

**IN THE COURT OF APPEALS FOR KNOX COUNTY, OHIO,
FIFTH APPELLATE DISTRICT**

Case No. 11 CA 000023

JOHN FRESHWATER,

Appellant,

vs.

MOUNT VERNON CITY SCHOOLDISTRICT
BOARD OF EDUCATION,

Appellee.

**BRIEF OF AMICUS CURIAE
NATIONAL CENTER FOR SCIENCE EDUCATION
IN SUPPORT OF AFFIRMANCE OF THE DECISION BELOW**

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TABLE OF CONTENTS

| | |
|---|-----|
| <u>TABLE OF AUTHORITIES</u> | iii |
| STATEMENT OF INTEREST <u>OF THE NATIONAL CENTER FOR SCIENCE EDUCATION</u> | 1 |
| <u>STATEMENT OF FACTS</u> | 2 |
| <u>STATEMENT OF THE ISSUES</u> | 5 |
| <u>ARGUMENT</u> | 5 |
| I. FRESHWATER’S PEDAGOGY REPRESENTS THE LATEST EFFORTS IN A LONG TRADITION OF OPPOSITION BY SOME RELIGIOUS GROUPS TO THE TEACHING OF EVOLUTION | 6 |
| A. The “First Generation” Of Anti-Evolution Efforts <u>Attempted To Ban The Teaching Of Evolution Outright.</u> | 6 |
| B. The “Second Generation” Of Anti-Evolution Efforts Attempted To <u>Establish “Balanced Treatment” Between Evolution And Creationist Dogma.</u> | 8 |
| C. The “Third Generation” Of Anti-Evolution Efforts Attempts To <u>Undermine Evolution While Promoting A Theory Of Intelligent Design.</u> | 11 |
| D. Freshwater’s Pedagogy Is Consistent With This “Third <u>Generation” Of Opposition Tactics Designed To Undermine Evolution.</u> | 12 |
| II. FRESHWATER’S TEACHING METHODS UNDERMINE SCIENCE EDUCATION AND CONSTITUTE ANTIEVOLUTION TEACHINGS | 14 |
| A. <u>Freshwater Misuses The Scientific Terms “Theory” And “Fact.”</u> | 14 |
| B. <u>The Scientific Community Does Not Doubt The Validity Of Evolution.</u> | 16 |
| C. The “Alternatives” To Evolution <u>Freshwater Taught Are Not Scientific Theories.</u> | 18 |
| D. Freshwater’s Classroom Instruction Was Designed <u>To Undermine Science That Contradicts Creationism.</u> | 22 |
| E. Freshwater’s Pedagogical Techniques Had A Demonstratively <u>Negative Impact On His Students’ Understanding Of Science.</u> | 23 |
| <u>CONCLUSION</u> | 25 |

TABLE OF AUTHORITIES

CASES

| | |
|---|----------------|
| <i>Edwards v. Aguillard</i> , 482 U.S. 578 (1987) | 6, 10, 24 |
| <i>Epperson v. Arkansas</i> , 393 U.S. 97 (1968)..... | 7 |
| <i>Kitzmiller v. Dover Area Sch. District</i> , 400 F. Supp. 2d 707 (M.D. Pa. 2005) | 11, 12, 13, 20 |
| <i>McLean v. Ark. Board of Education</i> , 529 F. Supp. 1255 (E.D. Ark. 1982)..... | Passim |
| <i>Peloza v. Capistrano Unified School District</i> , 37 F.3d 517 (9th Cir. 1994)..... | 6, 24 |
| <i>Selman v. Cobb County Sch. District</i> , 449 F.3d 1320 (11th Cir. 2006)..... | 12 |
| <i>Webster v. New Lenox School District Number 122</i> , 917 F.2d 1004 (7th Cir. 1990)..... | 6, 24 |

