moral Arc: How Science and Reason Lead Humanity toward Truth, Justice, and Freedom (2015) Why Darwin Matters: The Case Against Intelligent Design (2007)	\$24 \$13	4 4	53 92

It is apparent by looking at this table that there is a great difference in the amount of reviews each author receives. For instance, while Michael Ruse and Ronald Numbers, who have been actively studying and publishing on this subject for decades, have received relatively low amounts of reviews, newer authors like Jerry Coyne (biology professor) and Bill Nye (who is most well-known for his TV show “Bill Nye the Science Guy” and most recently known for publicly debating Ken Ham) are receiving much greater readership.

Out in front by far, with regard to number of positive reviews, is Richard Dawkins. He has accordingly written a great number of books (currently 12) about the truth of evolution and the dangers of Creationism (and faith) aimed at the general public. The table above shows that Dawkins has succeeded in obtaining a large readership (thousands of positive reviews and the numbers keep climbing)

and has received more positive reviews of his book *The God Delusion*¹¹⁰ than all of the other authors combined.

Before moving on to the next point, here is a quick summary of the averages. The following table shows the average price, number of stars and number of reviews that were received by the authors supporting the creationist cause and those supporting the pure scientific understanding of evolution.

Tab. 39: Average price, rating and number of reviewers of creationist and evolutionary literature

	Creationist literature	Evolution literature
Price	\$14	\$17
Stars	3.8	4.0
Reviews	157	290

The above table is based on 21 books chosen from each category, which were all mentioned in the previous tables. Here the values for the evolutionary literature are higher than the creationist literature in all categories, meaning that it is more expensive, better rated and receives a greater number of reviews. However, as mentioned earlier, Richard Dawkins received a greater number of ratings than all the authors combined. If one were to look at the same averages without Dawkins, the picture looks very different.

Tab. 40: Average price, rating and number of reviews of creationist and evolutionary literature – excluding Richard Dawkins

	Creationist literature	Evolution literature
Price	\$14	\$19
Stars	3.8	4.0
Reviews	157	89

When Richard Dawkins is excluded from the averages, suddenly the number of reviewers drops dramatically, while the overall number of stars remains the same and the average price increases only slightly. Meaning that although Dawkins books do not necessarily increase the average quality of evolutionary literature, his lower priced books are very popular among the general public and increase the exposure of the subject tremendously.

¹¹⁰ *The God Delusion* addresses the fact that although there is an increasing trend towards secularization, there is a rise of fundamentalism in the Middle East and America where the dispute between Intelligent Design and Darwinism is posing a threat the teaching of science in the US.

After looking at the books in general, a focus was again placed on the Best Seller lists in order to determine whether or not these books had made it onto the Best Seller lists in any categories. It was found that many of these authors were successful in achieving Best Seller status. In the category of “Evolution” many of the above named authors were present: Richard Dawkins’ *The Selfish Gene* was #3, Bill Nye’s *Undeniable* was #7 and Darwin’s work *Species* came in number #8. Although Meyer’s book *Darwin’s Doubt* is the #1 Best Seller in the category of “Organic Evolution” many of these authors also made it into the top 10 in this category, such as Richard Dawkins with his books *The Greatest Show on Earth* (#2), *The Blind Watchmaker* (#4), and *The Ancestor’s Tale* (#10). *Wonderful Life* by Stephen Jay Gould is currently #8 while Jerry Coyne’s *Why Evolution is True* is #7. Richard Dawkins also made it to the top of the Best Seller list in another biological category “Genetics” with his book *The Selfish Gene* as well as Stephen C. Meyer with his book *Signature in a Cell* #7. The following table summarizes the books that made it onto the Best Seller lists according to category. The data for the table was taken from March 20, 2015 and differs somewhat from the numbers quoted above; any variations are marked in parentheses.

Tab. 41: Overview of bestselling books in scientific categories (color-coded)

Best Seller Category	Books	Author	Places up to 10
“Evolution”	<i>The Selfish Gene</i>	Dawkins	#3
	<i>Undeniable</i>	Nye	#7
	<i>Origin of Species</i>	Darwin	#8
“Organic Evolution”	<i>Darwin’s Doubt</i>	Meyer	#1
	<i>Greatest Show</i>	Dawkins	#2
	<i>Blind Watchmaker</i>	Dawkins	#4
	<i>Why Evolution is True</i>	Coyne	#3 (up from 7)
	<i>Wonderful Life</i>	Gould	#10 (down from 8)
	<i>Ancestor’s Tale</i>	Dawkins	#6 (up from 10)

"Genetics"	Selfish Gene	Dawkins	#1
	Signature in a Cell	Meyer	#7
"Paleontology"	Darwin's Doubt	Meyer	#2
	Wonderful Life	Gould	#6

The entries are color-coded to show that although all of these categories are science categories (green), some of the creationists, namely Meyer, have been able to successfully break into this category and in some cases make it to the top of the list. From this table one can also see that although there is some variation in the rankings over time, the top spots seem to stay fairly stable over time. The names of Dawkins and Meyer have been highlighted to make it that these two authors are leading the way in their respective fields in terms of popularity and readership.

Interestingly both Dawkins and Nye made it to the top of two non-science categories as well. Nye's book *Undeniable* is the #1 Best Seller in the category "Creationism" while Dawkins' book *The God Delusion* is the #1 Best Seller in the category of "Religious Philosophy". All of these rankings are based on data from March 15, 2015. The table below shows how the books mentioned above placed in religious categories. The data was taken from March 20, 2015.

Tab. 42: Overview of bestselling books in creationism category (color-coded)

Best Seller Category	Books	Author	Places up to 10
"Creationism"	Undeniable	Nye	#1
	Undeniable (Kindle Edition)	Nye	#3
	Darwin's Doubt	Meyer	#4
	Signature in a Cell	Meyer	#5
	The New Answers Book	Ham	#7
	Scientific Creationism	Morris	#8

This table is also color coordinated to represent red: creationist and green: evolution. Again, here it is interesting that Nye is the only pro-evolution author who was able to make it onto the “Creationism” Best Seller list. At this point, it is not surprising to see that Meyer is dominating over other creationist writers in this category as well.

There are of course 100s if not 1000s of other books that have been written by ID-proponents, scientists, lawyers, politicians, Christian groups, and more who also have hundreds of positive reviews and have made it onto Best Seller lists, but this section cannot cover all available literature but instead should only provide a sample of well-known literature on the subject. Moreover, it should be stated that the number of reviews in no way depicts who is the leading expert in that field but simply shows how is popular among the general public. For instance, if one checks the category of Buddhism on amazon.com, one would see that the Dali Lama did not make it onto the Best Seller list, instead the most popular Buddhist book on amazon.com is currently *The Life-Changing Magic of Tidying Up: The Japanese Art of Decluttering and Organizing* (March 20, 2015). Pointing to the fact that the number of reviews is only a representation of popularity and not expertise.

That is the exact point of free-choice literature; it is created to disseminate information in a form that is popular to the general public so that individuals freely choose to read these books. The main focus is not on fact or education as would be seen in a scientific journal or textbook but instead on a form of enjoyable reading. Regardless of whether these books are full of facts or lacking in facts, the general public’s opinion and viewpoints are influenced by reading these books. Thus the more popular the book, the wider range of influence it has.

What this section has shown is that some books are more capable of capturing the general public’s attention and that the authors with the greatest readership are Meyer for the creationists and Dawkins for the evolutionists. The next section will look at films and documentaries where it is once again apparent that Dawkins is a very present personality.

Videos and Documentaries

For anyone who believes that the debate over evolution and Creationism is a thing from the 1900s just needs to take a quick search at the world’s top online platform to find lists of current movies dealing with the topic. There is one film (*Flock of Dodos*) that tries to depict both sides of the story. The rest of the films can be categorized as promoting either the creationist side, often in promotion of Intelligent Design, or the evolutionary side, examining either the evolution/Creationism conflict or an explanation of evolution.

Most of these films were made for the small screen, meaning they were either television productions or went straight to DVD. Two of the movies that were made for the large screen, i.e. movie theaters, namely *Expelled: No Intelligence*

Allowed (2008) and *Flock of Dodos: The Evolution-Intelligent Design Circus* (2006):

Expelled: No Intelligence Allowed (2008) is a clearly pro-Creationism film that opened in 1052 theaters, which is a greater number of theaters than any other documentary before it¹¹¹. The film depicts the mainstream science establishment as an agent that actively suppresses those who would like to criticize the failings that they see in evolutionary theory and believe to see evidence of an Intelligent Designer. The film tries to portray Intelligent Design and a bona fide scientific theory that is motivated by intellectual interest rather than religion. At the same time, evolution is stated to have contributed to the rise of fascism, the Holocaust, communism, atheism and eugenics.

Flock of Dodos: The Evolution-Intelligent Design Circus (2006) is a documentary film that attempts to make a balanced portrayal of the debate between ID proponents and evolutionary biologists and featured an almost equal amount of ID and evolution experts. The film was produced by an American marine biologist and filmmaker, Randy Olson, who despite his science background painted an unflattering portrait of his fellow scientists, showing that they can be arrogant, condescending and self-righteous – equally deserving of the term flock of dodos. He insinuates that the congenial nature of the ID proponents may be the key to their success and that the biologists could learn from their social skills. The film first opened in Kansas in 2006 and as of January 2008 it is being played in rotation on the television station, Showtime, in the US and available for purchase on DVD.

Most productions, though, concerning the topic are made for TV specials or DVDs. First the Intelligent Design films will be discussed since they appear to be particularly focused (and successful) in this venue and even have their own movie production company, Illustra Media.

Pro-Intelligent Design or Creationism

Most films concerning Intelligent Design are produced by Illustra Media (<http://illustramedia.com>). According to their website “Illustra Media is a non-profit 501 (c) (3) corporation specializing in the production of video documentaries that examine the scientific evidence for Intelligent Design”. Their films have been distributed to multiple countries throughout the world and have been translated into more than twenty languages.

Illustra Media works closely with the Discovery Institute and has produced a series of films, which attempt to define both the scientific case for design while also showing the limitations of “blind, materialistic processes” as seen in Darwinian evolution. These documentaries include *Unlocking the Mystery of Life*, *The*

¹¹¹ Documentary. Box Office Mojo.

<http://www.boxofficemojo.com/genres/chart/?id=documentary.htm> (Accessed 8 June 2013)

Privileged Planet, and Darwin’s Dilemma. They are also available as part of the Intelligent Design Collection that offers all three DVDs as part of a set.

The customer reviews for these films are astonishing. All three of these films received a 4.5 star rating (out of 5) from over 600 customers¹¹². Illustra Media has produced a number of other films including: *Flight*, *Metamorphosis*, *Where Does the Evidence Lead?* and *The Case for a Creator*. *Flight* marks the first in a series of documentaries called *The Design of Life*, which will investigate the animal biology and behavior for evidence of supernatural intelligence and mind.

Illustra Media is based in Southern California. It is comprised of a team of writers, cinematographers, animators, and producers, each committed to the “search for truth about the origin of life and the universe”. (<http://illustramedia.com/about/> Accessed 17 June 2013).

Another producer of Intelligent Design movies is ColdWater Media and according to their website: “ColdWater Media is a recognized leader of powerful, cutting edge documentary films. We also make video curricula and television series. The subjects that we have explored have included history, biology, philosophy, anthropology, theology, economics, and public policy. We want to encourage serious thought about important subjects, but we never forget that it needs to be entertaining—or nobody will watch it! ColdWater takes great care to build deep, trusting, relationships with our clients for the purpose of understanding their goals and objectives and translating them into the visual medium. There are thousands of small details involved in every job and we strive for the highest production values in everything that we do¹¹³”. *Icons of Evolution* was produced by ColdWater Media in 2005.

The following table shows a synopsis of price and ratings of the above-mentioned films. The primary source for this search was again amazon.com due to its universal access in the United States with sales of DVDs and its Instant Video option which allows individuals to rent, stream or download the digital content instantly instead of purchasing a DVD. All rankings and prices are based on data from March 13, 2015.

Tab. 43: Overview of creationist films

Film	Price	Stars	Reviews	Instant Video
Expelled	\$18	4.0	1,035	Yes \$3 SD
Icons of Evolution	\$20	4.0	63	Yes \$2 SD

¹¹² According to Customer Review data on www.amazon.com (Accessed 13 March 2015)

¹¹³ <http://coldwatermedia.com/> (Accessed 17 June 2013)

Flight	\$20	4.5	102	Yes \$5 HD
Metamorphosis	\$20	4.5	122	Yes \$5 HD
Where Does the Evidence Lead?	\$15	4.5	34	Yes \$2 SD
Unlocking the Mystery of Life	\$15	4.5	192	Yes \$2 SD
Privileged Planet	\$15	4.5	252	Yes \$2 SD
Intelligent Design Collection	\$21	4.5	122	No
Darwin's Dilemma	\$14	4.5	162	Yes \$2 SD

As can be seen in the above table, all of these pro-ID films are available for rental via Instant Video for \$5 or less meaning that an individual does not have to make a large investment in purchasing a DVD in order to see the content of the documentary. This is important because the content of a video is irrelevant if it is not seen. The streaming option at a low price ensures the potential for a larger viewership.

The largest number of reviewers is above 1000 for *Expelled*. This is very logical since it was the only one of these films that was produced for the big screen and was not a straight to DVD production. Overall, one can see that all of the videos received a rating of 4.0 or 4.5 stars.

Pro-Evolution or Anti-Creationism Films

The main producers of films concerning evolution are the Richard Dawkins together with BBC (currently 10 documentaries on this subject) in the UK and PBS in the US. PBS stands for Public Broadcasting Service and is a non-profit television network in the United States (www.pbs.org, Accessed 13 October 2013).

Richard Dawkins who is an active producer of literature surrounding the importance of evolution and the dangers of Creationism has produced a large number of DVDs and DVD collections such as *The Richard Dawkins Collection*, which contains *The Genius of Charles Darwin*, *The Enemies of Reason* and *The Root of All Evil?* (2008) however, since Dawkins produces his films in the UK in connection with the BBC some of the DVDs that are sold in the US on amazon.com are only available in Region 2 European format which does not work on American DVD players.

The main producer of films regarding the importance of science education is the public broadcasting channel in the US is PBS, which works together with third party contracts with production companies such as WGBH-TV in Boston. *Nova*

is a popular science television series, produced by WGBH-TV that is broadcast on PBS. Nova also produced one two-hour special in cooperation with Vulcan Productions that depicts the evolution/Creationism battle entitled Judgement Day: Intelligent Design on Trial that was broadcast on PBS in the United States and is now available on DVD. Many of Nova's episodes do not address Creationism or science education, but are simply dedicated to promoting the understanding of evolution and Darwin such as What Darwin Never Knew and Darwin's Dangerous Idea. Nova also produced a three-part series that was dedicated to specifically looking at the evolution of man called Becoming Human.

Here is a synopsis of price and ratings of the above-mentioned films. Again, amazon.com was used as the primary source, due to its universal access in the United States with sales of DVDs and its Instant Video option, which allows viewers to choose instant access by renting and streaming chosen titles. All rankings and prices are based on data from March 13, 2015.

Tab. 44: Overview of anti-creationist/evolutionary films

Film	Price	Stars	Reviews	Instant Video
Evolution: Darwin's Dangerous Idea	\$60	4.0	10	No
What Darwin Never Knew	\$18	5.0	10	Yes \$2
Becoming Human	\$17	4.5	185	Yes \$0 / \$2
Judgement Day	\$12	4.5	40	No
The Root of All Evil	\$20	4.5	7	No
The Genius of Charles Darwin	\$44	4.0	13	No
Enemies of Reason	\$8	3.5	3	No
Flock of Dodos	\$27	3.5	48	Yes \$3 SD

What becomes obvious immediately by looking at the table is that although Dawkins' books received enormous readership and praise from the Amazon customers, his films have not. The films in the Richard Dawkins Collection received 3.5–4.5 stars from a low number of viewers (total of 23 reviews). Additionally, one sees that

the films from this category are almost absent from Amazon's Instant Video channel and that the overall number of reviews is very low. The highest reviews and number of reviews was for PBS's *Becoming Human* series and the two-hour special *Judgement Day*.

In comparing the two tables, a couple of points become very clear. First, the pro-ID films are enjoying much greater overall viewership as can be seen by the number of reviews. *Expelled* for instance has over 1000 reviews. Second, the pro-ID films on average have a higher ranking than the other films. And third, the pro-ID films are much more present on the Instant Video channel than the evolutionary films, allowing viewers to quickly and spontaneously watch one of these films for a relatively low cost, while anyone interested in seeing Dawkins' film *Root of All Evil* will need to spend \$20 and then wait for the DVD to be delivered.

At a more in depth look at all of these videos, it appears that the pro-ID movement has put a lot of money into the production of documentaries with two specific and equal goals: (1) promote Intelligent Design, (2) undermine evolution. They realize that the only way to really promote an idea and have any real change is if this message reaches a large audience and speak to those individuals who may still be on the fence. Thus, they have recognized the need to appeal to a wide and diverse audience, and they attempt to do this by (1) making their films enjoyable by keeping the message subtle yet positive and avoiding straightforward attacks and (2) making them entertaining by using state-of-the art graphics as well as sound tracks. In this manner, they can reach a large viewership to spread their message.

The pro-evolution films, on the other hand, seem to have either one aim or the other. In other words, they aim to educate or they aim to dismiss Intelligent Design. The films aimed at education of course also try to appeal to audiences yet they take a more targeted approach at educating and showing the facts to support their claims. The films created by PBS have the typical documentary feel although they do contain increasingly good graphics. However, it remains obvious that the main goal is to educate about the scientific facts, the second goal is to make it as entertaining as possible. Moreover, most of these documentaries are specifically looking at increasing the understanding of evolution, such as the *Nova* series *Becoming Human* for instance, does a great job at chronicling the evolution of human kind, but it does not directly address Intelligent Design and therefore does not act as an antidote for the promotion of Intelligent Design through other videos. The only PBS production that tries to dispel Intelligent Design is *Judgement Day* and it has done a very good job at appealing to a wider audience especially in comparison to the other films with a similar goal.

Dawkins on the other hand takes a very concentrated and obvious focus on dispelling Intelligent Design and creationist claims in his films, at times quoting them and then showing exactly why their claims are false. This could have the

effect of education and could, if done right, appeal to larger audience in the US¹¹⁴. However, the lack of popularity for his films may be due to the particular tone he takes in his films that he narrates himself, as well as conducts all interviews with his guests. The overall tone is aggressive and he goes on the definite offensive in trying to show that creationists are inferior.

While the tone of the ID movies is always much subtler even though one could argue that they are equally motivated and passionate about their beliefs. For instance, in *Icons of Evolution* Wells discusses what he calls “Evolution’s Big Bang” – referring to the Cambrian Explosion and he states, “from nothing, we have almost everything overnight – geologically speaking”. He portrays it as a mystery and explains that although the fossils are real, the explanation of these fossils is controversial. This shows that he is interested in the science. He then says that this fact violates Darwin’s prediction that the animals developed slowly and gradually throughout time with many intermediate steps. This could be seen as the first “attack” on Darwin in the film, but then Wells goes on to say that Darwin, himself, considered the Cambrian explosion to be problematic for his theory. In other words, he does not make an open attack on Darwin, nor does he state that Darwin is sub-intelligent or evil, but simply says, hey look, even Darwin had a hard time with this. In this way, they do a very good job of appealing to the viewer who may be a fan of Darwin and be truly interested in evolution. There are no direct attacks on Darwin or insults aimed at evolutionary biologists meaning that they do not create a situation in which the viewer may become offended or defensive.

Instead of being aggressive or overly propagandist, these pro-ID films from *Illustra Media* and *Cold Water Media* try to achieve their goals of disseminating ID beliefs through more subtle means such as the inclusion of human interest pieces like the case of DeHart which is also included in the *Icons of Evolution* video explaining how DeHart¹¹⁵ lost his job for trying to teach about these interesting, yet controversial points and is then replaced by a less educated, inexperienced teacher. They equate DeHart to the common day Scopes. Again, the message is that of inclusion. They also appeal to the viewer’s sensitivities by showing how amazing and beautifully complex the Earth, life and the universe are. Once they have established this good feeling, they then slowly and always subtly show that the theory of evolution is not really capable of answering the question of how this complexity came into being. They politely and respectfully conduct interviews with “experts” who uphold these claims. Each film contains a sound track and a message that is aimed at leaving the viewer with a sense of awe in the complexity and design of life, a feeling that they are special and a belief that evolution is not

¹¹⁴ Dawkins does appear to be more popular with the UK audience. The Richard Dawkins DVD collection on amazon.co.uk (also on March 13, 2015) showed an overall ranking of 4.5 stars from 51 reviewers.

¹¹⁵ More information about DeHart can be found in the chapter about Legal Conflicts.

wrong or evil but it is definitely lacking in being able to answer any of the questions raised in the film – and that Intelligent Design may be able to answer these questions.

Dawkins' on the other hand seems to have made his number one goal that of showing just how dumb Creationists are, and then expands upon that point to show how all faith is utterly stupid, wrong and evil. These words have intentionally been chosen because the words dumb and stupid are often used by Dawkins along with a harsh tone and vocabulary. Instead of polite or pleasant interviews with individuals, he will use terms such as “mumbo jumbo” while referring to the faith of the person he is interviewing. All of his movies are about relatively different topics, but they all have the same fashion – Dawkins takes an aggressive look at everything that is non-science as equal to “utter nonsense” and most recently – evil. Although entertaining at some level, the viewer is not left feeling inspired or with a good feeling.

Now this section will take a more depth about Dawkins and his approach in films because Dawkins is an essential character in the realm of free-choice education because (1) he produces so many books and films and (2) he has been able to capture a large readership with this books in the US, in fact larger than any of the other American authors on the subject, yet (2) his films fail to receive the same popularity as his books with the same American market. And this may be simply due to his word choice and tone he takes in these films. In *The Root of All Evil?* a.k.a. *The God Delusion* Dawkins equates faith with the process of not thinking. He states very clearly that he believes there is a clear contradiction between religion and science. And states that religion discourages independent thought and is dangerous.

The documentaries are interesting and entertaining unless you are Christian, Islamic, or Jewish, have any type of faith or believe in a god, which in that case, the documentary at some point will probably seem insulting and abrasive. He attacks pastors: for instance, upon visiting the New Life Church in Colorado, Dawkins speaks to the pastor and compares the sermon at the church to the Nurnberg Rallies, further saying that it would have made Goebbels very proud. He insults the Bible: for instance, by referring to the Bible as ancient scribblings. He attacks American evangelicals: for example, he makes a very clear connection between to Islamic fundamentalism by referring to American evangelicals as the American Taliban attacking science. He attacks sacred sites: for instance, while visiting Jerusalem in the film, he refers to it as one of the most unenlightened places in the world. He insults faith in general: for instance, while closing the segment in Israel he states that all problems in the world would be eradicated if people were no longer brought up to believe that there is something good about faith. He then equates the possibility of a god as equal to fairies, unicorns and goblins. In the second part, he talks about his fears of how religion leads to a warped and inflexible of morality and indoctrination of children. “Faith is like a virus that

attacks the young and injects generation after generation”. But he doesn’t stop there. “Religion is bad for our children and it’s bad for you”.

“To be fair, much of the Bible is not systematically evil but just plain weird, as you would expect of a chaotically cobbled-together anthology of disjointed documents, composed, revised, translated, distorted and ‘improved’ by hundreds of anonymous authors, editors and copyists, unknown to us and mostly unknown to each other, spanning nine centuries” – Dawkins

For anyone who already believes that religion is nonsense or is an avid atheist, they will love Dawkins’ films and chuckle along with him and he insults one group of people after another. However, for all of the people who have any type of faith or even any sense of spirituality or even anyone who finds confrontation awkward and unpleasant will at some point during the film feel offended, put off, ill at ease or insulted by Dawkins. This is very important because it means that his films will not have as great of an effect in supporting his cause. In the extremist approach of his films, it means that the films will only appeal to audiences who already share the same beliefs as Dawkins, in other words, he has accomplished the proverbial “preaching to the choir”. Anyone who was on the fence, wary of evolution or trying to harmonize their religious beliefs with their science education will be not be persuaded in favor of science through Dawkins’ films but may instead be put off by the abrasive character of the scientist. Moreover, his films and open attacks on God and religion provide plenty of material to those trying to prove that a belief in evolution leads to atheism.

The next section will take an in depth look at museums. Museums are another key source of free-choice learning. Once again, there will be a comparison made between a museum intended to teach Creationism and one intended to teach about evolution in the context of natural history.

Museums

Although there are many museums that address creation (about 16 in the United States) and even more that address evolution and natural history (multiple museums in each of the 50 states in the US), this section will only look at the two main museums, one from each category: the Creation Museum and the National Museum for Natural History. The comparison of these two museums will be based on the purpose and structure of the museums as well as the entertainment value since again as a free-choice learning option, the amount of appeal for the general public is necessary to be able to disseminate any information or message.

All information in this section has been taken from the respective museum websites unless otherwise stated.

Creation Museum – Prepare to Believe

2800 Bullittsburg Church Rd., Petersburg, KY 41080

* Located seven miles west of the Cincinnati Airport

The Creation Museum is run by Answers in Genesis. According to their website answersingenesis.org Answers in Genesis (AiG) is “an apologetics ministry, dedicated to helping Christians defend their faith and proclaim the gospel of Jesus Christ effectively. [They] focus on providing answers to questions about the Bible—particularly the book of Genesis—regarding key issues such as creation, evolution, science, and the age of the earth”. AiG has a number of goals and mission statements on their website: “Goal: To support the church in fulfilling its commission; Vision: Answers in Genesis is a catalyst to bring reformation by reclaiming the foundations of our faith which are found in the Bible, from the very first verse. Mission: (1) We proclaim the absolute truth and authority of the Bible with boldness. (2) We relate the relevance of a literal Genesis to the church and the world today with creativity. (3) We obey God’s call to deliver the message of the gospel, individually and collectively”.

The Creation Museum is a museum dedicated to promoting the Young Earth Creationist viewpoint. It was constructed in the 1990s and early 2000s using funds from private donations. The project is overseen by Ken Ham (Australian-born Young Earth Creationist and fundamentalist Christian) who described how the site of the museum was chosen because it would be within a one-hour flight of 69% of the American population¹¹⁶. Below is a brief overview of the museum’s specifications. All information was taken from the museum’s website, <http://www.creationmuseum.org>, on March 18, 2015.

Tab. 45: Overview of Creation Museum

Founded	2007
Admission Costs	Adult (ages 13–59): \$29.95 Senior (age 60 and up): \$23.95 Children (ages 5–12): \$15.95 Children (under age 5): free
Operated by	Christian Creationist apologetics ministry Answers in Genesis
Size	70,000 square feet

¹¹⁶ Sheehan, Paul (January 17, 2005). “Onward the new Christian soldier”. *The Sydney Morning Herald* Pyrmont, New South Wales: Fairfax Media. (Accessed 18 March 2015)

Average Annual No. of Visitors	approx. 250,000
Mission	“The Creation Museum exists to point today’s culture back to the authority of Scripture and proclaim the gospel message”.
Reviews ¹¹⁷	4.5 stars (of 5) from 603 reviews

National Museum for Natural History

Smithsonian Institution National Museum of Natural History
1000 Constitution Ave., NW in Washington, D.C. 20004

National Museum for Natural History (NMNH) is run by the Smithsonian Institution, which is a group of research institutions and museums that are administered by the US government. The Smithsonian Institution was established in 1846 and is currently the world’s largest museum and research complex with 19 museums and galleries and the National Zoo. The Smithsonian’s goal and vision according to their website is, “Our Mission: The increase and diffusion of knowledge; Our Vision: Shaping the future by preserving our heritage, discovering new knowledge, and sharing our resources with the world”.

The NMNH is one museum within this group of Smithsonian museums and according to their website, “The Museum is dedicated to inspiring curiosity, discovery, and learning about the natural world through its unparalleled research, collections, exhibitions, and education outreach programs¹¹⁸”.

Since March 17, 2010, NMNH now also has a special exhibit called the David Koch Hall of Human Origins, which belongs to the institute’s large initiative entitled “What does it mean to be human?” (<http://humanorigins.si.edu/>). The exhibit is 15,000 square feet large and contains specimens as well as interactive elements such as the archaeological dig. The goal of the project, as described by the director of the museum, Cristián Samper, “Our goal is to provide visitors and online guests with an exciting educational experience that will encourage them to explore for themselves the scientific discoveries about what it means to be human”. The exhibit places special emphasis on the 6 million years of change that were necessary to gain “our human characteristics” and also shows how ancient humans were dealing with paleo-climate change.

A brief overview of the NMNH specifications can be seen in the table below. All data for the table was taken from the museum’s website, mnh.si.edu, on March 18, 2015.

¹¹⁷ According to TripAdvisor (www.tripadvisor.com) on March 22, 2015. TripAdvisor LLC is an American travel website that includes reviews and user-generated data regarding travel experiences.

¹¹⁸ <http://www.mnh.si.edu/> (Accessed 15 March 2015).

Tab. 46: Overview of National Museum for National History

Founded	1910
Admission Costs	Free
Operated by	United States government
Size	350,000 square feet (exhibition space)
Annual No. of Visitors	approx. 7 million
Mission	“The Museum is dedicated to inspiring curiosity, discovery, and learning about the natural world through its unparalleled research, collections, exhibitions, and education outreach programs.”
Reviews ¹¹⁹	4.5 stars (of 5.0) from 4,073 reviews

In comparing the details of the National Museum for Natural History and the Creation Museum, one can see that they differ greatly. The NMNH has been in existence for over 100 years while the Creation Museum has only been in existence for 8 years. The NMNH is run by the US government while the Creation Museum is run by Answers in Genesis under the primary leadership of Ken Ham.

The Creation Museum had admission costs ranging from \$16 to \$30 per person while the NMNH is free with the exception of the IMAX Theater and the Butterfly Pavilion. The Creation Museum is only 70,000 square feet and only hosts approximately 250,000 visitors per year, while the NMNH hosts between seven and 8 million visitors each year in its 350,000 square feet of exhibition area.

So as one can see, the museums are very different and based on the specifications above, one could assume that the NMNH would have a much larger impact on education than the Creation Museum. What is definitely known is that the NMNH has millions of more visitors per year and that the visitors to the museum have given the majority of positive reviews.

However, what these specifications do not provide is a true sense of what a visit to these museums is like for the visitor, i.e. what have they rated as positive. Although it would be hard to evaluate the personal experiences of each visitor to the museum, it is possible by looking at the websites alone that while the NMNH is focused on education, the Creation Museum is focused 100% on edutainment.

¹¹⁹ Taken from TripAdvisor (www.tripadvisor.com) on March 22, 2015.

An example of this focus on edutainment can be seen for instance by their “Family Fun Night” at the Creation Museum banner from their website. While the NMNH on the other hand boasts that it has 126 million of natural specimens, including a whopping 30 million insects pinned to boxes, the Creation Museum advertises their new Zip Line and Canopy Adventure Tours as well as the Petting Zoo that features “Zorses and Zonkeys” (Zebra/Horse and Zebra/Donkey hybrids) as well as Camel Rides.

The Creation Museum plans to expand its edutainment by opening up the Ark Encounter down the street which will be a creation-themed amusement park. While the NMNH tries to make learning as fun as possible, their primary goal of education and research do not permit them to spend funds creating amusement rides. And although a roller coaster will not educate an individual it does add an exciting emotional experience that is coupled with a place trying to persuade the visitor of the truth of special creation and this emotional component is a great selling device, since many people may not remember what they read or heard, but they do remember how they felt (LaRocque, 2013). By creating exciting and pleasant experiences, it is possible to “sell” an idea easier since most people in the general public do not have enough knowledge of science to base their decision on sound facts and logic.

Summary

Therefore, in looking at the books, videos and museums from the creationist-proponents and the creationist-opponents or science education-proponents one can see that both sides are actively involved in creating material for the general public to be used as a venue of free-choice learning.

As discussed, the authors from both sides have mixed readership and the most-read authors on the amazon.com site are Meyer and Dawkins. With regards to books, the authors from both camps were equally capable of convincing readers and making it onto the Best Seller lists.

When it came to the videos, it seems that the pro-Creationism camp may have a slight advantage. As discussed, the Intelligent Design group has the advantage of having their own film production company dedicated to disseminating “the truth” about ID and they were actively pursuing this goal by utilizing their films to spread their message to a wide audience and to convert the viewers. This is seen through the easy access to their videos on Amazon Instant Video and the gentle subtle tone they use in their appealing films.

With regard to museums, the pro-science team appears to have the edge. The genre of natural history museums is more represented in the country than the creation museums – less than 20 creation museums nationwide while there are 100s of natural history museums. Also in comparing the largest creation museum to the largest natural history museum there was a great disparity in the amount of square footage – the NMNH has 350,000 square feet of exhibition space while the

Creation Museum only has 70,000. The NMNH also hosts millions of visitors each year while the Creation Museum only has 250,000 per year. While the Creation Museum is definitely more focused on creating a place of entertainment and fun, the NMNH has been able to find fun ways to explain evolution and the natural world to its visitors and thus also finding ways to connect with visitors and teach them at the same time.

A look at creationism outside of the United States: Focus on Germany

This chapter will look at the Creationism/Intelligent Design movement outside of the United States and specifically look at the movement in Germany. This chapter is useful for two purposes. First, since this thesis is being written as part of a doctoral program at a German university, it is only fitting to offer the German readers information about this topic in their own country. Additionally, it is useful to compare the situation in the United States to another country that is similar in many characteristics such as being a western, democratic country with a large protestant Christian population in order to better see how this movement evolves in environments that are similar to the United States but with a different historical and socio-political structure.

A look at Germany is also particularly interesting in the context of this thesis because as was discussed in earlier chapters, Germany was often the country that fundamentalists in the United States pointed to when looking for an example of a country that had gone astray. This was first seen in the early 1900s when Americans saw Germany as an example of what kind of moral decay can occur when a society engages in biblical criticism as Wacker described it, the Americans saw Germany as the “cradle of destructive biblical criticism” (2000). And Germany also provided the Americans with their proof of what would happen if a country embraced Darwinian principles as Kellogg wrote, “The creed of the Allmacht of natural selection based on violent and fatal competitive struggle is the gospel of the German intellectuals; all else is illusion and anathema” (1917).

This early German interest in biblical criticism may in fact have had a large influence on the development of German intellectual traditions. Biblical criticism or higher criticism or historical criticism is a form of literary criticism, which aims to determine the origin of ancient texts, the text’s original meaning within the original historical context and its literal sense in order to understand the story behind the text (Soulén and Soulén, 2001). Higher criticism is most often linked to the German scholars like Schleiermacher and Feuerbach, who in the mid-19th century analyzed the historical records of the Middle East from Christian and Old Testament eras in an attempt to find independent confirmation of events stated in the Bible (Everett, 1988).

Friedrich Schleiermacher was a German theologian, philosopher and biblical scholar who lived from 1768 to 1834. He was a pastor and professor during his life, teaching in Halle and Berlin and although he did not publish a great deal, he is often seen “the father of modern hermeneutics as a general study” (Palmer, 1969). Hermeneutics is the philosophy and methodology of text interpretation and Schleiermacher divided his interpretation into a grammatical look at the text and a psychological look at the author (Schleiermacher, 1998). The purpose of hermeneutics is to achieve the highest understanding of a text and not to take it at face value. In essence, by looking at the bible through the eyes of hermeneutics, it is the exact opposite of believing in the inerrancy of the bible, which as was discussed in earlier chapters is a major component of fundamentalist thought.

Ludwig Feuerbach was a German philosopher and anthropologist who lived from 1804–1872. Feuerbach’s primary book was published in 1841, *Das Wesen des Christentums* (The Essence of Christianity). It is a classic humanism book, which explains Feuerbach’s philosophy and simultaneously criticizes religion. According to Robert Williams Feuerbach reduces theology to anthropology through his belief that metaphysics can be reduced to psychology (1973). Williams continues to point out that this philosophy is best described as anthropologism, which places man as the measure of all things (1973).

This rationalistic perspective directed at scripture from the bible was in direct opposition to the conventional focus on the supernaturalism of the biblical accounts, both historically and spiritually. If one looks at the focus on man as the agent of text writing and the idea of interpreting religion using man as the measure of all things, one can see how the concept of humanism arose, replacing dogmatic theology. Feuerbach in fact can be credited with helping move German philosophy from idealism to forms of naturalism and materialism in the mid- nineteenth century (Gooch, 2013).

This early focus on rationalism, naturalism in German philosophy is a stark contrast to the United States during this same point in history. While the Germans were involved in developing naturalistic philosophy and analysis of the Bible as a historical piece of literature, the United States was an incomplete complete nation, in fact, much of the United States still consisted of unorganized territories and involved in the Second Great Awakening emphasizing the close personal relationships to the Lord which was promoted in large revivals (see earlier chapters for more details). In general, the two countries have very different pasts. While the United States is a relatively young country that was settled in the 1400s and became did not become a sovereign nation until the late 1700s, the Kingdom of Germany was the largest state in the Holy Roman Empire in 962.

Yet despite the varied histories, the countries have developed into similar modern countries that both have democratic political systems, free education and recognize Christian holidays as public holidays. While the United States and Germany are both democratic countries, they do have slightly different forms of gov-

ernment. The United States has a federal, presidential, constitutional republic form of government in which the head of the state (the president) is head of government and forms the executive branch of the government, which is completely separate from the legislature. Germany, on the other hand, is run by a federal, parliamentary republic in which the parliament has authority over the executive branch and there is a differentiation between the head of government (president) and the head of state (chancellor) both of which are accountable and derive their legitimacy from the legislature (parliament).

This may not seem like a large difference but the differences in the political system also effects the manner in which school standards are decided and the way in which the general populous sees their role in deciding educational standards. While the German population is accustomed to the fact that the parliament has the power to decide the head of state and the head of government, the American population is used to being able to vote for their head of government directly. This tradition is reflected in the same way that state standards are greatly influenced by the political pressures from a grassroots level in the United States, while the German population is more comfortable allowing the governmental agencies to create centralized educational decisions independent from general population input.

Yet both systems seem equally effective when looking at general quality of life and education which is very high in both the United States and Germany according to the Human Development Index (HDI) – Germany was ranked 6th in the world in 2015 and the United States ranked 8th (Jahan, et. al, 2015). The HDI is based on life expectancy, GNI per capita and education so it is not surprising that both countries provide free education to their citizens until the age of 18 (longer in Germany) and both have high education indexes with 0.88 for Germany (6th in the world) and 0.89 for the United States in 2013 (5th in the world).

Yet the actual school systems differ in a few key ways. As discussed in earlier chapters, the American school system is a mono-linear school system that begins at the age of five and continues until the 12th grade. Germany on the other hand has a multi-linear school system in which students all begin together in the first grade but then choose or are assigned to different schools after completing the fourth grade. Below is a copy of the table from chapter 5 showing the American school system.