OTHER AUTHORITIES

| | |
|---|--------|
| Jon D. Miller, <i>Scientific Literacy</i> (Jan. 17, 1989)..... | 2 |
| Nat'l Acad. Of Sciences, <i>Science and Creationism: A View from the National Academy of Sciences</i> (2d ed. 1999) | Passim |
| Paul DeHart Hurd, <i>Scientific Literacy: New Mind for a Changing World</i> (Aug. 20, 1997) | 2 |
| William Paley, D.D., <i>Natural Theology</i> 9-19 (American Tract Soc.) (1881)..... | 18 |

**STATEMENT OF INTEREST
OF THE NATIONAL CENTER FOR SCIENCE EDUCATION**

The National Center for Science Education ("NCSE") is a not-for-profit membership organization that provides information and resources for schools, parents, and citizens working to maintain a well-grounded, scientifically based public school science curriculum. Founded in the early 1980s by a group of scientists and teachers, the NCSE is internationally-known as a clearinghouse for information on the creationism and evolution controversy. It is consulted by scientists, teachers, school boards, legislators, parents, and other citizens because of its deep knowledge of and experience with conflicts concerning the teaching of evolution in the public schools. The archives of the NCSE go back over 30 years, and have been consulted by scholars from North America, Japan, Australia, and Europe. The NCSE advises many organizations regarding religious objections to the teaching of evolution, especially as these conflicts play out on the state and local level. These organizations include scientific organizations such as the National Academy of Sciences and the American Association for the Advancement of Science, and science educator associations such as the National Association of Biology Teachers and the National Science Teachers Association.

Members and staff of the NCSE include individuals holding a wide range of religious beliefs and none at all. The organization is not affiliated with any religious or anti-religious organization.

The NCSE is gravely concerned by the level of science literacy in the United States and recognizes that public school science education is a major way through which the public gains basic knowledge of science. When the nature and content of science are erroneously presented in the public schools, the position of science in society is negatively affected, which directly affects the interests of scientists and, ultimately, the public at large. The

technological innovations that drive our economy and provide for our national security are dependent on sound scientific research.¹ So too are the breakthroughs that will provide for the improved health of our population, for a dependable food supply, and for increasingly needed alternative energy sources. At no point in our nation's history has American leadership in science, technology, and medicine been more important.

Sound scientific instruction means teaching evolution. As the National Academy of Sciences has explained, "[t]he concept of biological evolution is one of the most important ideas ever generated by the application of scientific methods to the natural world." Nat'l Acad. Of Sciences, *Science and Creationism: A View from the National Academy of Sciences* (2d ed. 1999) at viii (hereinafter "Nat'l Acad. of Sciences").²

STATEMENT OF FACTS

For 21 years, John Freshwater ("Freshwater") was an eighth grade science teacher at Mount Vernon middle school. Freshwater, by his own account and others', is a deeply religious man who believes strongly in the teachings of the Bible. *See* Ex. 7 (Hearing Transcript In The Matter Of Termination of Employment of John Freshwater (hereinafter "Hearing Tr.") at 1669:8-1670:1; 1707:18-1708:22); Ex. 8 (Hearing Tr. at 4400:3-4402:5). Consistent with his faith, Freshwater cannot believe in any theory that he regards as contradicting the Bible's account of creation, a view he has expressed both at his home and at his church. Exhibit 2

¹ Science has played an important role in our national development since the earliest days of the United States. In 1798, Thomas Jefferson endeavored to add science to the curriculum of our nation's schools because "[h]e viewed 'sciences as keys to the treasures of nature . . . hands must be trained to use them wisely.'" Paul DeHart Hurd, *Scientific Literacy: New Minds for a Changing World* (Aug. 30, 1997) at 1. Science continues to ascend in prominence more than 200 years later. Indeed, "[t]here is growing recognition in the industrialized world that scientific literacy is an important component of long-term economic growth and of effective citizenship." Jon D. Miller, *Scientific Literacy* (Jan. 17, 1989) at 1.

² Due to its substantial relevance, this publication has been appended in its entirety as Ex. 22.