Tab. 47: School system in the United States

Compulsory education in the United States: K through 12			
School		Grade	Age
Elementary School	Elementary School	Kindergarten ¹²⁰	5–6
		First	6–7
		Second	7–8
		Third	8–9
		Fourth	9–10
		Fifth	10–11
Junior High School	Middle School	Sixth	11–12
		Seventh	12–13
		Eighth	13–14
High School	High School	Ninth/Freshman	14–15
		Tenth/Sophomore	15–16
		Eleventh/Junior	16–17
		Twelfth/Senior	17–18

Notice here that the only difference within the United States is whether or not a student attends Middle School or Junior High, but all begin together in Elementary School and end together in High School. Now for the purpose of comparison, here is a table that depicts a simplified version of the German school system. Notice the

¹²⁰ The ages marked in gray are not compulsory in all states.

multilinear nature of the educational system, which branches out in multiple directions following elementary school (Grundschule).

Tab. 48: School system in Germany

Compulsory education in Germany			
School		Grade	Age
Grundschule		First	6–7
		Second	7–8
		Third	8–9
		Fourth	9–10
Gymnasium	Realschule	Fifth	10–11
		Sixth	11–12
		Seventh	12–13
	Hauptschule	Eighth	13–14
		Ninth	14–15
		Tenth	15–16
	Gesamtschule	Eleventh	16–17
		Twelfth	17–18
		Thirteenth ¹²¹	18–19

Here it is important to notice the largest difference between the German and American systems is the difference of when and what kind of school diplomas students

¹²¹ It is required in some states in Germany for students to attend Gymnasium until the 13th grade but not in all states.

receive. In Germany, it is possible to receive different types of school diplomas that each of which has different duration of study and content focus. In the United States, it is only possible to receive a school diploma after finishing the 12th grade. As discussed in earlier chapters, compulsory education in America varies state to state but even though a student may leave school legally after they are 16 years of age in some areas in the United States they do so without receiving a school diploma.

This singular diploma system in the United States means that a high school diploma from any high school in the country is universally accepted as a university qualifying diploma and that any student who finishes high school is eligible to attend university in the United States or other countries if desired. This is not true in Germany. Students who finish *Gymnasium* or attend the *Gesamtschule* until the 12th grade (or 13th in some states) and pass the *Abitur* are eligible to attend university, while students who finish the *Hauptschule* or *Realschule* are not eligible to attend university¹²². Both systems have the advantages and disadvantages that cannot be discussed in great detail within the framework of this thesis but it suffices to say that because the *Hauptschule* and *Realschule* are both more oriented towards preparing students to pursue an apprenticeship instead of pursuing a theoretical degree at the university, there is much more emphasis on practical knowledge. Just as there are science standards in each state in America, there are also *Bildungsstandards* in Germany that vary not only state to state but of course depend greatly on the type of school, i.e. *Realschule* standards vs. *Gymnasium* standards.

By looking at examples of *Bildungsstandards* from the state of Baden-Württemberg, one can quickly recognize the differences. While Baden-Württemberg has specific learning standards for biology education for students at the *Gymnasium*, there are only general standards for working in the natural sciences (*Naturwissenschaftliches Arbeiten*) for *Realschule* students. For students at the *Hauptschule* the *Bildungsstandards* are even more general, the topic most resembling biology could be found bundled together in standards written for matter, nature and technology¹²³.

Thus from this point on, when discussing evolution education or even general biology education in Germany, this will specifically be limited to education that takes place at *Gymnasiums* or during the *Gymnasium* track at that *Gesamtschule*. Here it is therefore interesting to note how many students attend *Hauptschule*, *Realschule* or *Gymnasium* in Germany. The following table shows what type of

¹²² It is possible for students who finish *Realschule* to attend further education courses that lead to a *Fachabitur* which allows them to attend a *Fachhochschule* or study a specific subject at the university. Students from a *Hauptschule* could in theory go back to school to complete a *Realschule* diploma and then follow the same course to the university, but it is seldom achieved.

¹²³ *Bildungsstandards* can be found at <http://www.schule-bw.de/entwicklung/bistand/> (Accessed 18 March 2016)

school diplomas are most prevalent among Germans over the age of 15 in 2014 according to the Statistisches Bundesamt (Destatis, 2016).

Tab. 49: Percent of school diplomas in Germany

Highest School Diploma	Percent
Still in school	3.7%
Hauptschule	33.8%
Polytechnischen Oberschule ¹²⁴	6.9%
Realschule	22.7%
Gymnasium or other university qualifying diploma	28.8%
No response	0.2%
No school diploma	3.6%

As can be seen from this table, a very large percent of the population has their degree from the Hauptschule and less than a third of the population receives a degree that would enable them to attend university. Which means that less than 30% of the population will take part in a science class that is purely dedicated to biology and thus receive lessons dedicated to teaching evolution. This also means that more than 70% of the population will not be exposed to curriculum specifically designed to teach the principles of evolution, meaning that the question surrounding evolution or creationism is a rather moot point in this situation. This low exposure to evolution to the majority of the population is reminiscent of the late 1800s in the United States, prior to the expansion of public education, when only about 6% of the seventeen year-olds received a high school education and thus evolution was also a point of non-contention because so few individuals were exposed to the systematic teaching of the theory (Slawson, 2005).

Another major difference between the American and German school systems is the clarity of separation of church and state in the United States and the grayish hue of separation in Germany. Germany in principle, like all democratic nations, has a clear separation of church in state in that religious leaders cannot dictate political policies. Yet, while there is a very strict adherence to this rule in the United States, Germany allows for a larger amount of more overlap between government and church. For example, although every citizen has a right to practice religion or not, the state is involved in controlling how this is done, in so much as the German citizens or permanent residents can only renounce their membership in a church at the civil registry or municipal court (Deutsche Welle, 2006). Moreover,

¹²⁴ This type of school diploma was part of the education system in the German Democratic Republic (former Eastern Germany) but is no longer part of the current education system.

the church membership is overseen by the state and the state plays an active role in collecting church taxes from the church members that then go to pay for houses of worship or institutions such as daycares that are often run by the churches (Deutsche Welle, 2006).

Moreover, while the United States upholds a “wall of separation” between church and state that is protected by central institutions such as the American Civil Liberties Union (ACLU) and politicians, teachers and other government employees must be sure that their opinions and work are not detectably motivated by religious belief, in Germany it is possible for entire political parties to declare their intention of upholding Christian beliefs. For instance, the current majority party, the Christlich Demokratische Union Deutschlands (CDU), is a party that in its own words is based on a Christian understanding of man and his responsibility to God. (original German: “Grundlage unserer Politik ist das christliche Verständnis vom Menschen und seiner Verantwortung vor Gott” www.cdu.de, retrieved on 26 October 2015).

This overlap or gray zone is also seen in the public schools where religious classes are still offered and public universities teach theology, while this is not the case in the United States. For that reason, it is not necessarily possible to prevent creationism from being taught in public German schools purely on the principle that it is religious since religion is not abolished from the German schools in the same stark manner as it is in the United States. In fact, politicians can openly state that they believe that creationism should be taught in German classrooms without facing legal prosecution. In fact, the Hessian Minister of Culture, Karin Wolff (CDU), openly stated that she believes that creationism should be taught along with evolution in the science classroom and not delegated to religion courses (Joffe, 2007; Kutschera 2014). She was then applauded by the Augsburg Bishop, Walter Mixa who also believes that evolution cannot be taught as the sole explanation for life on earth (ZEIT, 2007). These views are also completely legitimate in Germany and officially it is legally tolerable to teach creationism in biology classes in Germany in individually sponsored schools since the only requirement is that they fulfill the educational standards set by the state, but they are free to teach these standards from their own individual perspectives (Kramer, 2011).

Thus, it is legally possible and educationally permissible to teach creationism in public schools in Germany and as will be discussed in the next section, it is in fact promoted in an increasing number of evangelical schools (Kutschera, 2014). It cannot be expelled from classrooms simply due to its religious nature but instead, creationism is held at bay through centralized recommendations made by the European Parliament at the highest level and by the Kultusministerium at the national level.

The Council of Europe’s Committee on Culture, Science and Education, as part of the European Parliamentary Assembly, published a poignant resolution on this subject in 2007 entitled “The dangers of creationism in education”, which

included over 18 points of arguments against the inclusion of creationism in the science classroom and several points of recommendations for member states (Blancke, 2014). The following table includes portions from this statement (the full statement can be found in the appendix).

Tab. 50: Statement by the Council of Europe regarding the dangers of creationism

The dangers of creationism in education (abbreviated version) Council of Europe Resolution 1580 June 2007
<p>2. For some people the Creation, as a matter of religious belief, gives a meaning to life. Nevertheless, the Parliamentary Assembly is worried about the possible ill-effects of the spread of creationist ideas within our education systems and about the consequences for our democracies. If we are not careful, creationism could become a threat to human rights, which are a key concern of the Council of Europe.</p> <p>3. Creationism, born of the denial of the evolution of species through natural selection, was for a long time an almost exclusively American phenomenon. Today creationist ideas are tending to find their way into Europe and their spread is affecting quite a few Council of Europe member states.</p> <p>4. The prime target of present-day creationists, most of whom are of the Christian or Muslim faith, is education. Creationists are bent on ensuring that their ideas are included in the school science syllabuses. Creationism cannot, however, lay claim to being a scientific discipline.</p> <p>5. Creationists question the scientific character of certain areas of knowledge and argue that the theory of evolution is only one interpretation among others. They accuse scientists of not providing enough evidence to establish the theory of evolution as scientifically valid. On the contrary, creationists defend their own statements as scientific. None of this stands up to objective analysis.</p> <p>6. We are witnessing a growth of modes of thought which challenge established knowledge about nature, evolution, our origins and our place in the universe.</p> <p>7. There is a real risk of serious confusion being introduced into our children's minds between what has to do with convictions, beliefs, ideals of all sorts and what has to do with science. An "all things are equal" attitude may seem appealing and tolerant, but is in fact dangerous.</p> <p>10. Creationism claims to be based on scientific rigour. In reality the methods employed by creationists are of three types: purely dogmatic assertions; distorted use of scientific quotations, sometimes illustrated with magnificent photographs; and backing from more or less well-known scientists, most of whom are not specialists in these matters. By these means creationists seek to appeal to non-specialists and spread doubt and confusion in their minds.</p> <p>11. Evolution is not simply a matter of the evolution of humans and of populations. Denying it could have serious consequences for the development of our societies.</p> <p>12. Our modern world is based on a long history, of which the development of science and technology forms an important part. However, the scientific approach is still not well understood and this is liable to encourage the development of all manner of fundamentalism and extremism. The total rejection of science is definitely one of the most serious threats to human and civic rights.</p>

13. The war on the theory of evolution and on its proponents most often originates in forms of religious extremism closely linked to extreme right-wing political movements. The creationist movements possess real political power. The fact of the matter, and this has been exposed on several occasions, is that some advocates of strict creationism are out to replace democracy by theocracy.

15. The teaching of all phenomena concerning evolution as a fundamental scientific theory is therefore crucial to the future of our societies and our democracies. For that reason, it must occupy a central position in the curriculums, and especially in the science syllabuses, as long as, like any other theory, it is able to stand up to thorough scientific scrutiny

18. Investigation of the creationists' growing influence shows that the arguments between creationism and evolution go well beyond intellectual debate. If we are not careful, the values that are the very essence of the Council of Europe will be under direct threat from creationist fundamentalists. It is part of the role of the Council of Europe's parliamentarians to react before it is too late.

Here it is important to notice that the Council of Europe clearly states that for a long period of time, creationism was only present in the United States, but that it is now currently infiltrating the European educational system. At this point, it is necessary to look at when and why creationism appeared in Germany. As recently as 1999, Jay Gould stated that creationism was distinctive for the United States, yet even in 1992 Ronald L. Numbers had already devoted a portion of his book, *The Creationists*, to the global spread of creationism, prompting Numbers to address Gould directly in 2006 saying, "Although Gould remained oblivious to it, the worldwide spread of creationism by 2000 had already proven him utterly wrong. Anti-evolutionism had become a global phenomenon, as readily exportable as hip-hop and blue jeans" (Branch, 2013).

The next section will look at how and why creationism was imported into Germany. According to Hemminger, creationism in Germany is essentially a Protestant phenomenon and even in Germany there is no conflict between the Catholic belief system and scientific teachings regarding the age of the Earth or the development of various species including *Homo sapiens* (2009), while Kutschera points out the creationism is more specifically situated within the evangelical movement in Germany, much as it is in the United States (2014). The earliest entrance of creationist ideas into the German-speaking world seems to be in the 1960s, when Arthur E. Wilder-Smith in essence laid the foundation for creationism in Germany by translating Morris' work and that of other American creationists into German (Kutschera, 2007). Numbers in fact believes that Wilder-Smith was Europe's leading creationist (1992). He also wrote numerous creationist books such as *Herkunft und Zukunft des Menschen* in 1966 (which is still currently available on amazon.de and currently has a customer review level of five – 10/26/2015). Wilder-Smith earned three scientific doctorates and many of the arguments he made in favor of special creation were in the form of scientific argumentation rather than bible inerrancy. For instance, in his book *The Creation of*

Life: A Cybernetic Approach to Evolution published in 1970, he defended William Paley's design argument using computer calculations to show the improbability of genetic sequences. He further went on to describe "the abhorred necessity of divine intelligent activity behind nature" and with this line of argumentation, he became the impetus for future work by William Dembski (Dembski, 2005).

Hemminger argues, on the other hand, that creationism did not enter Germany until the 1980s, although he also agrees that the import was a direct result of American influences (2009). He states that although there were critical arguments made against evolution from the religious circles in Germany prior to the 1980s, they took the form of pietistic and Christian theosophical confrontation with science and not fundamentalist attacks (2009). Hemminger also proposes that idea, an evangelical news agency in Germany, is responsible for the surge of creationism in Germany after they released the first *Evangelikum und Kirche* in 1980. Today idea presents the American creationism model as a real alternative to science and encourages the rejection of evolution (Hemminger, 2009). For this reason, Hemminger believes that idea can be given the credit for the rise of creationists in Germany over the past few decades and points out that the rapid development of the *Studiengemeinschaft Wort und Wissen* in the 1980s is symptomatic of this increase of interest in creationism within the German population and not the cause for it (2009).

The *Studiengemeinschaft Wort und Wissen*, which was founded in Germany by Horst W. Beck in 1979, is focused on the literal interpretation of the Bible (Kutschera, 2014). It is not only the most important creationist organization in the German-speaking world but it is also better equipped in regard to staff and scientific knowledge than any other creationist association in all of Europe (Hemminger, 2009). It is financed by private sponsors and almost two hundred members (Kutschera, 2014). In fact, they receive enough support in Germany that they are able to finance five full-time positions, whereas The Biblical Creation Society in Great Britain, for example, is only able to finance one full-time position (Hemminger, 2009).

The primary goal of the organization is to promote the teaching of creationism in public schools in Germany, Austria and German-speaking Switzerland (Kutschera, 2014). The society claims that a firm belief in Jesus Christ and a following of the bible as the Word of God will provide one with essential knowledge about the natural world – specifically the origin of life and development of organisms (Kutschera, 2014). Hemminger describes why *Wort und Wissen* believes that the core of Christian belief is incompatible not only with evolution but also with geology and physics (2009): According to the Bible, death did not enter the world until after the fall of Adam, yet, scientific theory describes the emergence of modern species – including humans – as a result of millions of generations of mutations, which presupposes the death of millions of creatures before the appearance of man and the biblical fall from grace. Thus, if one is committed to God and the

authority of the Bible, one must reject not only the evolutionary mechanisms as proposed by Darwin but also the long periods of time as described in geology and physics (Hemminger, 2009). This line of argument again reflects that of many of the fundamentals in the United States as discussed in earlier chapters, which points to the inerrancy of the Bible, which must be upheld.

Interestingly, despite the obvious American influence upon German creationism, many make a point of refusing to use the term “Kreationismus” and prefer the much more German term “biblische Schöpfungstheorie” and also like to use the word “evolutionismus” (evolutionism) instead of “evolution theory” in order to make it appear to be an ideology and not a scientific theory (Hemminger, 2009).

Regardless of exactly who is the most responsible for importing creationism to Germany, it is clear that it is here and gaining support as evangelical fundamentalism also increases in Germany (Kutschera, 2007). For this reason, the Council of Europe made a point to make a direct call for action to the member states in Europe after their lengthy description of the dangers of creationism and the importance of teaching pure science and evolution in Resolution 1580. Their suggestions for action can be found in the table below.

Tab. 51: Council of Europe’s Call for Action for Science Education (2007)

European Parliamentary Assembly’s Suggestions for Member States
<p>19. The Parliamentary Assembly therefore urges the member states, and especially their education authorities to:</p> <p>19.1. defend and promote scientific knowledge;</p> <p>19.2. strengthen the teaching of the foundations of science, its history, its epistemology and its methods alongside the teaching of objective scientific knowledge;</p> <p>19.3. make science more comprehensible, more attractive and closer to the realities of the contemporary world;</p> <p>19.4. firmly oppose the teaching of creationism as a scientific discipline on an equal footing with the theory of evolution and in general the presentation of creationist ideas in any discipline other than religion;</p> <p>19.5. promote the teaching of evolution as a fundamental scientific theory in the school curriculums.</p>

Yet despite clearly worded warnings and direct suggestions from the Parliamentary Assembly of the Council of Europe, the resolution was met with resistance (Blancke, 2014). In fact, the European Centre for Law and Justice published a 14-page response that resonates with the same arguments seen in the bills created in the United States regarding academic freedom. The following table includes excerpts from their response.

Tab. 52: European Centre for Law and Justice's response to the European Parliamentary Assembly's Resolution

Response to the Council of Europe's Resolution by the European Centre for Law and Justice from June 2007 (abbreviated version)
<p>Section I: Summary</p> <p>The aim of the Report is to forego scientific discussion between the theories of evolution and creationism, or intelligent design, to impede the educational formation of children by restricting classroom exploration of ideas, and effectively infringe on the rights of free exercise of expression, religion, and education.</p> <p>Respect for pluralism and diversity are hallmarks of a democratic society. To censor discussion and teaching of creationism would violate the spirit as well as the letters of democracy enshrined in the European Convention on Human Rights ("Convention"), the Charter on Fundamental Rights of the European Union ("Charter"), and the United Nations Convention on the Rights of the Child ("UNCRC").</p> <p>Section II: Freedom of Expression</p> <p>The Report of the Committee on Culture, Science and Education represents a grave threat to freedom of expression as enshrined in Article 10 of the Convention; as this freedom is manifested in academic freedom and in the right to education in Article 2 of Protocol 1 of the Convention; because the Report seeks to censor criticism of the theory of evolution and to eliminate mention of the theory of intelligent design from science classrooms. The Report, including its Resolution, is a document that can only work to the detriment of the expressive and educational climates of the member states.</p> <p>A vital manifestation of this freedom of expression is academic freedom.</p> <p>The Report does not respect the freedom of expression of teachers, researchers, and students, as manifest in academic freedom, because it seeks to eradicate an alternative to the Darwinian model of the origin of life, thereby elevating the theory of evolution to scientific dogma.</p> <p>As the Parliamentary Assembly has noted, "[h]istory has proven that violations of academic freedom . . . have always resulted in intellectual relapse, and consequently in social and economic stagnation."</p> <p>The conclusions and recommendations of the Report also threaten to undermine the education of students in the member states by restricting the access of students to alternative scientific theories concerning the origin of life and by devaluing critical thinking regarding the theory of evolution.</p> <p>The Resolution aims to silence expressions of criticism of the theory of evolution and any and all mentions of the theory of intelligent design in academic and educational settings. As such, passing of the Resolution would undermine free expression and academic freedom, two crucial elements of a progressive and democratic society. Furthermore, the Resolution jeopardizes the right to education of students in the member states by eliminating access to competing scientific theories and by denying critical analysis of the theory of evolution.</p> <p>Section III: Freedom of Religion in the Context of Education</p> <p>In terms of education, in the event that schools and parents determine creationism to be appropriate scientific subject matter, they should be able to freely include it in classroom discussion under the protection of freedom of religion and the right to education.</p> <p>As regards the fourth requirement for restriction, the inclusion of creationism in no way impinges upon the rights and freedoms of others and is necessary in a democratic society.</p>

According to various European Institutions, the features typical of a democratic society are pluralism, tolerance, and broadmindedness. The inclusion of intelligent design as alternative scientific theory in the classroom broadens the child's intellectual horizons and encourages tolerance and pluralism, embodying democratic characteristics. It should accordingly be embraced as a desirable addition to the educational curriculum and receive protections under free exercise of religion and the right to education.

Section IV: Conclusion

The result of passing the instant Resolution would be the prevention of academic and educative discussion between the theory of intelligent design and the theory of evolution. This approach can only hamper the educational progress of students by restricting their examination of competing scientific ideas and will necessarily violate the right to freedom of expression, including academic freedom, the right to free exercise of religion in education. Therefore, the Parliamentary Assembly should reject the Resolution as incompatible with the goals and ideals of the Council of Europe.

The European Centre for Law and Justice (ECLJ) is an international NGO that is based in France and like the Thomas More Law Center (TMLC), which defended the pro-ID school board in Dover, is a law center based on Christian inspiration (About the ECLJ, 2016). Other Christian groups in Europe have also protested the Resolution such as the European Evangelical Alliance (EEA) who published a statement urging the plenary session to reject the proposed resolution, highlighting the general rise all over Europe (Blancke, 2014).

Specifically, in Germany, the spread of creationism and evangelical schools is still on the rise despite the warnings and resolutions made by the Parliamentary Assembly. In fact, creationism has replaced evolution at an increasing number of evangelical schools in Germany – 92 evangelical private schools as of 2011, over one hundred by 2014 – with a total of over 33,000 students (Kramer, 2011; Kutschera, 2014). While many parents who send their children to these schools are not particularly religious and believe that their children are receiving a well-balanced education, the children are in fact receiving their education about evolution from an evangelical schoolbook designed to discredit evolution and promote the idea of special creation and a young Earth (Kramer, 2011).

This book, *Evolution – ein kritisches Lehrbuch*, is technically only allowed to be used in private schools since it has not been recognized as an official textbook by the Kultusministerien and it is not likely to receive this recognition in the future (Hemminger, 2009). This point has been emphasized by Sylvia Schill, the spokeswoman for the Standing Conference of the Ministers of Education and Cultural Affairs of the German Länder (Kultusministerkonferenz), who has officially said that this development of trying to discredit evolution and instead promote creationism or intelligent design will not reach Germany. She has stated that evolution is taught in biology classes in all German schools while references to creationism are made in religious classes (Casagrande, 2005). Yet with the absence of organizations such as the ACLU or the NCSE, the creationists in Germany

have a carnival license to mislead the public with their pseudo-biology (Kutschera, 2011).

The next section will take a more in depth look at the textbooks produced by Wort und Wissen, since they have become one of the pillars of the European anti-evolution movement and almost 50,000 copies have already been sold and it has been donated to countless public school libraries around Germany (Kutschera, 2008; Kutschera, 2014; Casagrande, 2005). In *Kreationismus in Deutschland – Fakten und Analysen* Kutschera describes the history of this schoolbook, which was first, published in 1986 under the title *Entstehung und Geschichte der Lebewesen. Daten und Deutungen für schulischen Bereich* (Origin and History of Organisms: Data and Interpretations for Biology Classes). The book was written by high school teacher Reinhard Junker and microbiologist Siegfried Scherer, both of whom are young earth creationists and both of whom are affiliated with Wort und Wissen (2007). The schoolbook is marketed as a supplementary book, much as the way that *Of Pandas and People* is marketed, which also came out in the late 1980s. The book by Junker and Scherer was republished as a new edition in 1988, and 1992. These early editions were translated into multiple languages. These books introduce students to the concept of “Grundtypen des Lebens” (Basic Types of Life), which is an idea that life was created by the word of God in the basic shape that it is at present reflecting a mix of young earth creationism and intelligent design (Kutschera, 2014).

This concept is not original to Germany or created by Junker and Scherer but is in fact a reference to an American young-earth creationist, Frank L. Marsh, who is the original author of the Basic Type concept, which he derived from the Genesis account of “kinds” (Kutschera, 2014). According to this idea, Adam and Eve would be the Basic Type from which all humans have descended (Kutschera, 2014). By 1998 the book the fourth edition was published, this time with its new title, *Evolution – ein kritisches Lehrbuch*, and was promoted by a popular video, *Hat die Bibel doch recht? Der Evolutionstheorie fehlen die Beweise* (Is the Bible Right? There is No Evidence for the Theory of Evolution), which was produced by the German film producer Fritz Poppenberg (Kutschera, 2014). The fifth edition was published in 2001 (Kutschera, 2007; Kutschera, 2014). These newer editions are in line with the US “intelligent design” trend in that the content has been updated and there is now explicit reference to “the Designer” and “ID theory” (Kutschera, 2008; Kutschera, 2014). Moreover, like intelligent design proponents in the United States, Wort und Wissen has stated that they do not believe that creationism should be taught in biology class but instead discussed only in religious classes – the critical analysis of evolution as discussed in this schoolbook would be beneficial in a scientific class (Casagrande, 2005). This fifth edition was awarded the “Deutschen Schulbuchpreis” (German schoolbook prize) in 2002 by the Minister President of Thuringia but was prevented from becoming an official state textbook “Grundtypen-Lehrwerk” by the Verband Deutscher Biologen

(Kutschera, 2007). The sixth edition came out in 2006 and the seventh edition came out in 2013. The book is sold at production costs and continues to be a popular piece of work (Casagrande, 2005).

The book can truly be considered a success for *Wort und Wissen* in that it has been widely distributed and translated into multiple languages, has been integrated into German schools and moreover, it has offered conservative Germans an opportunity to question evolution without being branded as fundamentalist creationist (Kutschera, 2014). In fact, the Christian Democrat Dieter Althaus praised the textbook as “a good example of value-based education” (Kutschera, 2014). Furthermore, the book is often mistaken as a serious scientific work that was even quoted by the German Cardinal Ratzinger, who became Pope Benedict XVI in 2005, when he referenced the preface of the fourth edition (1998) in order to illustrate the arguments against macroevolution during a talk in Paris in 1999 (Kutschera, 2008; Kutschera 2014).

Like their American counterparts, *Wort und Wissen* offers many options for free-choice learning and supplemental tools for classroom teaching in addition to their schoolbooks¹²⁵.

Many originally produced films and translated versions of American films on creationism are promoted on their website. In their first film, *Hat die Bibel doch recht? Der Evolutionstheorie fehlen die Beweise* (as mentioned above was used to promote the fourth edition of their schoolbook), the main actor, Scherer, is supported by the geneticist Wolf-Ekkehard Lönnig, who claims, “there is no evidence for macroevolution” (Kutschera, 2008). Over 50,000 copies of this film have been sold, in which Charles Darwin and Ernst Haeckel are cast as the spiritual fathers of the Nazi Holocaust (Kutschera, 2008). Other original titles include *Was Darwin nicht wissen konnte: Der Streit um die Entstehung des Lebens* (What Darwin Could Not Have Known), which was also produced by Fritz Poppenberg. The implicit anti-evolution claim in these German films is that Darwinism is merely “a pseudo-scientific construction”, which is in essence equivalent to “atheism, materialism, and Hitler’s Nazi ideology” (Kutschera, 2008). *Wort und Wissen* also promotes a collection of the *Illustra Media* films (discussed in the previous chapter), which have been translated into German. As discussed previously, the films from *Illustra Media* are very well produced, containing a large amount of quality photography and special graphics that make the films not only entertaining but effective through their subtle introduction of their creationist propaganda.

Yet despite the tremendous efforts made by evangelical groups in Germany such as *idea* and *Wort und Wissen*, the acceptance of evolution is still much higher in Germany than in the United States as can be seen in the graph to the left (Miller, et. al, 2006). It is obvious from the graphic that the United States and Germany are on very different poles when it comes to the question, “Is evolution

¹²⁵ A full list of all available materials can be found on their website www.wort-und-wissen.de

true?” While the United States scored second to last with just 40% believing that evolution is a fact, Germany is up top with about 70% of the population accepting evolution as truth. Nick Matzke’s opinion about this piece is not so much that this data show how religious a population is but rather the issue between fundamentalism vs. modernism (Matzke, 2006). In that case, Germany would be on the side of modernism, while the United States was deeply entrenched in the fundamentalist side.

These different traditions may have their roots in the history of the two countries. Germany on the one side with centuries of movements towards modernism, while the American population spent hundreds of years developing an evangelically personal relationship to God during the establishment of the modern country as discussed in earlier chapters. The differentiation between the two countries again points to the difference between religion and fundamentalism as discussed in previous sections. One point that illustrates how the history and political nature of a country can affect their views on evolution is seen in the comparison between former eastern states of Germany and former Western states of Germany. In a poll from 2005, participants were asked to select one of the following statements that best reflects their viewpoint:

Tab. 53: German opinion poll on evolution and creation

Statements offered to participants during a 2005 opinion poll in Germany
God created all forms of life directly, as described in the Bible.
Life on earth was created by a supernatural being (or God) and thereafter developed over a long period of time. This process was guided by a higher intelligence (or God).
Life on earth evolved without the interference of God (or a higher being) by natural processes.

Statement one represents a belief in creationism, statement two represents a belief in intelligent design and the third statement represents an acceptance of naturalistic evolution. The results of the poll showed that 42.4% of former western Germans are adherents of creationism or intelligent design, while only 16.5% of their eastern German counterparts shared their religious views (Kutschera, 2014). Meaning that while only 57.6% of “West Germans” accept naturalistic evolution, a whopping 83.5% of “East Germans” are convinced of the legitimacy of the theory of evolution. Kutschera points out that these differences can be traced back to the fact that West Germans were (are) brought up in a Christian-based society in which children are exposed to the creation story in pre-school and elementary school and not exposed to science until briefly during high school, while the East Germans were brought up under communist rule, where atheism and science literacy were enforced from a young age (Kutschera, 2014).

Summary

There are many similarities between the creationists in Germany and the United States, which is to be expected due to the fact that many creationist ideas and strategies have clearly been imported from America. Currently Germany is well above the United States in the acceptance of evolution, yet the percentage of acceptance varies greatly between the eastern Germans and the western Germans. Although there is a much smaller percentage of Germans toting the creationist line than in the United States, they are still able to exert a large amount of influence on the traditional education of German students and more recently have begun to exert their power through the production and promotion of free-choice learning materials much like their American counterparts.

Like the United States, the creationist proponents are largely entrenched within evangelical sects, but this movement towards evangelical Protestantism is much newer in Germany than in the United States. While evangelical fundamentalism has been present in the United States for almost one hundred years, it began in Germany roughly 35 years ago. Yet if evangelical creationists continue to exert their power in Germany and continue to receive support from politicians it may be possible that Germany will find itself on the bottom side of the graph in the future. According to Kutschera, education is still the best tool to counteract movements such as creationism – “More emphasis is necessary on biology in German schools in order to counteract the lack of knowledge about evolution. A literal interpretation of biblical creationist myths no longer suit our times. Geology and life sciences have made enormous progress, and this cannot simply be ignored” (Casagrande, 2005).

Conclusion

The purpose of the current study was to examine the origin, development and metamorphosis of the creationist movement within the United States from a historical and judicial standpoint in order to elucidate exactly how creationist trends have affected the nation's education system. The empirical findings of this study provide additional evidence of the American origin of creationism and its connection to Christian fundamentalism and evangelical Protestantism. Moreover, this study has enhanced our understanding of how and why creationist trends and strategies have mutated multiple times within the past century. While the majority of the literature on the subject of creationism does a tremendous job in describing the development of the creationist movement and its various forms, it fails to go into detail about how this movement actually effects the American public. The key strength of this thesis was its detailed look at the comprehensive legal conflict in the US involving creationism and at the legal framework that is in place in the United States to protect secular education. Moreover, this was the first study to provide a new detailed understanding of exactly how creationists affect the integrity educational system using political avenues to modify science standards and textbook content as well as how creationists use the free market to disseminate anti-science literature and films.

By examining the multiple paradigms involved in the creationist phenomenon – American cultural heritage, religious developments, constitutional constructs, the American judicial system, public school education system, political-educational

processes, free-choice learning materials – it was possible to create a detailed picture of the complexity of the creationist movement in the United States. Moreover, this study aimed to analyze the creationist movement from the inside out – meaning that in terms of methodology a great deal of emphasis was placed on using firsthand information produced by creationists instead of information written about creationists – in order to not only create a detailed look at creationism but an authentic analysis as well.

The first aspect of examining the origin of creationism was to clarify the origin of creationist thought. Although some authors oversimplify the creationist phenomenon as a war between science and religion or religion against science (Dawkins, 2006; Ham, 2012), the present study confirmed the previous findings that there is not a universal conflict between religion and science nor one generally between Christianity and evolution (Gould, 1997; Ruse, 2001). On the contrary, the present study could contribute additional evidence showing that the crux of the conflict resides in a specific fundamentalist evangelical branch of Protestantism that opposes specific components of evolution – in particular macroevolution, source of information, complexity, origin of man, etc. It was shown that religious belief does not necessarily lead to creationist views but instead that creationist views require the presence of fundamentalist beliefs in the literal interpretation of the Bible (Ruse, 2005; Watts, et al., in press).

With regards to the literal interpretation of the Bible, evidence was brought forth to show that the Bible was not intended to be used as a literal handbook to understand how the world was created, but instead to understand the nature of the Judeo-Christian God and the relationship between God and man (Dixon, 2008; Ruse, 2001; Scott, 2009). Although this fact has been acknowledged by Christian leaders since the 4th century, creationists in America continue to claim that a literal interpretation of the Bible is a necessary component of Christian faith thereby perpetuating fundamentalist trends in America (Ham, 2013; Hemminger, 2009, Morris, 1961).

Results of this study also confirmed findings from Gould and Numbers that the creationist movement is truly an organic American phenomenon (Gould, 1997; Numbers, 2006) and provided evidence of why this fundamentalist movement would originate and flourish in the United States due to the zealous religious history and milieu that has been present in the US for hundreds of years and has led to a large and active evangelical population (Watts et al., in press). The analysis showed that even the earliest settlers came to the new world with the intention of creating a perfect Christian nation. This concept of a model Christian nation was exemplified as the idea of the “city on a hill” which has been repeated throughout centuries of American history. Furthermore, it was found that following the initial founding of this relatively young nation began to grow, numerous Americans began moving west, away from the established cities along the east coast in order to found new towns in the western areas of the US. During the settlement of the

western frontier, new religious traditions developed due to the lack of churches in this under developed area. This new religious culture was characterized by circuit riders, revivals and personal Bible study. These conditions led to a new religious philosophy in which Americans valued a close and personal relationship with God, while placing a large emphasis on the Bible as a direct communication between God and man. As these new religious trends in revivalism grew, there was a rapid increase in evangelical Protestantism in the United States.

As the history of the nation continued, this special relationship to God and the special role of religion in American's lives became coupled with political movements. The United States began to see their role in wars as an expression of their relationship to God and as their position at the crown of God's creation. In the 20th century, as evangelical Protestantism began to displace traditional Protestantism in the US, there was a major focus on organizing evangelical votes in an attempt to create political change. This could be seen through the foundation of political organizations such as the Moral Majority and the Christian Coalition. The success of these evangelical efforts could be seen in the way that politicians began to placate to the evangelicals and through the election of political leaders who expressed conservative beliefs such as Ronald Reagan and evangelical beliefs such as George W. Bush.

By understanding the American's view on their special relationship to God, it offered an understanding for why American fundamentalists and evangelicals object to evolution as they believe that it could topple the idea of America's special relationship to God. In order to better respond to creationist accusations that are specifically directed at the invalidity and "evilness" of the theory of evolution, a section of this thesis was also devoted to examining the nature of science and evolution. It was illustrated that the intention of science and scientists is to describe how the natural world works and that the reliance upon using natural forces to explain natural phenomenon is not an attack on Christianity or morality but simply the manner in which science functions and leads to scientific advancement (Ruse, 1996). Moreover, a look at the development of science illustrated that the banishment of supernatural causal agents formed the foundation of the science revolution – highlighting the fact that a reintroduction of supernatural forces into scientific explanations could cause the dissolution of the science revolution (Shermer, 2006). In this section, it could be shown that the theory of evolution is a very robust and well-substantiated theory in contrast to many creationist claims. Darwin did not invent the idea of evolution and actually referred to his concept as transmutation of species. Darwin's major contribution was to provide the mechanism by which evolution could take place, i.e. natural selection.

In looking at Darwin's idea of natural selection, it was shown how this concept mutated into the idea "survival of the fittest" that was then applied to humans and (mis)used by philosophers, scientists and world leaders in order to add scientific validity to their own ideas (Bowler, 2003; Junker & Hoßfeld, 2009). Although it is

clear that concepts such as fascism were not instigated by Darwin or his theory – creationists continue to use cleverly crafted propaganda tactics to link evolution to everything from slavery to Nazism (Ham, 2012; Morris, 1989).

Once a background had been established to understand the backdrop of the creationist phenomenon, a specific examination of creationism as a movement showed that an organized creationist movement aimed directly at the opposition of evolution began in the early 1900s as a reaction to multiple socio-political components that posed a threat to traditional Christian beliefs and the concept that the United States had a special relationship to God. The findings of this investigation provided evidence that suggest that the spark that led to the rise of this organized fundamentalist movement was the expansion of secular public schooling at the turn of the century, which provided the first systematic lessons on evolution. This new trend in secular science education coincided with a trend towards liberalism within the ranks of American Protestant circles, which caused concern among evangelical Protestants as they saw this as a sign that they were losing their dominance and their special charge over this chosen nation and began to see science as the evil seed that needed to be expunged (Miller, 2012; Numbers, 1998) Moreover, it was shown that and the atrocities of World War I provided a further catalyst in the movement towards fundamentalism because the Americans believed that the monstrous acts of that war were due to a movement towards modernism, technology, science and specifically evolution since the German military and intellectual leaders had justified their militarism and imperialistic expansion using classic social Darwinism (Blancke, 2014; Shermer, 2006; Kellogg, 1917).

It was shown that beginning of the creationist movement in the United States was so quick and forceful that within just a couple of years, multiple states had passed state-wide legislation banning the teaching of evolution at any school in the given state. This initial thrust in the fundamentalist movement was led by former presidential candidate William Jennings Bryan. The main player in opposing this fundamentalist trend was the newly formed non-profit organization American Civil Liberties Union (ACLU). The ACLU began to actively challenge anti-evolution legislation by seeking a volunteer to violate the ban on evolution in Tennessee. The volunteer, John Scopes, was tried and found guilty for teaching evolution in Tennessee in 1925. The trial itself illustrated the great divide within the United States with one side claiming the inerrancy of the Bible must be upheld, while the other side argued that the most important document in America was the Constitution.