(Hearing Tr. at 462:18-463:4). Freshwater's religious beliefs were also apparent at his school. He was the school monitor for the Fellowship of Christian Athletes, a role he embraced with sometimes-controversial enthusiasm. Ex. 1 (Hearing Tr. at 63:5-69:22). He decorated his classroom to reflect his religion by keeping posters of the Ten Commandments on the front door, numerous decorations containing Bible verse on the wall, and Bibles themselves visible on his desk and in a box at the back of the room. Ex. 1 (Hearing Tr. at 70:6-71:1).

Freshwater also allowed his religious beliefs to seep into his science curriculum. He instructed his students about an alleged scientific "controversy" surrounding the theory of evolution and taught them "various alternative theories" that coincided with religious beliefs concerning "the formation of the universe and the beginning of life." Appellant's Brief at 9-10 (hereinafter "App. Br."). These "alternative theories" included "intelligent design," a belief that the complexity of nature necessitates a supernatural creator, and the "hydrosphere theory," a pseudo-scientific explanation of the Noachian flood. *See, e.g.*, Ex 2 (Hearing Tr. at 347:22-348:10; 456:25-457:3); Ex. 12 (Board Ex. 6 at Attachment 8)³.

In addition to promoting these extracurricular "alternatives" to evolution, Freshwater also used his classroom to highlight alleged deficiencies in the theory and in science more generally. For example, he instructed his students that the scientific methods used to determine the Earth's age are unreliable. *See* Ex. 13 (Board Ex. 6 at Attachment 9) (radiometric dating is erroneous). He used handouts that questioned various aspects of evolutionary theory and instruction, including the use of embryo drawings in textbooks, the validity of Darwin's tree of life, and the status of homology. *See generally* Ex. 16 (Board Ex. 24). And he employed a

³ These handouts also appear as Board Ex. 40 and 41 and are often referenced as such during Hearing testimony. Copies of Board Ex. 40 and 41 have been appended for this Court's review as Ex. 17.

rhetorical technique by which his students called out the word “here” whenever they encountered facts in their science textbook that predated a human observer. Ex. 9 (Hearing Tr. 4505:9-4507:14).

During the 2002-2003 school year, Freshwater formally proposed that the Mount Vernon School Board adjust its science curriculum to “[c]ritically analyze evolution” in the eighth grade. Ex. 2 (Hearing Tr. at 473:16-25). This proposed policy states on its face that it was copied from an intelligent design website. See Ex. 18 (Employee Ex. 5) (“This statement and policy was copied from *www.intelligentdesignnetwork.org* . . .”). The science department rejected his proposal, as did the Board of Education. Ex. 2 (Hearing Tr. at 473:16-474:14); Ex. 5 (Hearing Tr. at 909:20-910:20). Nonetheless, Freshwater continued to promote supposed alternatives to evolution and to emphasize alleged problems with the theory, this time purportedly to demonstrate the existence of bias. See Ex. 10 (Hearing Tr. at 4761:24-4762:11); see also Ex. 19 at 2-3 (Employee Ex. 126).

After receiving a complaint about Freshwater’s display of the Ten Commandments, the Superintendent ordered Freshwater to remove the religious items from his classroom. Ex. 1 (Hearing Tr. at 70:6-71:7). Freshwater removed many of the posters from the walls but stood firm on the Bible, refusing to remove it from his desk. Ex. 1 (Hearing Tr. 75:11-76:22). Instead, he made a public speech in the Mount Vernon town square and provided the Board with a “statement” arguing “[u]ntil the Mount Vernon City Schools can demonstrate to me how I can remove the Bible from my desk without sacrificing my own God-given right to free exercise of my faith, I cannot in good-conscience comply with their directive.” Ex. 15 (Board Ex. 14); Ex. 1 (Hearing Tr. 76:7-22); Ex. 10 (Hearing Tr. at 4763:19-4766:2). Freshwater also went to the middle school library, checked out its copy of the Bible and a book called *Jesus of*

Nazareth, and displayed them both prominently on his science lab table. Ex. 1 (Hearing Tr. 76:23-77:5). The Board of Education resolved to commence proceedings to terminate Freshwater's employment. Ex. 11 (Board Ex. 1).