Once the beginning of the creationist movement had been established, an overview was made of the various forms of creationism and the most prominent leaders. Findings showed that there is a wide variety of creationist lines – from promoters of a very literalist approach to biblical interpretation such as the Flat Earth, Geocentric and Young Earth Creationists who have rejected major scientific discoveries and facts such as heliocentrism and the ancient age of the earth.

There are also those creationists who accept much of scientific discovery and the ancient age of the earth but specifically reject the idea of naturalist evolution such as the Old Earth Creationists (Blancke, 2014). While Old Earth Creationism represented the dominant creationist stance during the first half of the 1900s, the Young Earth Creationists were very successful in spreading their beliefs in the 1960s and 1970s.

Although the Young Earth Creationists' rigid adherence to the literal interpretation of Genesis had been marginalized due to its association Seventh-Day Adventist, Henry Morris and John Whitcomb, Jr. were able to popularize these literalist views through their publication of *Genesis Flood* in 1961. Their work incorporated George McCready Price's flood geology studies and other pseudo-scientific pursuits that led to the promotion of a new "scientific theory" called Creation Science. The interest and promotion of the new "theory" – that could potentially upset the dominance of the theory of evolution – led to the establishment of creation of research institutes and the publication of hundreds of books promoting not only Creation Science but also ideas of a young earth. This movement was incredibly successful in the United States, causing a major shift in creationist views. While the majority of American creationists had accepted the old age of the earth up the 1960s, after the introduction of Creation Science, majority of creationist were toting ideas of a young earth by the 1980s.

Creation Science was promoted using Balanced Treatment legislation which required schools to teach scientific creationism alongside evolution. Yet, the creationists' religious motivation behind the creationists' new "scientific theory" was quickly recognized and following two major legal rulings, they were barred from spreading their ideas in public school classrooms. The Creation Science movement was successful though, in that it unified many creationists and focused on a movement towards creating a "scientific theory" that could upset the dominance of the theory of evolution.

It was discussed that following the rise and eventual fall of Creation Science, another trend in creationism developed known as Intelligent Design. Intelligent Design, like Creation Science claims to offer an alternative "scientific theory" to evolution. Yet while Creation Science purports to use science and facts to support the accounts of Genesis, Intelligent Design uses more abstract arguments to find gaps within scientific knowledge to act as proof of an intelligent designer. While Creation Science was shown to have originated and receive the most support from strong literalist proponents, in particular the young-earth creationists, it could be shown that Intelligent Design acts like a large tent offering space for all types of creationists by focusing on the Gospel of John and the "Word" as the beginning – thus bypassing many of the literalist arguments and inviting all types of creationists to become supporters of ID regardless of whether they believe in a flat earth, a geocentric universe or an old Earth.

Although theories regarding of Intelligent Design, Irreducible Complexity and Information Source will never convince the science world to abandon the theory of evolution in order to pursue evidence of an intelligent design, creationist marketing concepts, substantial funding and organization have made this creationist trend the most potent form of creationism ever. The legal knowledge, business sense and general planning skills of the modern creationists were illustrated in the Wedge document that outlines a multiple year plan to deconstruct perspectives on naturalistic science. If left unheeded, the ID movement and the Wedge strategy could truly cause damage to the American education system, due to the general popularity of Intelligent Design and the public's inability to differentiate between pseudo-science claims and actual scientific discovery. The general popularity of an idea was seen to be a very crucial factor in education, as well, due to the political nature of determining textbooks and science standards in the US.

A deeper understanding of these drastic changes within creationist trends was found through the detailed analysis of legal cases involving various judicial aspects of the creationism-evolution conflict. This is the largest study so far with regards to the study of the judicial aspect of the creationist phenomenon. While many books and articles on the subject mention the Scopes trial or the Kitzmiller trial, and while more in depth books may discuss other major cases such as Epperson or Edwards, this thesis was the first to analyze all creationist-related cases between 1925 and 2015. Through this comprehensive analysis, it was possible to isolate the reasoning for the major changes in creationist strategies regarding education as well as to identify the major players and driving forces in these legal battles. There have been many cases that have been heard at both state and national level concerning the teaching of Creationism or restrictions placed on the teaching of evolution and all of these cases were decided based on whether or not a policy was in violation of the first amendment rights as set forth by the Constitution of the United States. Of all of these cases, only one was won in the name of Creationism, and that was the first trial – Tennessee v. Scopes in 1925. Interestingly, after Scopes was found guilty for teaching evolution forty years passed until the next legal case. The reason for this remission was largely due to the fact that evolution disappeared from the textbooks and thus the classroom for multiple decades thus mitigating any potential conflict (Humes, 2007; Judith V. Grabiner & Miller, 1974; Shermer, 2006). This effect on textbook publication highlighted the economic-political nature of textbook adoption that was examined in detail in a subsequent analysis.

It was illustrated that once evolution reentered the classroom, the legal battles began anew since new curriculum standards required teachers to teach evolution, yet the anti-evolution legislation from the 1920s was still on the books in some states (Watts et al., 2007). In 1968, the Supreme Court ruling in Epperson v. Arkansas overturned the anti-evolution laws that had been on the books in Arkansas since the 1920s. The Supreme Court in a unanimous vote of 9:0 thus made any

laws preventing the teaching of evolution to be unlawful (393 U.S. 97). This ruling was monumental – not only did it lift any bans on the teaching of evolution in any state in America, but it forced a change in the creationist movement since they could no longer make any direct radical attacks on evolution or ban the teaching of evolution based on evangelical ideology (Blancke, 2014; Watts et al., 2017).

One of the next strategies that was highlighted through the legal analysis was the attempt to include a creationist textbook, created by the Creation Research Society, in public school science classrooms in Indiana. In 1977, in *Hendren v. Campbell*, it ruled that using such textbooks in public schools was unconstitutional and thus creationist began looking for new ways into the science class. Following the loss in 1977, Wendell Bird, from Yale Law school, authored a legal article describing how one could legally get Scientific Creationism into the classroom by using empirical evidence to construct scientific discussion that were separate from theological reasoning and terminology (1978). Bird then joined the ICR and began to update the “equal time” strategy and these resolutions were distributed across the US in 1979 (Matzke, 2010). The loss in 1968 and in 1977 led to the popularization of Balanced Treatment legislation, which was passed in multiple states. Balanced Treatment laws required teachers and schools to teach Creation Science along with evolution in the science classroom in equal amounts. It was shown that this move away from prohibiting the teaching to the promotion of Creation Science was a direct response to the losses in *Hendren* and *Epperson*, leading creationists to believe think that “they could squeeze into science classrooms simply by shedding superfluous biblical weight” (Numbers, 2006).

It was illustrated that this mutation pattern was repeated when the McLean ruling in 1982 and the Edwards Supreme Court ruling in 1987 made it illegal to teach or promote Creation Science in American public schools and thus the promoters of Creation Science dogma began pushing a different strain of anti-evolutionism – Intelligent Design. New centers popped up, new research was done and the new creationist variety was marketed as non-religious as possible. Schoolbooks that had promoted Creation Science in the late 80s, such as *Of Pandas and People*, were reprinted and sold as Intelligent Design books. In some states, these books were donated to school libraries and promoted by the local school boards, which led to the *Kitzmiller* case in Pennsylvania in 2005. The legality of Intelligent Design was tested in Pennsylvania and failed when Judge John E. Jones III ruled that Intelligent Design was equally as religious as its Creation Science and could thus also not be taught in public schools. Although many believe that *Kitzmiller* was the last nail in the coffin of creationist strategies, an analysis of post-*Kitzmiller* creationist activities provided evidence of how creationists changed their strategy again due to the negative *Kitzmiller* ruling and began focusing on grassroots actions to affect the content of textbooks, state science standards and the academic freedom of teachers across the nation. (Watts et al., in press).

As this study was the first to investigate all of the judicial cases involving creationism it was possible to create a comprehensive overview of the entire creationist strategies exercised in in the past almost 100 years. Temporally, there was a forty-year gap between Scopes and Epperson. Following Epperson in 1968, the cases took place at regular intervals – approximately one case every five years. Following Kitzmiller in 2005 the legal occurrences became even more frequent (almost 1 every two years) while the strategies also became much more ambiguous and complex. While cases between 1925 and 2005 focused majorly on statewide and district-wide strategies, the post-Kitzmiller legal landscape is marked by cases that represent subtler strategies that occur most often times at the classroom-level. The willingness to go to court over this issue only seems to have increased during the past decade and has spread from cases involving only public high schools to also include university policies and state board employee policies.

A summary of the rulings was made that provides a framework within which creationists have tried to affect change in the science education system. The rulings in these cases showed that: (1) any statute that prohibits the teaching of evolution is in violation of the Constitution, (2) any legislation requiring the teaching of Creation Science is in violation of the Constitution, (3) including a textbook that discusses Creationism or Creation Science in public schools is in violation of the Constitution, (4) teaching evolution cannot be considered the establishment of religion and is therefore not in violation of the Constitution, (5) a teacher's freedom of speech does give them the right to discuss creationism in a public school classroom, (6) requiring a teacher to teach evolution instead of Creationism is not a violation of that teacher's constitutional rights, (7) reading disclaimers before lessons on evolution is in violation of the Constitution, (8) prohibiting a teacher from teaching the weaknesses of the theory of evolution is not a violation of the teacher's constitutional rights, (9) the use of disclaimers on science textbooks is also a violation of the Constitution, (10) making hostile remarks against religious beliefs in the science classroom is also a violation of the Constitution.

Thus the analysis of the legal battles, provided not only a deep insight into the manifold approaches of introducing creationist principles into the classroom, but it also illustrated how and why the creationists amended the ways in which they marketed their ideas in order to avoid legal repercussions for their actions. As one avenue proved to be unsuccessful, they explored a new route to undermine evolution education.

The examination of the legal cases also illustrated the universality of the conflict within the US. Legal cases involving creationism took place on both coasts, in the north and in the south of the US, in democratic and republican dominated states, in historically confederate and historically union states as well as in states with high religiosity, average religiosity and low religiosity. The only locations that were void of legal conflict were the states with the lowest levels of religiosity and the non-continental states. The lack of legal conflict, however, does not mean a

lack of creationist activities. In order for a legal case to occur, there must be two parties who are in disagreement. This means that creationist activities could take place without challenge in homogeneous communities where citizens share similar evangelical worldviews as was illustrated in *Lane v. Sabine Parish School Board* where Christian fundamentalism ran rampant in a local public school for years without any protest until a Buddhist student moved to the town and complained about religious doctrines being incorporated into the science curriculum at his school. The response he was given was that he should attend a different school in another community where more Asian students lived. This type of situation illustrates the fact that the legal cases in the US represent just the known incidence of creationist indoctrination in America schools, where a party was willing to file complaint against it. There are undoubtedly many more schools where creationist doctrines are being taught without challenge due to the homogenous evangelical belief systems in communities and the social pressure to conform within such societies.

As this study investigated the background of the court cases, it became clear that creationist activities are well-organized and generously financed through sponsorships and donations. This level of organization and financing can be traced back to the large number of institutions and societies that have been founded to disseminate creationist beliefs. As creationist trends mutated, so did the types of organizations. While organizations that were focused on the dissemination of Creation Science and promotion of Balanced Treatment legislation were popular and manifold in the 1970s and 1980s, centers focused on supporting the dissemination of Intelligent Design began to pop up in the 1990s such as the Center for Science and Culture (CSC), which was founded in 1996 as a part of the Discovery Institute and is still currently very active in the United States. Moreover, it was discussed that the creationist movement was assisted through political activation in evangelical groups like the Moral Majority and the Christian Coalition and that they also receive funding and support from organizations such as the Thomas More Law Center who provide free legal counsel.

By examining the individuals involved in filing complaints and taking on the role of plaintiffs, evidence was found that corroborated the fact that the major conflict is not between religion and science. In fact, the parties in conflict in the US are not the faithful versus the atheists – or even religious vs. anti-religious – but instead specifically between creationists (most often YEC) who want to introduce religious doctrines into the classroom and secularists who feel strongly about the importance of upholding the separation of church and state in secular science education. It was shown that secularists include all types of individuals, from clergy to parents to science educators, who want to preserve the sanctity of the secular science classroom. This was shown time and time again by the fact that both scientific agencies as well as clergy acted as plaintiffs or defendants in trying to prevent the teaching of creationist propaganda in science classrooms. The legal

arguments are always specifically about the dangers of including this religious-based ideology in science curriculum in a secular classroom that should be focused on science and not religion. The arguments made in the judicial proceedings and the judgements made were in no way generally anti-religious but instead specifically delineated that religious doctrines do not belong in science classrooms – but that creationism, creation science and intelligent design can, of course, be taught and prophesized in other locations outside of public schools.

By examining the judicial aspect of the creationist phenomenon, it was also possible to identify the main organizations responsible for protecting secular education, namely, the American Civil Liberties Union (ACLU) and the National Center for Science Education (NCSE). While the NCSE is specifically focused on science education and the necessity of expunging religious teachings, such as creationism, from science classrooms, the ACLU is more broadly focused on upholding the rights of Americans as was laid forth in the Bill of Rights as part of the Constitution in the late 1700s. Most relevant to this study was the First Amendment, which states, “Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press;...”. This concept of religious freedom and freedom of speech are the points around which all the legal battles spin. Thus, the NCSE and especially the ACLU were actively involved in defending science education in many of the legal battles.

An understanding of the legal history of creationism in America also provided an initial understanding of the intricate web of politics, economics and social constructs that directly affect the education system. The complex interplay was seen, for example, in the fact that Scopes trial created enough of a social controversy to scare textbook publishers off of evolution for multiple decades. Moreover, the national government in the United States did not address this void in science education until it took a re-interest in science education in the 1950s for political reasons, once the race to space began with the USSR and the Americans panicked when they realized that they needed to update their textbooks and educational standards in order to keep up the soviets (Padian, 2010; Matzke, 2007). After receiving funding from the national government, the Biological Science Curriculum Study began work on creating a series of state-of-the-art biology textbooks and by the 1960’s evolution finally made a reappearance in school textbooks (Humes, 2007). This reappearance of evolution in the textbooks then led to the conditions responsible for the Epperson case in 1968 as described above.

From the educational perspective, multiple authors have warned against the dangers of teaching creationism in science classrooms, but this thesis was the first to take a detailed look at the adverse effect on science education that arise from creationist lobbying and political activism at a state and national level. American classrooms are the forefront of influential power because they offer a direct and powerful means of educating the masses but can also serve as a means of mislead-

ing masses of supple minds. There is a vast interest in quality public school curriculum in the US, yet due to the lack of a national curriculum and the political and economic nature of textbook adoption there is still plenty of room for creationists to get their foot in the door. These two pillars of education have become the most recent creationist target and thus a chapter of this thesis was devoted to examining the political processes involved in textbook and science standards adoption.

Textbooks have a tremendous amount of power within a classroom as they are the most visible part of the curriculum and the majority of teachers rely upon them for the majority of their teaching. For many students (and teachers) textbooks represent the only scientific literature that they will come in contact with, meaning that they do not have any other sources of information to allow them to question what is stated or omitted in the textbooks provided to them by the state.

Despite the unequivocal importance of quality textbooks, the analysis of the textbook adoption process showed that the content of textbooks more often reflects the desires of the state boards of education and their attempts to placate their constituents and does not represent the current stand of science or the recommendations made by the scientific community regarding science education. In fact, the current study provided evidence that state boards of education have so much economic leverage (Texas alone has an annual budget of \$570 million for textbooks) that publishers attempt to mitigate problems and appease conservative state boards by engaging in self-censorship, for example by omitting controversial issues such as evolution (Watts et al., 2016).

In addition to applying pressure to textbook adoption processes at a state-level, creationists have also created supplemental textbooks that have been introduced into schools at a local level through donations of books to school libraries. The newest Intelligent Design schoolbooks pose the greatest threat to science education as the religious nature is thickly enshrouded with scientific veils that could easily confuse both high school students and teachers alike.

Political pressure is also applied at the state-level in order to alter the content of state science standards, which dictate what a student must be able to do or understand by a certain grade and thus have a huge influence on the way in which evolution (and other subjects) are presented to students. While well-written science standards and comprehensive curricula can be an extraordinary asset for a biology teacher and thus a blessing to science students, there is an increasing amount of pressure from Darwin doubters to introduce obtuse language into the standards in order to allow for the teaching of alternative creationist theories. This obtuse language and intentional vagueness may serve anti-evolutionist in their aim to open a legal loophole to introduce ideas such as Intelligent Design into the science classroom. Since science standards are also decided through political committees that are comprised of elected representatives, this is also an opportunity for anti-evolutionists to influence the quality of science education (Watts et al., 2016).

An analysis of state standards in different states illustrated how some states have diminished the coverage of evolution or have included a “critical analysis” of evolution, which focuses more on discrediting evolution than providing students with a sound understanding of one of the most fundamental theories in science and further confuses them about the nature of scientific discovery. It was shown that despite the efforts from central science agencies and the creation of Next Generation Science Standards that most states still create their own set of standards that are well below par according to studies by the Fordham institute. This trend was shown to be particularly damaging to science education as the majority of American students have failed to pass the college readiness tests in science according to ACT studies (Watts et al., 2016).

Another grassroots strategy that has become increasingly popular after the Kitzmiller ruling in 2005 is the promotion of Academic Freedom bills, which provide teachers with immunity if they choose to discuss creationism or any other “alternative” to evolution within the classroom. These bills have become increasingly popular and are supported largely by the Discovery Institute. The general trend in the most current movements against evolution is focused on ambiguity and subtlety. In order for creationists to be able to have any influence on education in the American science classrooms, they must shed all appearances of being religiously motivated. So in general the creationist strategies involved in amending state science standards and the creation of academic freedom bills are camouflaged as promotions of science, critical thinking and academic achievement.

This thesis also was the first to take a detailed look at how creationists are able to further affect change in public opinion through the skillful development of free-choice learning materials. The production of these materials is a direct attempt to convince the American population that there are major flaws within the theory of evolution that can only be answered through supernatural explanations. This strategy was clearly delineated in the Wedge strategy by the Discovery Institute. A section of the thesis was therefore devoted to looking at the production and promotion of free-choice learning materials such as films, museums, websites, podcasts and books, since it has been shown that informal educational activities such as watching a documentary or visiting a museum, have a greater impact on the public’s understanding of science than what is actually taught in the science classroom (Dickerson, Dawkins, & Penick, 2007).

The examination of the large anti-evolution free-market enterprise demonstrated that the promoters of creationism are well-funded and talented in creating materials that are not only “educational” but also entertaining – in truth, they have become the experts of edutainment. Especially the books and films produced with the support of the Discovery Institute have proven to be very popular with the American public. The most current films and books take a rather subtle approach to the topics, are careful not to attack science and gently promote their ideas about Intelligent Design by asking pointed questions regarding the origin and

increasing amount of information needed to increase complexity. Some of the defenders of evolution have also been able to write books that have become popular among the Americans. The most author is Richard Dawkins. His approach to the matter is anything but subtle. He makes a frontal attack on creationism, as well as religion and spirituality. However, his books are popular among a certain group of Americans, his books and films also cause a larger polarization within the population (Scott, 2009).

In was emphasized that all of these trends (direct attempts to change educational standards and free-choice learning material) could deeply disturb the education of science students across the country and the general understanding of science among the American public. Studies by the PISA continue to show that American students perform well below average in comparison to other countries in general and that a specific look at science by the ACT has shown that 69% of American students failed to meet the ACT's college readiness benchmarks for science (ACT; 2012). This means that high schools across the nation are failing to prepare students for any type of science class at the university. Other studies more specific to evolution have shown that the acceptance of evolution among the general public in the United States is lower than almost all other western countries, coming in just above Turkey (Miller et al., 2006). This general lack of acceptance of evolution among the American public appears to be both a cause and a result of the lack of quality science education at many US schools.

Yet, while other countries may believe that they are safe from this seemingly American phenomenon, a look at creationism outside the US demonstrated that they are mistaken. When looking at Germany it became obvious that creationism has been increasing in popularity since the 1980s and continues to gain followers and supporters even today. Like the United States, the creationist proponents are largely entrenched within evangelical sects, but this movement towards evangelical Protestantism. It was also shown that the movement within Germany is gaining speed through the development of new schoolbooks that promote young-earth creationism and intelligent design tenets and is bolstered by the large amounts of free-choice learning materials from the United States that have made their way over to Europe through the translation of multiple films and books. Currently Germany is well above the United States in their general acceptance of evolution, yet the percentage of acceptance varies greatly between the eastern Germans and the western Germans (Kutschera, 2014). Moreover, it was discussed that countries such as Germany could, in fact, be more at risk due to the lack of institutions like the NCSE and ACLU which act as watchdogs to protect secular science education (Kutschera, 2014).

The purpose of this thesis was to chronicle the legal history of creationism and determine the effect of creationism on education. The findings of this study have a number of important implications for future practice. The theoretical implications of these findings are clear – understanding how and why fundamentalist

thought originates could provide information on how to dismantle anti-science attitudes that stem from fundamentalist thinking in order to decrease conflict in the classroom and in the courtroom. Regarding practical implications, the results of this thesis could be used to create school-based, church-based or extracurricular programs that help deconstruct the myth that there is a necessary conflict between religion and science, thus allowing students to better integrate their own personal beliefs with the evidence of evolution presented in the science class. This point is especially important in the US since the majority of the population and thus student body are persons of faith.

There are a number of important changes which need to be made at the state level in order to amend the way in which science standards and textbooks are determined. The organized fashion in which evangelicals engage in grassroots actions allows them to have great influential power over these educational pillars, thus negatively affecting the overall quality of science education. Unless state governments become more deeply involved in safeguarding science curriculums by requiring the input from central scientific agency, quality science education free of supernatural underpinnings may not be attained. The difficulty here lies therein that as the Moral Majority and Christian Coalition assist conservative politicians into office, it would be recklessness for a politician to then pass pro-science legislation that could alienate their most powerful constituents. This point emphasizes the fact that the general public needs to be convinced of the compatibility of science and Christian belief so that evangelicals may relinquish their anti-science agendas in the political arena as well.

The challenge is now to fabricate both educational materials, as well as free-choice learning materials, that are truly capable of communicating the strengths of the theory of evolution and how the study of evolution has been essential in the development of the entire field of biology and medicine. Greater efforts are needed to ensure that creationists do not continue to confuse students and the general public with their claims that the theory of evolution is baseless and that the teaching of evolution leads to moral degradation and a loss of faith. If educators, scientists and politicians ban together in improve the understanding and teaching of evolution it would be possible to strengthen science education and thus stop this dangerous trend towards science illiteracy in the United States.

Afterword

At the turn of the twenty-first century, the evangelical lobby in America became the most powerful grassroots coalition in the country (Gribben, 2011). This evangelical power, coupled with strategic marketing and financial backing of the creationist movement means that the fight against evolution is not on its way out but is actually becoming more threatening than ever. Early attempts to expunge evolution from the classroom were clear and easy to detect – both for the legal system and for the general public. The trends discussed in this thesis have shown that the anti-evolution movement is becoming more complex and subtle. This complexity mixed with ambiguous legal nomenclature is making it harder for the educational agencies to determine the religious nature of the pseudo-scientific claims and thus hinders their ability to uphold the wall between church and state, while trying to navigate a politically correct social environment. This complex and simultaneously subtle nature of the newest trends means that it is also easier to mislead students who may believe that there truly are weaknesses in the theory of evolution that can be answered through scientists like William Dembski or Michael Behe with new concepts like “irreducible complexity”.

If these trends continue, it can only be expected that the overall science literacy will continue to fall in the United States and in any other country where this movement takes hold. The subtler approach of Intelligent Design in comparison to pure creationism or Creation Science may have convinced many that intelligent

design is less harmful to science education than its older cousins, but it is clear that intelligent design may be the most dangerous version of creationism yet and is a major threat to the scientific education of American students (Forrest, 2007). Through the ambiguous and subtle undermining of one of the most fundamental theories in biology, students are being denied the opportunity to comprehend how science works and what science can tell us about the natural world (Good et al., 2000).

The intelligently designed movement away from literalist discussions of the meaning of the seven days of Genesis has truly created a big tent, in which not only all Protestants, but also an increasing number of Catholics and Muslims are finding a home (Blancke, 2014). Although many supporters do not consider themselves to be “creationists”, they are still in fact leading to a general loss of scientific literacy in that there is a general trend towards a belief that a supernatural agency is necessary for the comprehension of natural processes. If this movement continues to find support among the general public, it will lead to a severe loss of scientific literacy, as fewer people will be able to discern the difference between pseudo-scientific claims and true scientific discoveries.

Along with an overall loss of scientific literacy, there may be effects on the overall structure of the general society as the general popularity of these ideas increases. As discussed in this thesis, many of the movements towards fundamentalism were in reaction against a rise in enlightenment and intellect. Through a loss of general science literacy among the general public, it may be more possible to sway entire political systems to be more in line with particular religious doctrines. This concept was discussed during the analysis of the Wedge strategy that among other things, targets the cultural legacies of evolution. The promoters of the Wedge have repeatedly stated that they want to overturn materialism, naturalism and humanism. The implications of which is so grand that one can only imagine a quick travel backwards reversing all of the progress made through the age of enlightenment and science and returning to a time of theocracy.

All sides concerned with stopping this dangerous trend – from the European Parliament Assembly to the American clergy – are in agreement and reiterate that the only solution to this situation is quality science education that is focused on teaching students the strengths of the theory of evolution free of creationist undertones or the promotion of supernatural explanations. All attempts to encourage students to look for the loopholes, problems and alternatives to this theory are a direct hindrance to their education.

Yet, society cannot rely upon teachers, scientists or the central scientific associations to solve this problem alone due to the complex nature of creationist trends and the political nature of educational decisions in the United States. A unified attempt would need to be made across all channels – economic, political, societal and educational – in order to accomplish this goal of protecting the sanctity of secular science education.

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List of Appendices

Appendix 1: The Declaration of Independence

The Declaration of Independence¹²⁶

IN CONGRESS, July 4, 1776.

The unanimous Declaration of the thirteen United States of America,

When in the Course of human events, it becomes necessary for one people to dissolve the political bands which have connected them with another, and to assume among the powers of the earth, the separate and equal station to which the Laws of Nature and of Nature's God entitle them, a decent respect to the opinions of mankind requires that they should declare the causes which impel them to the separation.

We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these are Life, Liberty and the pursuit of Happiness.--That to secure these rights, Governments are instituted among Men, deriving their just powers from the consent of the governed, --That whenever any Form of Government becomes destructive of these ends, it is the Right of the People to alter or to abolish it, and to

¹²⁶ This was taken from The U.S. National Archives and Records Administration www.archives.gov on January 19, 2013. The page URL is www.archives.gov/exhibits/charters/declaration_transcript.html

institute new Government, laying its foundation on such principles and organizing its powers in such form, as to them shall seem most likely to affect their Safety and Happiness. Prudence, indeed, will dictate that Governments long established should not be changed for light and transient causes; and accordingly all experience hath shewn, that mankind are more disposed to suffer, while evils are sufferable, than to right themselves by abolishing the forms to which they are accustomed. But when a long train of abuses and usurpations, pursuing invariably the same Object evinces a design to reduce them under absolute Despotism, it is their right, it is their duty, to throw off such Government, and to provide new Guards for their future security.--Such has been the patient sufferance of these Colonies; and such is now the necessity which constrains them to alter their former Systems of Government. The history of the present King of Great Britain is a history of repeated injuries and usurpations, all having in direct object the establishment of an absolute Tyranny over these States. To prove this, let Facts be submitted to a candid world.

He has refused his Assent to Laws, the most wholesome and necessary for the public good. He has forbidden his Governors to pass Laws of immediate and pressing importance, unless suspended in their operation till his Assent should be obtained; and when so suspended, he has utterly neglected to attend to them. He has refused to pass other Laws for the accommodation of large districts of people, unless those people would relinquish the right of Representation in the Legislature, a right inestimable to them and formidable to tyrants only. He has called together legislative bodies at places unusual, uncomfortable, and distant from the depository of their public Records, for the sole purpose of fatiguing them into compliance with his measures. He has dissolved Representative Houses repeatedly, for opposing with manly firmness his invasions on the rights of the people. He has refused for a long time, after such dissolutions, to cause others to be elected; whereby the Legislative powers, incapable of Annihilation, have returned to the People at large for their exercise; the State remaining in the meantime exposed to all the dangers of invasion from without, and convulsions within. He has endeavoured to prevent the population of these States; for that purpose obstructing the Laws for Naturalization of Foreigners; refusing to pass others to encourage their migrations hither, and raising the conditions of new Appropriations of Lands. He has obstructed the Administration of Justice, by refusing his Assent to Laws for establishing Judiciary powers. He has made Judges dependent on his Will alone, for the tenure of their offices, and the amount and payment of their salaries. He has erected a multitude of New Offices, and sent hither swarms of Officers to harrass our people, and eat out their substance. He has kept among us, in times of peace, Standing Armies without the Consent of our legislatures. He has affected to render the Military independent of and superior to the Civil power. He has combined with others to subject us to a jurisdiction foreign to our Constitution, and unacknowledged by our laws; giving his Assent to their Acts of pretended Legisla-

tion: For Quartering large bodies of armed troops among us: For protecting them, by a mock Trial, from punishment for any Murders which they should commit on the Inhabitants of these States: For cutting off our Trade with all parts of the world: For imposing Taxes on us without our Consent: For depriving us in many cases, of the benefits of Trial by Jury: For transporting us beyond Seas to be tried for pretended offences.

For abolishing the free System of English Laws in a neighbouring Province, establishing therein an Arbitrary government, and enlarging its Boundaries so as to render it at once an example and fit instrument for introducing the same absolute rule into these Colonies: For taking away our Charters, abolishing our most valuable Laws, and altering fundamentally the Forms of our Governments: For suspending our own Legislatures, and declaring themselves invested with power to legislate for us in all cases whatsoever. He has abdicated Government here, by declaring us out of his Protection and waging War against us. He has plundered our seas, ravaged our Coasts, burnt our towns, and destroyed the lives of our people.

He is at this time transporting large Armies of foreign Mercenaries to complete the works of death, desolation and tyranny, already begun with circumstances of Cruelty & perfidy scarcely paralleled in the most barbarous ages, and totally unworthy the Head of a civilized nation. He has constrained our fellow Citizens taken Captive on the high Seas to bear Arms against their Country, to become the executioners of their friends and Brethren, or to fall themselves by their Hands.

He has excited domestic insurrections amongst us, and has endeavoured to bring on the inhabitants of our frontiers, the merciless Indian Savages, whose known rule of warfare, is an undistinguished destruction of all ages, sexes and conditions.

In every stage of these Oppressions We have Petitioned for Redress in the most humble terms: Our repeated Petitions have been answered only by repeated injury. A Prince whose character is thus marked by every act which may define a Tyrant, is unfit to be the ruler of a free people.

Nor have We been wanting in attentions to our British brethren. We have warned them from time to time of attempts by their legislature to extend an unwarrantable jurisdiction over us. We have reminded them of the circumstances of our emigration and settlement here. We have appealed to their native justice and magnanimity, and we have conjured them by the ties of our common kindred to disavow these usurpations, which, would inevitably interrupt our connections and correspondence. They too have been deaf to the voice of justice and of consanguinity. We must, therefore, acquiesce in the necessity, which denounces our Separation, and hold them, as we hold the rest of mankind, Enemies in War, in Peace Friends.

We, therefore, the Representatives of the united States of America, in General Congress, Assembled, appealing to the Supreme Judge of the world for the rectitude of our intentions, do, in the Name, and by Authority of the good People of these Colonies, solemnly publish and declare, That these United Colonies are, and of Right ought to be Free and Independent States; that they are Absolved from all Allegiance to the British Crown, and that all political connection between them and the State of Great Britain, is and ought to be totally dissolved; and that as Free and Independent States, they have full Power to levy War, conclude Peace, contract Alliances, establish Commerce, and to do all other Acts and Things which Independent States may of right do. And for the support of this Declaration, with a firm reliance on the protection of divine Providence, we mutually pledge to each other our Lives, our Fortunes and our sacred Honor.

Appendix 2: Texas Essential Knowledge and Skills for Biology

§112.34. Biology, Beginning with School Year 2010–2011 (One Credit).

(a) General requirements. Students shall be awarded one credit for successful completion of this course. Prerequisites: none. This course is recommended for students in Grade 9, 10, or 11.

(b) Introduction.

(1) Biology. In Biology, students conduct laboratory and field investigations, use scientific methods during investigations, and make informed decisions using critical thinking and scientific problem solving. Students in Biology study a variety of topics that include: structures and functions of cells and viruses; growth and development of organisms; cells, tissues, and organs; nucleic acids and genetics; biological evolution; taxonomy; metabolism and energy transfers in living organisms; living systems; homeostasis; and ecosystems and the environment.

(2) Nature of science. Science, as defined by the National Academy of Sciences, is the “use of evidence to construct testable explanations and predictions of natural phenomena, as well as the knowledge generated through this process.” This vast body of changing and increasing knowledge is described by physical, mathematical, and conceptual models. Students should know that some questions are outside the realm of science because they deal with phenomena that are not scientifically testable.

(3) Scientific inquiry. Scientific inquiry is the planned and deliberate investigation of the natural world. Scientific methods of investigation are experimental, descriptive, or comparative. The method chosen should be appropriate to the question being asked.

(4) Science and social ethics. Scientific decision making is a way of answering questions about the natural world. Students should be able to distinguish between scien-

tific decision-making methods (scientific methods) and ethical and social decisions that involve science (the application of scientific information).

(5) Science, systems, and models. A system is a collection of cycles, structures, and processes that interact. All systems have basic properties that can be described in space, time, energy, and matter. Change and constancy occur in systems as patterns and can be observed, measured, and modeled. These patterns help to make predictions that can be scientifically tested. Students should analyze a system in terms of its components and how these components relate to each other, to the whole, and to the external environment.

(c) Knowledge and skills.

(1) Scientific processes. The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices. The student is expected to:

(A) demonstrate safe practices during laboratory and field investigations; and

(B) demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.

(2) Scientific processes. The student uses scientific methods and equipment during laboratory and field investigations. The student is expected to:

(A) know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section;

(B) know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories;

(C) know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;

(D) distinguish between scientific hypotheses and scientific theories;

(E) plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology;

(F) collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures;

(G) analyze, evaluate, make inferences, and predict trends from data; and

(H) communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports.

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:

(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

(C) draw inferences based on data related to promotional materials for products and services;

(D) evaluate the impact of scientific research on society and the environment;

(E) evaluate models according to their limitations in representing biological objects or events; and

(F) research and describe the history of biology and contributions of scientists.

(4) Science concepts. The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells. The student is expected to:

(A) compare and contrast prokaryotic and eukaryotic cells;

(B) investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules; and

(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza.

(5) Science concepts. The student knows how an organism grows and the importance of cell differentiation. The student is expected to:

(A) describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms;

(B) examine specialized cells, including roots, stems, and leaves of plants; and animal cells such as blood, muscle, and epithelium;

(C) describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation; and

(D) recognize that disruptions of the cell cycle lead to diseases such as cancer.

(6) Science concepts. The student knows the mechanisms of genetics, including the role of nucleic acids and the principles of Mendelian Genetics. The student is expected to:

- (A) identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA;
 - (B) recognize that components that make up the genetic code are common to all organisms;
 - (C) explain the purpose and process of transcription and translation using models of DNA and RNA;
 - (D) recognize that gene expression is a regulated process;
 - (E) identify and illustrate changes in DNA and evaluate the significance of these changes;
 - (F) predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance;
 - (G) recognize the significance of meiosis to sexual reproduction; and
 - (H) describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms.
- (7) Science concepts. The student knows evolutionary theory is a scientific explanation for the unity and diversity of life. The student is expected to:
- (A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental;
 - (B) analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record;
 - (C) analyze and evaluate how natural selection produces change in populations, not individuals;
 - (D) analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success;
 - (E) analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species;
 - (F) analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination; and
 - (G) analyze and evaluate scientific explanations concerning the complexity of the cell.
- (8) Science concepts. The student knows that taxonomy is a branching classification based on the shared characteristics of organisms and can change as new discoveries are made. The student is expected to:
- (A) define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community;
 - (B) categorize organisms using a hierarchical classification system based on similarities and differences shared among groups; and
 - (C) compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals.

(9) Science concepts. The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms. The student is expected to:

(A) compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids;

(B) compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter;

(C) identify and investigate the role of enzymes; and

(D) analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life.

(10) Science concepts. The student knows that biological systems are composed of multiple levels. The student is expected to:

(A) describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals;

(B) describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants; and

(C) analyze the levels of organization in biological systems and relate the levels to each other and to the whole system.

(11) Science concepts. The student knows that biological systems work to achieve and maintain balance. The student is expected to:

(A) describe the role of internal feedback mechanisms in the maintenance of homeostasis;

(B) investigate and analyze how organisms, populations, and communities respond to external factors;

(C) summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems; and

(D) describe how events and processes that occur during ecological succession can change populations and species diversity.

(12) Science concepts. The student knows that interdependence and interactions occur within an environmental system. The student is expected to:

(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms;

(B) compare variations and adaptations of organisms in different ecosystems;

(C) analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids;

(D) recognize that long-term survival of species is dependent on changing resource bases that are limited;

(E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles; and

(F) describe how environmental change can impact ecosystem stability.

Source: The provisions of this §112.34 adopted to be effective August 4, 2009, 34 TexReg 5063.

Appendix 3: California Science Standards for Biology for Grades nine through twelve

Biology/Life Sciences

Cell Biology

1. The fundamental life processes of plants and animals depend on a variety of chemical reactions that occur in specialized areas of the organism's cells. As a basis for understanding this concept:

a. Students know cells are enclosed within semipermeable membranes that regulate their interaction with their surroundings.

b. Students know enzymes are proteins that catalyze biochemical reactions without altering the reaction equilibrium and the activities of enzymes depend on the temperature, ionic conditions, and the pH of the surroundings.

c. Students know how prokaryotic cells, eukaryotic cells (including those from plants and animals), and viruses differ in complexity and general structure.

d. Students know the central dogma of molecular biology outlines the flow of information from transcription of ribonucleic acid (RNA) in the nucleus to translation of proteins on ribosomes in the cytoplasm.

e. Students know the role of the endoplasmic reticulum and Golgi apparatus in the secretion of proteins.

f. Students know usable energy is captured from sunlight by chloroplasts and is stored through the synthesis of sugar from carbon dioxide.

g. Students know the role of the mitochondria in making stored chemical-bond energy available to cells by completing the breakdown of glucose to carbon dioxide.

h. Students know most macromolecules (polysaccharides, nucleic acids, proteins, lipids) in cells and organisms are synthesized from a small collection of simple precursors.

i. Students know how chemiosmotic gradients in the mitochondria and chloroplast store energy for ATP production.

j. Students know how eukaryotic cells are given shape and internal organization by a cytoskeleton or cell wall or both.