Freshwater requested and obtained a hearing on the Board's resolution that culminated in 38 days of testimony, involved 80 witnesses, and generated more than six thousand transcript pages. Ex. 20 at 1 (Order, *John Freshwater v. Mount Vernon City Sch. Dist. Bd. of Ed.*, Case No. 11AP02-0090 (Oct. 5, 2011) (hereinafter "Order")). Upon the hearing's conclusion, the Special Referee recommended that the Board terminate Freshwater "for good and just cause," finding, among other things, that Freshwater failed to adhere to the established science curriculum and was "determined to inject his personal religious beliefs into his plan and pattern of instruction of his students." Ex. 21 at 3, 13 (R. Shepherd Report, *In the Matter of John Freshwater* (hereinafter "Report")). Freshwater appealed to the trial court, which reviewed the record and affirmed the Referee's findings. Ex. 20 at 1-2 (Order). He has appealed again to this Court.

STATEMENT OF THE ISSUES

Whether there is any pedagogical or scientific merit in John Freshwater's teaching of "alternative theories" to evolution, including theories that are "consistent" with Christian religious beliefs, and whether there is pedagogical or scientific merit in his specific approach to "encouraging students to think critically" about evolution.

ARGUMENT

The NCSE submits this brief to place the teaching materials and methods used by John Freshwater in their historical, creationist context and to highlight that these materials and methods directly undermine the teaching of evolution in particular and of science generally. These materials and methods serve no legitimate pedagogical purpose in a public school science

class, are scientifically unsound, and serve only impermissibly to advance a sectarian purpose, namely, to teach creationism in its traditional version of creation science or its modern incarnation of intelligent design.

Eighth-grade students such as those taught by Freshwater are particularly susceptible to adopting these sectarian teachings and believing them to be science, both because they are in the early stages of intellectual development, and because these teachings come from an authority figure “clothed with the mantle of one who imparts knowledge and wisdom” and whose views they are likely to equate with the views of their school. *Peloza v. Capistrano Unified School District*, 37 F.3d 517, 522 (9th Cir. 1994); *see Edwards v. Aguillard*, 482 U.S. 578, 584 (1987) (noting coercive power of schools and “students’ emulation of teachers as role models”); *Webster v. New Lenox School District No. 122*, 917 F.2d 1004, 1007 (7th Cir. 1990) (same). Such teachings, however, hinder science education and, accordingly, the NCSE respectfully urges this court to uphold the decision of the court below.

I. FRESHWATER’S PEDAGOGY REPRESENTS THE LATEST EFFORTS IN A LONG TRADITION OF OPPOSITION BY SOME RELIGIOUS GROUPS TO THE TEACHING OF EVOLUTION

The facts of this case reveal that Freshwater’s classroom instruction to his eighth grade science students clearly reflects the beliefs of religious adherents who oppose the teaching of evolution, as well as their strategies to inject creationism into, and to undermine the presentation of evolution in, public school instruction.

A. The “First Generation” Of Anti-Evolution Efforts Attempted To Ban The Teaching Of Evolution Outright.

The anti-evolution movement and the efforts it has advocated to prevent or undermine the teaching of evolution in public schools find their origin just after World War I, when a segment of American Protestants, identifying themselves as fundamentalists, perceived

a decline in traditional morality and thought evolution was to blame. *McLean v. Ark. Bd. of Educ.*, 529 F. Supp. 1255, 1259 (E.D. Ark. 1982). Adhering to “the inerrancy of the Scriptures,” these religious groups began to lobby state legislatures for statutes banning the teaching of any theory in conflict with their views regarding the origins of life on earth. *Id.* at 1259. These outright prohibitions on the teaching of evolution constituted the “first generation” of anti-evolution efforts.