2. Mutation and sexual reproduction lead to genetic variation in a population. As a basis for understanding this concept:

a. Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.

b. Students know only certain cells in a multicellular organism undergo meiosis.

- c. Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.
 - d. Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).
 - e. Students know why approximately half of an individual's DNA sequence comes from each parent.
 - f. Students know the role of chromosomes in determining an individual's sex.
 - g. Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.
3. A multicellular organism develops from a single zygote, and its phenotype depends on its genotype, which is established at fertilization. As a basis for understanding this concept:
- a. Students know how to predict the probable outcome of phenotypes in a genetic cross from the genotypes of the parents and mode of inheritance (autosomal or X-linked, dominant or recessive).
 - b. Students know the genetic basis for Mendel's laws of segregation and independent assortment.
 - c. Students know how to predict the probable mode of inheritance from a pedigree diagram showing phenotypes.
 - d. Students know how to use data on frequency of recombination at meiosis to estimate genetic distances between loci and to interpret genetic maps of chromosomes.
4. Genes are a set of instructions encoded in the DNA sequence of each organism that specify the sequence of amino acids in proteins characteristic of that organism. As a basis for understanding this concept:
- a. Students know the general pathway by which ribosomes synthesize proteins, using tRNAs to translate genetic information in mRNA.
 - b. Students know how to apply the genetic coding rules to predict the sequence of amino acids from a sequence of codons in RNA.
 - c. Students know how mutations in the DNA sequence of a gene may or may not affect the expression of the gene or the sequence of amino acids in an encoded protein.
 - d. Students know specialization of cells in multicellular organisms is usually due to different patterns of gene expression rather than to differences of the genes themselves.
 - e. Students know proteins can differ from one another in the number and sequence of amino acids.
 - f. Students know why proteins having different amino acid sequences typically have different shapes and chemical properties.
5. The genetic composition of cells can be altered by incorporation of exogenous DNA into the cells. As a basis for understanding this concept:
- a. Students know the general structures and functions of DNA, RNA, and protein.

- b. Students know how to apply base-pairing rules to explain precise copying of DNA during semiconservative replication and transcription of information from DNA into mRNA.
- c. Students know how genetic engineering (biotechnology) is used to produce novel biomedical and agricultural products.
- d. Students know how basic DNA technology (restriction digestion by endonucleases, gel electrophoresis, ligation, and transformation) is used to construct recombinant DNA molecules.
- e. Students know how exogenous DNA can be inserted into bacterial cells to alter their genetic makeup and support expression of new protein products.

Ecology

- 6. Stability in an ecosystem is a balance between competing effects. As a basis for understanding this concept:
 - a. Students know biodiversity is the sum total of different kinds of organisms and is affected by alterations of habitats.
 - b. Students know how to analyze changes in an ecosystem resulting from changes in climate, human activity, introduction of nonnative species, or changes in population size.
 - c. Students know how fluctuations in population size in an ecosystem are determined by the relative rates of birth, immigration, emigration, and death.
 - d. Students know how water, carbon, and nitrogen cycle between abiotic resources and organic matter in the ecosystem and how oxygen cycles through photosynthesis and respiration.
 - e. Students know a vital part of an ecosystem is the stability of its producers and decomposers.
 - f. Students know at each link in a food web some energy is stored in newly made structures but much energy is dissipated into the environment as heat. This dissipation may be represented in an energy pyramid.
 - g. Students know how to distinguish between the accommodation of an individual organism to its environment and the gradual adaptation of a lineage of organisms through genetic change.

Evolution

- 7. The frequency of an allele in a gene pool of a population depends on many factors and may be stable or unstable over time. As a basis for understanding this concept:
 - a. Students know why natural selection acts on the phenotype rather than the genotype of an organism.
 - b. Students know why alleles that are lethal in a homozygous individual may be carried in a heterozygote and thus maintained in a gene pool.
 - c. Students know new mutations are constantly being generated in a gene pool.
 - d. Students know variation within a species increases the likelihood that at least some members of a species will survive under changed environmental conditions.

- e. Students know the conditions for Hardy-Weinberg equilibrium in a population and why these conditions are not likely to appear in nature.
- f. Students know how to solve the Hardy-Weinberg equation to predict the frequency of genotypes in a population, given the frequency of phenotypes.
- 8. Evolution is the result of genetic changes that occur in constantly changing environments. As a basis for understanding this concept:
 - a. Students know how natural selection determines the differential survival of groups of organisms.
 - b. Students know a great diversity of species increases the chance that at least some organisms survive major changes in the environment.
 - c. Students know the effects of genetic drift on the diversity of organisms in a population.
 - d. Students know reproductive or geographic isolation affects speciation.
 - e. Students know how to analyze fossil evidence with regard to biological diversity, episodic speciation, and mass extinction.
 - f. Students know how to use comparative embryology, DNA or protein sequence comparisons, and other independent sources of data to create a branching diagram (cladogram) that shows probable evolutionary relationships.
 - g. Students know how several independent molecular clocks, calibrated against each other and combined with evidence from the fossil record, can help to estimate how long ago various groups of organisms diverged evolutionarily from one another.

Physiology

- 9. As a result of the coordinated structures and functions of organ systems, the internal environment of the human body remains relatively stable (homeostatic) despite changes in the outside environment. As a basis for understanding this concept:
 - a. Students know how the complementary activity of major body systems provides cells with oxygen and nutrients and removes toxic waste products such as carbon dioxide.
 - b. Students know how the nervous system mediates communication between different parts of the body and the body's interactions with the environment.
 - c. Students know how feedback loops in the nervous and endocrine systems regulate conditions in the body.
 - d. Students know the functions of the nervous system and the role of neurons in transmitting electrochemical impulses.
 - e. Students know the roles of sensory neurons, interneurons, and motor neurons in sensation, thought, and response.
 - f. Students know the individual functions and sites of secretion of digestive enzymes (amylases, proteases, nucleases, lipases), stomach acid, and bile salts.
 - g. Students know the homeostatic role of the kidneys in the removal of nitrogenous wastes and the role of the liver in blood detoxification and glucose balance.
 - h. Students know the cellular and molecular basis of muscle contraction, including the roles of actin, myosin, Ca^{+2} , and ATP.

- i. Students know how hormones (including digestive, reproductive, osmoregulatory) provide internal feedback mechanisms for homeostasis at the cellular level and in whole organisms.
- 10. Organisms have a variety of mechanisms to combat disease. As a basis for understanding the human immune response:
 - a. Students know the role of the skin in providing nonspecific defenses against infection.
 - b. Students know the role of antibodies in the body's response to infection.
 - c. Students know how vaccination protects an individual from infectious diseases.
 - d. Students know there are important differences between bacteria and viruses with respect to their requirements for growth and replication, the body's primary defenses against bacterial and viral infections, and effective treatments of these infections.
 - e. Students know why an individual with a compromised immune system (for example, a person with AIDS) may be unable to fight off and survive infections by microorganisms that are usually benign.
 - f. Students know the roles of phagocytes, B-lymphocytes, and T-lymphocytes in the immune system.

Source: California Department of Education (Reposted June 11, 2009)

Appendix 4: The Wedge Document

The following pages include the entire Wedge document. The quality of the images are rather poor and contain handwritten notes because they are the original images that were scanned by an individual at the Discovery Institute and leaked online. These images were then save and made readily available to the general public by the National Center for Science Education and can be found on their website at: <http://ncse.com/creationism/general/wedge-document> (Accessed 29 April 2016).



CENTER FOR THE RENEWAL OF SCIENCE & CULTURE

THE proposition that human beings are created in the image of God is one of the bedrock principles on which Western civilization was built. Its influence can be detected in most, if not all, of the West's greatest achievements, including representative democracy, human rights, free enterprise, and progress in the arts and sciences.

Yet a little over a century ago, this cardinal idea came under wholesale attack by intellectuals drawing on the discoveries of modern science. Debunking the traditional conceptions of both God and man, thinkers such as Charles Darwin, Karl Marx, and Sigmund Freud portrayed humans not as moral and spiritual beings, but as animals or machines who inhabited a universe ruled by purely impersonal forces and whose behavior and very thoughts were dictated by the unbending forces of biology, chemistry, and environment. This materialistic conception of reality eventually infected virtually every area of our culture, from politics and economics to literature and art.

The cultural consequences of this triumph of materialism were

devastating. Materialists denied the existence of objective moral standards, claiming that environment dictates our behavior and beliefs. Such moral relativism was uncritically adopted by much of the social sciences, and it still undergirds much of modern eco-

The Center seeks nothing less than the overthrow of materialism and its cultural legacies ...

nomics, political science, psychology and sociology.

Materialists also undermined personal responsibility by asserting that human thoughts and behaviors are dictated by our biology and environment. The results can be seen in modern approaches to criminal justice, product liability, and welfare. In the materialist scheme of things, everyone is a victim and no one can be held accountable for his or her actions.

Finally, materialism spawned a virulent strain of utopianism. Thinking they could engineer the perfect society through the application of scientific knowledge,

materialist reformers advocated coercive government programs that falsely promised to create heaven on earth.

Discovery Institute's Center for the Renewal of Science and Culture seeks nothing less than the overthrow of materialism and its cultural legacies. Bringing together leading scholars from the natural sciences and those from the humanities and social sciences, the Center explores how new developments in biology, physics and cognitive science raise serious doubts about scientific materialism and have re-opened the case for a broadly theistic understanding of nature. The Center awards fellowships for original research, holds conferences, and briefs policymakers about the opportunities for life after materialism.

The Center is directed by Discovery Senior Fellow Dr. Stephen Meyer. An Associate Professor of Philosophy at Whitworth College, Dr. Meyer holds a Ph.D. in the History and Philosophy of Science from Cambridge University. He formerly worked as a geophysicist for the Atlantic Richfield Company.

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GOALS	FIVE YEAR OBJECTIVES	ACTIVITIES
<p>Governing Goals</p> <ul style="list-style-type: none"> ♦ To defeat scientific materialism and its destructive moral, cultural and political legacies. ♦ To replace materialistic explanations with the theistic understanding that nature and human beings are created by God. 	<ol style="list-style-type: none"> 1. A major public debate between design theorists and Darwinists (by 2003) 2. Thirty published books on design and its cultural implications (sex, gender issues, medicine, law, and religion) 3. One hundred scientific, academic and technical articles by our fellows 4. Significant coverage in national media: <ul style="list-style-type: none"> ♦ Cover story on major news magazine such as <i>Time</i> or <i>National</i> ♦ PBS show such as <i>New</i> treating design theory fairly ♦ Regular press coverage on developments in design theory ♦ Favorable op-ed pieces and columns on the design movement by 3+ party media 	<ol style="list-style-type: none"> (1) Research Fellowship Program (for writing and publishing) (2) Front line research funding at the "pressure points" (e.g., Paul Chien's Chengiang Cambrian Fossil Fund in paleontology, and Doug Axe's research laboratory in molecular biology)
<p>Five Year Goals</p> <ul style="list-style-type: none"> ♦ To see intelligent design theory as an accepted <i>alternative</i> in the sciences and scientific research being done from the perspective of design theory. ♦ To see the beginning of the influence of design theory in spheres other than natural science. ♦ To see major new debates in education, life issues, legal and personal responsibility pushed to the front of the national agenda. 	<ol style="list-style-type: none"> 5. Spiritual & cultural renewal: <ul style="list-style-type: none"> ♦ Mainline renewal movements begin to appropriate insights from design theory, and to repudiate ideologies influenced by materialism ♦ Major Christian denomination(s) defend(s) traditional doctrine of creation & repudiate(s) Darwinism ♦ Seminars increasingly recognize & repudiate naturalistic presuppositions ♦ Positive uptake in public opinion polls on issues such as sexuality, abortion and belief in God 	<ol style="list-style-type: none"> (3) Teacher training (4) Academic Conferences (5) Opinion-maker Events & Conferences
<p>Twenty Year Goals</p> <ul style="list-style-type: none"> ♦ To see intelligent design theory as the <i>dominant</i> perspective in science. ♦ To see design theory application in specific fields, including molecular biology, biochemistry, paleontology, physics and cosmology in the natural sciences, psychology, ethics, politics, theology and philosophy in the humanities; to see its influence in the fine arts. ♦ To see design theory permeate our religious, cultural, moral and political life. 	<ol style="list-style-type: none"> 1. Ten states begin to rectify ideological imbalance in their science curricula & include design theory 2. Scientific achievements <ul style="list-style-type: none"> ♦ An active design movement in Israel, the UK, and other influential countries outside the US ♦ Ten CRSC Fellows teaching at major universities ♦ Two universities where design theory has become the dominant view ♦ Design becomes a key concept in the social sciences ♦ Legal reform movements base legislative proposals on design theory 	<ol style="list-style-type: none"> (6) Alliance-building, recruitment of future scientists and leaders, and strategic partnerships with think tanks, social advocacy groups, educational organizations and institutions, churches, religious groups, foundations and media outlets (7) Apologetics seminars and public speaking (8) Op-ed and popular writing (9) Documentaries and other media productions (10) Academic debates (11) Fund Raising and Development (12) General Administrative support

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CENTER FOR THE RENEWAL OF SCIENCE & CULTURE

THE WEDGE PROJECTS

Phase I. Scientific Research, Writing & Publication

- ◆ Individual Research Fellowship Program
- ◆ Paleontology Research Program (Dr. Paul Chien et al.)
- ◆ Molecular Biology Research Program (Dr. Douglas Axe et al.)

Phase II. Publicity & Opinion-making

- ◆ Book Publicity
- ◆ Opinion-Maker Conferences
- ◆ Apologetics Seminars
- ◆ Teacher Training Program
- ◆ Op-ed Fellow
- ◆ PBS (or other TV) Co-production
- ◆ Publicity Materials/Publications

Phase III. Cultural Confrontation & Renewal

- ◆ Academic and Scientific Challenge Conferences
- ◆ Potential Legal Action for Teacher Training
- ◆ Research Fellowship Program: shift to social sciences and humanities

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FIVE YEAR STRATEGIC PLAN SUMMARY

The social consequences of materialism have been devastating. As symptoms, those consequences are certainly worth treating. However, we are convinced that in order to defeat materialism, we must cut it off at its source. That source is *scientific* materialism. This is precisely our strategy. If we view the predominant materialistic science as a giant tree, our strategy is intended to function as a "wedge" that, while relatively small, can split the trunk when applied at its weakest points. The very beginning of this strategy, the "thin edge of the wedge," was Phillip Johnson's critique of Darwinism begun in 1991 in *Darwinism on Trial*, and continued in *Reason in the Balance* and *Defeating Darwinism by Opening Minds*. Michael Behe's highly successful *Darwin's Black Box* followed Johnson's work. We are building on this momentum, broadening the wedge with a positive scientific alternative to materialistic scientific theories, which has come to be called the theory of intelligent design (ID). Design theory promises to reverse the stifling dominance of the materialist worldview, and to replace it with a science consonant with Christian and theistic convictions.

The Wedge strategy can be divided into three distinct but interdependent phases, which are roughly but not strictly chronological. We believe that, with adequate support, we can accomplish many of the objectives of Phases I and II in the next five years (1999-2003), and begin Phase III (See "Goals/ Five Year Objectives/Activities").

Phase I: Research, Writing and Publication

Phase II: Publicity and Opinion-making

Phase III: Cultural Confrontation and Renewal

Phase I is the essential component of everything that comes afterward. Without solid scholarship, research and argument, the project would be just another attempt to indoctrinate instead of persuade. A lesson we have learned from the history of science is that it is unnecessary to outnumber the opposing establishment. Scientific revolutions are usually staged by an initially small and relatively young group of scientists who are not blinded by the prevailing prejudices and who are able to do creative work at the pressure points, that is, on those critical issues upon which whole systems of thought hinge. So, in Phase I we are supporting vital writing and research at the sites most likely to crack the materialist edifice.

Phase II. The primary purpose of Phase II is to prepare the popular reception of our ideas. The best and truest research can languish unread and unused unless it is properly publicized. For this reason we seek to cultivate and convince influential individuals in print and broadcast media, as well as think tank leaders, scientists and academics, congressional staff, talk show hosts, college and seminary presidents and faculty, future talent and potential academic allies. Because of his long tenure in politics, journalism and public policy, Discovery President Bruce Chapman brings to the project rare knowledge and acquaintance of key op-ed writers, journalists, and political leaders. This combination of scientific and scholarly expertise and media and political connections makes the Wedge unique, and also prevents it from being "merely academic." Other activities include production of a PBS documentary on intelligent design and its implications, and popular op-ed publishing. Alongside a focus on influential opinion-makers, we also seek to build up a popular base of support among our natural constituency, namely, Christians. We will do this primarily through apologetics seminars. We intend these to encourage and equip believers with new

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scientific evidences that support the faith, as well as to "popularize" our ideas in the broader culture.

Phase III. Once our research and writing have had time to mature, and the public prepared for the reception of design theory, we will move toward direct confrontation with the advocates of materialist science through challenge conferences in significant academic settings. We will also pursue possible legal assistance in response to resistance to the integration of design theory into public school science curricula. The attention, publicity, and influence of design theory should draw scientific materialists into open debate with design theorists, and we will be ready. With an added emphasis to the social sciences and humanities, we will begin to address the specific social consequences of materialism and the Darwinist theory that supports it in the sciences.

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THE WEDGE STRATEGY PROGRESS SUMMARY

Books

William Dembski and Paul Nelson, two CRSC Fellows, will very soon have books published by major secular university publishers, Cambridge University Press and The University of Chicago Press, respectively. (One critiques Darwinian materialism; the other offers a powerful alternative.) Nelson's book, *On Common Descent*, is the seventeenth book in the prestigious University of Chicago "Evolutionary Monographs" series and the first to critique neo-Darwinism. Dembski's book, *The Design Inference*, was back-ordered in June, two months prior to its release date. These books follow hard on the heels of Michael Behe's *Darwin's Black Box* (The Free Press) which is now in paperback after nine print runs in hard cover. So far it has been translated into six foreign languages. The success of his book has led to other secular publishers such as McGraw Hill requesting future titles from us. This is a breakthrough. InterVarsity will publish our large anthology, *Mere Creation* (based upon the Mere Creation conference) this fall, and Zondervan is publishing *Maker of Heaven and Earth: Three Views of the Creation-Evolution Controversy*, edited by fellows John Mark Reynolds and J.P. Moreland. McGraw Hill solicited an expedited proposal from Meyer, Dembski and Nelson on their book *Uncommon Descent*. Finally, Discovery Fellow Ed Larson has won the Pulitzer Prize for *Summer for the Gods*, his retelling of the Scopes Trial, and InterVarsity has just published his co-authored attack on assisted suicide, *A Different Death*.

Academic Articles

Our fellows recently have been featured or published articles in major scientific and academic journals in *The Proceedings to the National Academy of Sciences*, *Nature*, *The Scientist*, *The American Biology Teacher*, *Biochemical and Biophysical Research Communications*, *Biochemistry*, *Philosophy and Biology*, *Faith & Philosophy*, *American Philosophical Quarterly*, *Rhetoric & Public Affairs*, *Analysis*, *Books & Culture*, *Ethics & Medicine*, *Zygon*, *Perspectives on Science and the Christian Faith*, *Religious Studies*, *Christian Scholars' Review*, *The Southern Journal of Philosophy*, and the *Journal of Psychology and Theology*. Many more such articles are now in press or awaiting review at major secular journals as a result of our first round of research fellowships. Our own journal, *Origins & Design*, continues to feature scholarly contributions from CRSC fellows and other scientists.