These efforts initially were successful in Arkansas. In 1928, a statute was passed by initiative making it illegal “to teach the theory or doctrine that mankind ascended or descended from a lower order of animals” or adopt any textbook advancing that position. *Epperson v. Arkansas*, 393 U.S. 97, 98-99 (1968). In doing so, Arkansas adopted a watered-down version of Tennessee’s famed “monkey law,” which was passed three years earlier and made it unlawful “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.” *Id.* at 107. The Arkansas law remained in effect for forty years.

In 1968, the Supreme Court struck down this law, holding that “[t]here is and can be no doubt that the First Amendment does not permit the State to require that teaching and learning must be tailored to the principles or prohibitions of any religious sect or dogma.” *Id.* at 106. Accordingly, the Court found that the Arkansas law violated the First and Fourteenth Amendments to the Constitution because it reflected “an attempt [by fundamentalists] to blot out a particular theory because of its supposed conflict with the Biblical account, literally read.” *Id.* at 110. This ended the era of outright prohibition on teaching evolution.

B. The “Second Generation” Of Anti-Evolution Efforts Attempted To Establish “Balanced Treatment” Between Evolution And Creationist Dogma.

In response to the *Epperson* decision, evolution opponents refined their approach and began advocating for a “second generation” of anti-evolution efforts. The nation had been inspired to improve its science curriculum after the Soviets launched Sputnik, and an organization composed of scientists and master teachers, the Biological Sciences Curriculum Study, produced biology texts that significantly incorporated evolution. *McLean*, 529 F. Supp. at 1259. At the same time, fundamentalists formed organizations to advance the idea that the account of creation in the Book of Genesis was supported by scientific data. *Id.* This “scientific” approach to creationism would form the cornerstone of the second generation anti-evolution efforts.

These second generation anti-evolution efforts called for “equal time” or “balanced treatment” between evolution and “creation science” in public schools. *See id.* at 1261. They were typified by a “model act” propounded by Paul Ellwanger and his organization, Citizens for Fairness in Education. *Id.* Ellwanger may have viewed anti-evolution efforts as sorties in a “battle . . . between God and anti-God forces,” but he did not believe that creation science was scientific. *Id.* As he explained, “we’re not making any scientific claims for creation, but we are challenging evolution’s claims to be scientific.” *Id.* Nevertheless, Ellwanger instructed supporters to “be careful not to present our position and our work in a religious framework,” as that would harm his group’s lobbying efforts. *Id.* at 1261-62.

Ellwanger’s lobbying efforts were successful in Arkansas, which passed legislation providing that “[p]ublic schools within this State shall give balanced treatment to creation-science and to evolution-science.” *Id.* at 1256. The statute defined “creation science” to include “[s]udden creation of the universe, energy, and life from nothing”; “[s]eparate

ancestry for man and apes”; “[e]xplanation of the earth’s geology by catastrophism, including the occurrence of a worldwide flood”; and a “relatively recent inception of the earth and living kinds.” *Id.* at 1264. This law was quickly challenged as violating the First and Fourteenth Amendments to the Constitution.

The district court considering the Arkansas statute held that its definition of “creation science” conveyed “an inescapable religiosity.” *Id.* at 1265. The court noted that the ideas contained in the definition were “not merely similar to the literal interpretation of Genesis; they are identical and parallel to no other story of creation.” *Id.* Accordingly, the court found that there was “no doubt that a major effect of the Act is the advancement of particular religious beliefs.” *Id.* at 1266.

The court also examined the merits of creation science as a scientific doctrine and found it to be baseless. The court noted that creation science relies on a two-model approach which contends that there are only two possible explanations for the appearance of life on earth: either the creationism of some conservative Christians or the scientific theory of evolution. Under the assumptions of this model, creationists believe that the denigration of evolution is sufficient to demonstrate the truth of creationism. The *McLean* court held, however, that the “two model approach of the creationists is simply a contrived dualism” that “has no scientific factual basis or legitimate educational purpose.” *Id.* at 1266. And the assumption of only two explanations for the origins of life and the existence of man amounted to “fallacious pedagogy.” *Id.* at 1267.