Television and Radio Appearances

During 1997 our fellows appeared on numerous radio programs (both Christian and secular) and five nationally televised programs, *TechnoPolitics*, *Hardball with Chris Matthews*, *Inside the Law*, *Freedom Speaks* and *Firing Line*. The special edition of *TechnoPolitics* that we produced with PBS in November elicited such an unprecedented audience response that the producer Neil Freeman decided to air a second episode from the "out takes." His enthusiasm for our intellectual agenda helped stimulate a special edition of William F. Buckley's *Firing Line*, featuring Phillip Johnson and two of our fellows, Michael Behe and David Berlinski. At Ed Atsinger's invitation, Phil Johnson and Steve Meyer addressed Salem Communications' Talk Show Host conference in Dallas last November. As a result, Phil and Steve have been interviewed several times on Salem talk shows across the country. For example, in July Steve Meyer and Mike Behe were interviewed for two hours on the nationally broadcast radio show *Janet Parshall's America*. Canadian Public Radio (CBC) recently featured Steve Meyer on

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their *Tapestry* program. The episode, "God & the Scientists," has aired all across Canada. And in April, William Craig debated Oxford atheist Peter Atkins in Atlanta before a large audience (moderated by William F. Buckley), which was broadcast live *via* satellite link, local radio, and internet "webcast."

Newspaper and Magazine Articles

The *Firing Line* debate generated positive press coverage for our movement in, of all places, *The New York Times*, as well as a column by Bill Buckley. In addition, our fellows have published recent articles & op-eds in both the secular and Christian press, including, for example, *The Wall Street Journal*, *The New York Times*, *The Washington Times*, *National Review*, *Commentary*, *Touchstone*, *The Detroit News*, *The Boston Review*, *The Seattle Post-Intelligencer*, *Christianity Today*, *Cosmic Pursuits* and *World*. An op-ed piece by Jonathan Wells and Steve Meyer is awaiting publication in the *Washington Post*. Their article criticizes the National Academy of Science book *Teaching about Evolution* for its selective and ideological presentation of scientific evidence. Similar articles are in the works.

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EVENTS OF RELEVANCE IN THE LAST THREE WEEKS

- ◆ Newsweek magazine has published a cover story, "Science finds God," discussing among other things evidence for God from cosmology.
- ◆ McGraw Hill publishers have solicited an expedited proposal from CRSC fellows Steve Meyer, Paul Nelson, and Bill Dembski for their book on design in DNA.
- ◆ Steve Meyer and Mike Behe were interviewed for two hours on the nationally broadcast radio show *Janet Parshall's America*.
- ◆ Bill Dembski's book *The Design Inference* has already been back-ordered from Cambridge University Press in advance of its release.
- ◆ Fellow Paul Chien has been asked by the leading Chinese paleontologist to co-author a book with him on the Cambrian Explosion (which has profoundly anti-Darwinian implications).
- ◆ The Society for the Study of Evolution, the oldest and largest professional association of evolutionary biologists, announced a special teacher training program to combat design theory.
- ◆ Steve Meyer has been asked to testify before the U.S. Commission on Civil Rights concerning anti-religious discrimination in public education.

Appendix 5: Council of Europe Resolution 1580

The dangers of creationism in education

1. The aim of this resolution is not to question or to fight a belief — the right to freedom of belief does not permit that. The aim is to warn against certain tendencies to pass off a belief as science. It is necessary to separate belief from science. It is not a matter of antagonism. Science and belief must be able to coexist. It is not a matter of opposing belief and science, but it is necessary to prevent belief from opposing science.

2. For some people the Creation, as a matter of religious belief, gives a meaning to life. Nevertheless, the Parliamentary Assembly is worried about the possible ill-effects of the spread of creationist ideas within our education systems and about the consequences for our democracies. If we are not careful, creationism could become a threat to human rights, which are a key concern of the Council of Europe.

3. Creationism, born of the denial of the evolution of species through natural selection, was for a long time an almost exclusively American phenomenon. To-

day creationist ideas are tending to find their way into Europe and their spread is affecting quite a few Council of Europe member states.

4. The prime target of present-day creationists, most of whom are of the Christian or Muslim faith, is education. Creationists are bent on ensuring that their ideas are included in the school science syllabuses. Creationism cannot, however, lay claim to being a scientific discipline.

5. Creationists question the scientific character of certain areas of knowledge and argue that the theory of evolution is only one interpretation among others. They accuse scientists of not providing enough evidence to establish the theory of evolution as scientifically valid. On the contrary, creationists defend their own statements as scientific. None of this stands up to objective analysis.

6. We are witnessing a growth of modes of thought which challenge established knowledge about nature, evolution, our origins and our place in the universe.

7. There is a real risk of serious confusion being introduced into our children's minds between what has to do with convictions, beliefs, ideals of all sorts and what has to do with science. An "all things are equal" attitude may seem appealing and tolerant, but is in fact dangerous.

8. Creationism has many contradictory aspects. The "intelligent design" idea, which is the latest, more refined version of creationism, does not deny a certain degree of evolution. However, intelligent design, presented in a more subtle way, seeks to portray its approach as scientific, and therein lies the danger.

9. The Assembly has constantly insisted that science is of fundamental importance. Science has made possible considerable improvements in living and working conditions and is a rather significant factor in economic, technological and social development. The theory of evolution has nothing to do with divine revelation but is built on facts.

10. Creationism claims to be based on scientific rigour. In reality the methods employed by creationists are of three types: purely dogmatic assertions; distorted use of scientific quotations, sometimes illustrated with magnificent photographs; and backing from more or less well-known scientists, most of whom are not specialists in these matters. By these means creationists seek to appeal to non-specialists and spread doubt and confusion in their minds.

11. Evolution is not simply a matter of the evolution of humans and of populations. Denying it could have serious consequences for the development of our societies. Advances in medical research, aiming at combating infectious diseases

such as Aids, are impossible if every principle of evolution is denied. One cannot be fully aware of the risks involved in the significant decline in biodiversity and climate change if the mechanisms of evolution are not understood.

12. Our modern world is based on a long history, of which the development of science and technology forms an important part. However, the scientific approach is still not well understood and this is liable to encourage the development of all manner of fundamentalism and extremism. The total rejection of science is definitely one of the most serious threats to human and civic rights.

13. The war on the theory of evolution and on its proponents most often originates in forms of religious extremism closely linked to extreme right-wing political movements. The creationist movements possess real political power. The fact of the matter, and this has been exposed on several occasions, is that some advocates of strict creationism are out to replace democracy by theocracy.

14. All leading representatives of the main monotheistic religions have adopted a much more moderate attitude. Pope Benedict XVI, for example, as his predecessor Pope John-Paul II, today praises the role of science in the evolution of humanity and recognises that the theory of evolution is “more than a hypothesis”.

15. The teaching of all phenomena concerning evolution as a fundamental scientific theory is therefore crucial to the future of our societies and our democracies. For that reason it must occupy a central position in the curriculums, and especially in the science syllabuses, as long as, like any other theory, it is able to stand up to thorough scientific scrutiny. Evolution is present everywhere, from medical over-prescription of antibiotics that encourages the emergence of resistant bacteria to agricultural overuse of pesticides that causes insect mutations on which pesticides no longer have any effect.

16. The Council of Europe has highlighted the importance of teaching about culture and religion. In the name of freedom of expression and individual belief, creationist ideas, as any other theological position, could possibly be presented as an addition to cultural and religious education, but they cannot claim scientific respectability.

17. Science provides irreplaceable training in intellectual rigour. It seeks not to explain “why things are” but to understand how they work.

18. Investigation of the creationists’ growing influence shows that the arguments between creationism and evolution go well beyond intellectual debate. If we are not careful, the values that are the very essence of the Council of Europe will be

under direct threat from creationist fundamentalists. It is part of the role of the Council of Europe's parliamentarians to react before it is too late.

19. The Parliamentary Assembly therefore urges the member states, and especially their education authorities to:

19.1. defend and promote scientific knowledge;

19.2. strengthen the teaching of the foundations of science, its history, its epistemology and its methods alongside the teaching of objective scientific knowledge;

19.3. make science more comprehensible, more attractive and closer to the realities of the contemporary world;

19.4. firmly oppose the teaching of creationism as a scientific discipline on an equal footing with the theory of evolution and in general the presentation of creationist ideas in any discipline other than religion;

19.5. promote the teaching of evolution as a fundamental scientific theory in the school curriculums.

20. The Assembly welcomes the fact that 27 academies of science of Council of Europe member states signed, in June 2006, a declaration on the teaching of evolution and calls on academies of science that have not yet done so to sign the declaration.

Appendix 6: List of Theses

1. Anti-evolutionary thought is not a general characteristic of faith in God or even organized religion but is instead intrinsically linked to a fundamentalist belief in an inerrant Bible.
2. The creationist movement is truly, organically American in that it originated in the States and that it continues to be more present and have more influence in the United States than in any other country.
3. Despite the different names – Creationism, Creation Science, Intelligent Design – are all intrinsically linked in that they all stem from similar fundamentalist beliefs and are focused on the diminishing the coverage of evolution in public school science classrooms.
4. The legal triumphs of evolution over creationism in the courtroom can be accredited to the secular authority preserved by the Constitution of the United States, which prescribes a strict enforcement of the separation of state and church.

5. Legal losses and precedence set by judicial rulings on previous creationist cases created an impetus for creationists to alter their anti-evolution strategies throughout the 1900s – moving away from direct attacks on evolution to the promotion of alternative “theories”.
6. Curriculum standards are decided through politically driven processes – not by central scientific organizations – and thus demonstrate a great amount of variability among states due to the diverse political environments in the absence of a centralized, nation-wide curriculum policy.
7. Due to the political nature of textbook adoptions and the economic interests of publishers, creationists attempt to utilize their political lobbying power at a state-level in major textbook states to decrease the coverage of evolution in textbooks across the nation.
8. Despite Intelligent Design being declared a non-science in the Kitzmiller case in 2005, legal battles have increased since 2005 as Intelligent Design proponents continue to endorse anti-evolutionary tactics such as “teach the controversy”.
9. Due to the support of publishers, film companies and the financial backing from think-tanks such as the Discovery Institute, the creationists have had exponential success in marketing and spreading their ideas through free-choice learning opportunities in the form of popular books, films and museums.
10. Although, historically creationism was thought to be a purely American phenomenon, the availability and translation of free-choice learning materials have bolstered the export of American-style creationism to Europe and this evangelical trend has been gaining support in Germany, for example, through agencies such as Wort und Wissen since the 1980s.

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Comment: Creationism and Intelligent Design: Dogmatic concepts that will not go away

Ulrich Kutschera, Georgy S. Levit & Uwe Hofffeld

Many historians of biology, such as Stephen Jay Gould (1941–2002), have claimed that creationism is a home-grown phenomenon of North American sociocultural history. There are two major reasons for this assertion. The first is the widespread occurrence of evangelicalism. Due to the evangelical zeal that has been present in the United States since its beginning as a nation, biblical literalism became quite influential in the USA. It is not surprising that an organized creationist movement arose there in response to Charles Darwin's 1859 publication of the theory of descent with modification (i.e., biological evolution, Kutschera, 2017) that contradicts most crucial evangelical beliefs. The central importance of religion in North America can be traced back to the earliest periods in American history as the Puritans brought with them the idea of establishing a "city on the hill" where man lived according to God's rules. These Biblical literalists saw their movement in the Americas as the most significant action in human history since Christ's crucifixion. The missionary spirit of the first communities is still alive. The very structure of these communities and their independence from mainstream theologies create a breeding ground for the growth of creationism.

Second, unlike many other countries, the American school system is not regulated by national laws but is instead largely dictated by state-level decisions, which means that public education in the United States varies greatly state-to-state, due to the lack of a nationally centralized curriculum or education standards (Watts et al., 2016). Committees and boards of elected individuals make the decision about curricula. Accordingly, there are numerous possibilities for Biblical literalists to try to manipulate the educational system, especially science education with a focus on biology and geology.

Modern scientific creationism first occurred in the US, but then spread to other countries, including Western Europe. American creationism is used as argumentative and strategic planning template for creationists and ID-champions around the globe.

In 2006, Ronald L. Numbers published the expanded edition of his monograph *The Creationists. From Scientific Creationism to Intelligent Design to explain the origin and international spread of creationism*. In this monumental 600-page book, Numbers (2006) provided an overview of the origin, occurrence, dispersion and impact of fundamentalist views of creation and how these views are used to expound a selection of biological facts. This composite of evangelical views and real-world phenomena, taken from geology and biology, must be labelled as a pseudoscientific construct, void of explanatory power and significance. Nevertheless, the same Biblical fundamentalism (originating in the 1920s) that gave rise to the creationist movement spread from US-epicenters, to Europe and other countries. Today, creationism represents a disturbing, world-wide phenomenon with negative impacts on science education and society.

In 2009, the second edition of Eugenie C. Scott's more accessible book *Evolution vs. Creationism. An Introduction* was published. In contrast to the comprehensive treatise of R. L. Numbers, the account of Scott is shorter and much easier to understand, so that this popular reference book developed into the standard treatise on creationism in English-speaking countries. In contrast to Numbers (2006), Scott (2009) focused on the situation in the United States of America; she introduced basic concepts comprehensible to the general reader, and hence provided a solid base for the ongoing agenda of the National Center for Science Education (NCSE) in Oakland, CA, to combat the spread of anti-evolutionism in the USA.

With the publication of the 2016-PhD-thesis of Elizabeth Watts in the pages of this journal, a more timely account of this topic is now available for generalists and specialists alike (E. Watts: *Analysis of Creationism in the United States from Scopes [1925] to Kitzmiller [2005] and its Effect on the Nation's Science Education System*, *Ann. Hist. Phil. Biol.* 19, pp. ii–361, 2017). In five major chapters, supplemented by a Foreword/Introduction, and Conclusions/Afterword, Watts (2017) analyses the following topics: The conflict between science and religion in the USA, with reference to Christian fundamentalism, evangelicalism, evolution

and Darwinism; Bible-inspired creationism vs. its elaborations, i.e., creation science and Intelligent Design; examination, chronology and geography of legal conflicts – from Scopes (1925) to Kitzmiller (2005); the evolution/creation-conflict with reference to the American education system/curriculum (science) standards, inclusive of textbook adoption/classroom strategies; creationism post Kitzmiller (2005) and anti-evolutionism outside the US with a focus on Germany. In six appendices, important documents are provided that pertain to creationism in the US and its effects on science education (the Declaration of Independence; Texas Essential Knowledge and Skills for Biology; California Science Educations Standards for Biology; The Wedge Document; Council of Europe Resolution 1580 of June 2006; List of Theses).

As the title of her monograph indicates, and as detailed in the Foreword, the published doctoral thesis of Watts (2017) on the origin, historical development and impact of creationism focusses specifically on science education. Since biology – the science of the living world – is attacked by Biblical literalists (mostly evangelical Christians) via a number of strategies, for instance, the questioning of facts such as macroevolution, the age of the Earth etc., the evolution/creation-conflict represents the key topic of her broad analysis. In the conclusion section, Watts (2017) provides a list of recommendations as to how to combat creationist interferences in biology curricula in the US, as well as in European countries, such as Germany. Since creationism steadily evolves and adapts to new intellectual environments and challenges, it will not simply go away.

The comprehensive analysis and documentation of creationism and its elaborations (Intelligent Design) published by Watts (2017) in this journal is an important source for arguments against the sophisticated strategies of anti-evolutionists in fundamentalist (mostly Evangelical Protestants) communities around the world. Why is this issue of ongoing importance?

In the most recent North American Gallup-Poll (May 22, 2017), it was found that approximately 38 % of U. S. adults still believe that the Biblical God created humans in their present form about 10,000 years ago. This means that approximately 4 out of ten Americans adhere to the dogma of Young Earth creationism, which not only rejects the evidence for macroevolution, but also essentially all principles and facts of the geological sciences (specifically, the age of the Earth of ca. 4.600 million years). Although this anti-scientific attitude from 2017 is the lowest in 35 years (40 to 43 % creationists were recorded over the past three and a half decades), this result reveals that science education with respect to biology and geology is still insufficient. The same fraction of Americans (38 %) as those who believe in the Adam & Eve-story assume that humans evolved, but God guided this process in some way. These educated people adhere to the principles of Old Earth Creationism, Intelligent Design or theistic evolution. Together with those who accept naturalistic (Darwinian) descent with modification (ca. 19 %), about 57 % of American adults “believe in some form of evolution”, the authors of

Gallup May 22/2017 argued in their announcement (Silva, 2017; Watts et al., 2017).

Over the past decade, the first author of this Comment has repeatedly witnessed in Stanford Palo/Alto CA (USA) the following representative dialogue.

Person A: "With respect to evolution vs. creationism, we can't really say what is true, I mean everyone has their own theory. Sure, the atheists believe in evolution, but I am just not convinced. The scientists don't even have any real evidence. Humans are just too special to have evolved. We are obviously designed!"

A typical response to such a claim reads as follows.

Person B: "You know that the term 'theory' means something different in biology, right? Theories in science explain collections of facts and data – they are not just guesses or hunches. Neither Creationism, nor its elaborated brainchild, Intelligent Design, is science, and these ideas cannot be considered a theory to explain anything, because there is zero empirical evidence to support it. The fact is that organic evolution can be explained in detail by a well-supported theory."

If we replaced the last word by "a system of theories", which represents the core principles of evolutionary biology (a scientific discipline), our Person B would have exactly summarized the current consensus among biologists working at research institutions around the world (Kutschera, 2017).

Unfortunately, the arguments of our Person A persist in the USA, as well as in many European countries. For instance, here in Germany, the evangelical Studiengemeinschaft Wort und Wissen (W+W) would defy the claims of the "atheistic Darwinists" and argue that the Biblical God created "Basic Types of Life" a few thousand years ago (Blancke et al., 2014). Therefore, the work of Watts (2017) published in this volume of the *Annals of History and Philosophy of Biology* is of special importance. Her detailed analysis of the roots and developments of American anti-evolutionism is an important reference work. Since it contains recommendations regarding how to help Person A better grasp the nuances of evolutionary theory and its central role in modern science, the work of Watts (2017) will be a key publication for the improvement of science education for years to come.

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The name DGGTB (Deutsche Gesellschaft für Geschichte und Theorie der Biologie; German Society for the History and Philosophy of Biology) reflects recent history as well as German tradition. The Society is a relatively late addition to a series of German societies of science and medicine that began with the “Deutsche Gesellschaft für Geschichte der Medizin und der Naturwissenschaften”, founded in 1910 by Leipzig University’s Karl Sudhoff (1853–1938), who wrote: “We want to establish a ‘German’ society in order to gather German-speaking historians together in our special disciplines so that they form the core of an international society...”. Yet Sudhoff, at this time of burgeoning academic internationalism, was “quite willing” to accommodate the wishes of a number of founding members and “drop the word German in the title of the Society and have it merge with an international society”. The founding and naming of the Society at that time derived from a specific set of historical circumstances, and the same was true some 80 years later when in 1991, in the wake of German reunification, the “Deutsche Gesellschaft für Geschichte und Theorie der Biologie” was founded. From the start, the Society has been committed to bringing studies in the history and philosophy of biology to a wide audience, using for this purpose its *Jahrbuch für Geschichte und Theorie der Biologie*. Parallel to the *Jahrbuch*, the *Verhandlungen zur Geschichte und Theorie der Biologie* has become the by now traditional medium for the publication of papers delivered at the Society’s annual meetings. In 2005 the *Jahrbuch* was renamed *Annals of the History and Philosophy of Biology*, reflecting the Society’s internationalist aspirations in addressing comparative biology as a subject of historical and philosophical studies.



ISBN: 978-3-86395-339-3
eISSN: 2512-5923

Universitätsverlag Göttingen