The court added that creation science was “simply not science” because it did not meet any of science’s essential characteristics. *Id.* The belief in creation out of nothing depends upon the influence of a supernatural creator, which is not testable against the empirical world or

falsifiable. *Id.* Moreover, the court noted that “[a] worldwide flood as an explanation of the world’s geology is not the product of natural law” and that the earth’s “relatively recent inception” was a similarly hollow concept. *Id.* In striking down the Arkansas law, the court explained that scientists as a whole had rejected creation science, as evidenced by the fact that “not one recognized scientific journal has published an article espousing the creation science theory,” and had opined that the creationist’s methods were incompatible with science because they were “dogmatic, absolutist, and never subject to revision.” *Id.*

The Supreme Court was also called on to consider the second generation of anti-evolution efforts and arrived at a similar conclusion. A Louisiana statute adopted under the guise of improving academic freedom required teachers to teach creation science if they taught evolution, and defined “creation science” to be “the scientific evidences for [creation] and inferences from those evidences.” *See Edwards*, 482 U.S. at 581, 586. The Court noted that although it “is normally deferential to a State’s articulation of a secular purpose, it is required that the statement of such purpose be sincere and not a sham” and found that “requiring schools to teach creation science with evolution does not advance academic freedom.” *Id.* at 587-88. Examining the legislative history, the Court also concluded that that “the term ‘creation science’ . . . embodies the religious belief that a supernatural creator was responsible for the creation of humankind.” *Id.* at 592. Additionally, “the legislature chose to affect the teaching of the one scientific theory that historically has been opposed by certain religious sects” in passing the law. *Id.* at 593. Given this, the Court held that the primary purpose of the law was to advance a religious belief and that it was therefore constitutionally impermissible. *Id.* Indeed, every court to examine the issue has held that creation science is not science at all.

C. **The “Third Generation” Of Anti-Evolution Efforts Attempts To Undermine Evolution While Promoting A Theory Of Intelligent Design.**

Edwards ended the second generation of anti-evolution efforts. However, fundamentalists modified their efforts to target evolution and promote their religious views through the science classroom. This “third generation” of anti-evolution efforts uses a two-pronged approach: undermining the perceived validity of evolution and promoting a new form of creationism called intelligent design.

In the first prong of the third generation of anti-evolution efforts, a number of opponents of evolution also responded to *Edwards* with a new “alternative” to evolution. See *Kitzmiller v. Dover Area Sch. Dist.*, 400 F. Supp. 2d 707, 718-22 (M.D. Pa. 2005). Dropping the moniker “creation science,” they began to advocate for “intelligent design,” an argument that the complexity of nature necessitates an intelligent creator. *Id.* at 718. For the Discovery Institute, the de facto headquarters for intelligent design, intelligent design was the thin end of a “wedge” intended to “defeat scientific materialism and its destructive moral, cultural, and political legacies.” *Id.* at 720. However, like previous fundamentalist “alternatives” to evolution, intelligent design was rejected by the federal court as being religious in nature. In doing so, the *Kitzmiller* court noted that “[a]lthough proponents of the [intelligent design movement] occasionally suggest that the designer could be a space alien or a time-travelling cell biologist, no serious alternative to God as the designer has been proposed” by those who advance the theory. *Id.* Accordingly, the court concluded that “[t]he overwhelming evidence at trial established that [intelligent design] is a religious view, a mere re-labeling of creationism, and not a scientific theory.” *Id.* at 726.

The second prong of the third generation of anti-evolution efforts focuses on undermining the public’s belief in evolution as a viable scientific theory. Its proponents have

advocated “teaching the controversy” that allegedly surrounds evolution. They have succeeded in enacting policies that require disclaimers to be attached to science textbooks that state evolution “is a theory not a fact.” *See, e.g., Selman v. Cobb County Sch. Dist.*, 449 F.3d 1320, 1324 (11th Cir. 2006). They have published lists of “tough” questions for students to ask their science teachers, hoping to undermine evolution. Ex. 6 (Hearing Tr. at 1551:9-17). And they have attempted to proliferate an idea that scientists are increasingly withdrawing from their acceptance of evolution. Ex. 6 (Hearing Tr. at 1591:2-8). These and other tactics are being employed to undermine evolution and “replace materialistic explanations with the theistic understanding that nature and human beings are created by God.” *Kitzmiller*, 400 F. Supp. 2d at 720. However, like other creationist constructs, they are intended to promote religion, and their use in our public schools violates the Constitution. *See id.* at 731 (“An objective adult member of the Dover community would also be presumed to know that . . . teaching about supposed gaps and problems in evolutionary theory [is a] creationist religious strateg[y] that evolved from earlier forms of creationism.”).

D. Freshwater’s Pedagogy Is Consistent With This “Third Generation” Of Opposition Tactics Designed To Undermine Evolution.

Freshwater’s pedagogy is consistent with this third generation of anti-evolution efforts. He has attempted to minimize the religious nature of his pedagogy by advancing secular purposes for it, but these secular purposes do not withstand scrutiny. For example, Freshwater taught his students to call out the word “here” when they encountered facts in their textbooks that predated a human eyewitness or where “scientific theories appeared . . . to be portrayed as indisputable facts.” App. Br. at 11. Although Freshwater testified that he did not use this method to highlight passages that in his view contradicted Biblical perspectives, the only example of this method he could provide concerned the earth’s age, a point that Biblical

creationists characteristically dispute. Ex. 9 (Hearing Tr. at 4505:12-4510:12). (*See* II D, *infra*.) Moreover, although he argued that he used a number of anti-evolution materials as examples of scientific “bias,” he admitted that these materials “are not good scientific method.” Ex. 9 (Hearing Tr. at 4513:21-4516:24).

Instead, Freshwater’s anti-evolution materials, just like the third generation anti-evolution movement of which they are a part, are intended to promote his view of religion rather than further any legitimate scientific or secular purpose. The materials Freshwater used were generated by organizations with religious goals such as Kids4truth.com, whose stated goal is to “caus[e] you to acknowledge that there is one true creator, God,” and the Discovery Institute, the organization responsible for advancing the “Wedge” strategy. Ex. 6 (Hearing Tr. at 1532:22-1536:16; 1537:7-1545:7; 1547:13-1548:4, 1559:23-1561:20). He also directed students to the “Answers in Genesis” fundamentalist Christian website. Ex. 2 (Hearing Tr. at 471:17-25). And, as discussed more fully below, Freshwater taught the “alternatives” of intelligent design and the “hydrosphere theory,” concepts which courts have been expressly found to be motivated by a non-secular, religious purpose. *See* Ex. 12 (Board Ex. 6 at Attachment 8); Ex. 2 (Hearing Tr. at 347:22-348:10; 456:25-457:3); *Kitzmiller*, 400 F. Supp. 2d at 726; *McLean*, 529 F. Supp. at 1265. Indeed, when making a speech in the Mount Vernon town square, Freshwater relied on a “statement” that proclaimed “I do not forfeit my right to free expression of my faith when I walk into the school.” Ex. 15 (Board Ex. 14).

Freshwater’s teaching materials and methods may have helped him convey his faith in the science classroom, but they did not accurately describe the state of science in the 21st Century. Instead, they operated to undermine science education and had a demonstrably negative effect on his students’ understanding of the subject.

II. **FRESHWATER'S TEACHING METHODS UNDERMINE SCIENCE EDUCATION AND CONSTITUTE ANTIEVOLUTION TEACHINGS**

In this matter, Freshwater contends that he “encourage[d] his students to differentiate between facts and theories” and “informe[d] students of various alternative theories” to evolution that happened to coincide with religious beliefs concerning “the formation of the universe and the beginning of life.” App. Br. at 9-10. Freshwater concedes that he instructed his eighth grade students “in such a way that they were examining evidence both for and against evolution.” *Id.* at 10 (quoting Ex. 21 at 4 (Report)). And he argues that these teaching methods are permissible under the Establishment Clause of the First Amendment and good pedagogy, because they promote critical thinking. *See id.* at 9-10.

These practices and classroom instruction clearly fall within the third generation of anti-evolution efforts discussed above. Moreover, they are scientifically and pedagogically unsound.

A. **Freshwater Misuses The Scientific Terms “Theory” And “Fact.”**

By teaching that evolution is a theory and not a fact, Freshwater implied to his students that a scientific theory is a speculative or unsubstantiated proposition. This evinces a fundamental misunderstanding and misuse of the scientific terms “theory” and “fact,” and is a staple of the anti-evolution movement in the United States since the era of Scopes. In science, our most well-substantiated and comprehensive explanations for natural phenomena are called theories. Well-known scientific theories include the atomic theory, the general theory of relativity, quantum mechanics, the germ theory of disease, and the gene theory of heredity. The National Academy of Sciences, an organization of leading scientists in every field which advises the President and Congress on scientific affairs, explains that in science “theories do not turn into

facts through the accumulation of evidence. Rather, theories are the end point of science.” Nat’l Acad. of Sciences at 2.

Even well-established scientific theories may be, and usually are, incomplete. Atomic theory, for example, expresses the general understanding that matter is composed of atoms. It does not mean that physicists fully understand everything about atoms; there are “gaps” in our knowledge of atomic theory. Nonetheless, no reputable scientist doubts the basic proposition that matter is made of atoms or that atomic theory is a powerful framework for understanding natural phenomena.

Teaching science students to view evolution as a “theory” in the non-scientific, lay sense, *i.e.*, a speculative or unsubstantiated proposition, misinforms them of the true nature of evolutionary theory accepted throughout the scientific community. This miseducation, however, may be compounded by misleadingly juxtaposing the word “fact” with “theory,” as Freshwater concedes he did. *See* App. Br. at 11 (Freshwater “develop[ed] ... means by which students could independently call attention to instances in the textbook where scientific theories appeared to students to be portrayed as indisputable facts.”). In a non-scientific context, the word “fact” connotes certainty, finality, and immutability; facts are permanent and unproblematic. In science, however, everything – including what we take to be facts – is in principle revisable in light of more accurate instrumentation, further evidence, or changes in theory that cause us to look differently at phenomena.

Scientists do not doubt the basic proposition that living things share common ancestry. Using the terms “fact” and “theory” wrongly and misleadingly serves to propagate an incorrect view of science and of evolution. Certainly there is no valid pedagogical or scientific

purpose for using scientific terms incorrectly and thereby thwarting the purpose of science education.

B. The Scientific Community Does Not Doubt The Validity Of Evolution.

Freshwater contends that he merely “encourage[d] students to think critically about scientific theories” and matters in the textbooks that are “subject to scientific debate,” and taught his students to consider “the evidence both for and against evolution.” App. Br. at 9-10. This manner of instruction implies that there is doubt within the scientific community about the validity of evolutionary theory. There is none, and teaching students that there is doubt where none exists serves no pedagogical purpose; rather, it is detrimental to their science education.

Evolution is among the most well-tested theories known to the world, the evidence for it is overwhelming, and no alternative or competing scientific theory exists. As the National Academy of Sciences has explained:

The concept of biological evolution is one of the most important ideas ever generated by the application of scientific methods to the natural world. The evolution of all the organisms that live on Earth today from ancestors that lived in the past is at the core of genetics, biochemistry, neurobiology, physiology, ecology, and other biological disciplines. It helps to explain the emergence of new infectious diseases, the development of antibiotic resistance in bacteria, the agricultural relationships among wild and domestic plants and animals, the composition of the Earth’s atmosphere, the molecular machinery of the cell, the similarities between human beings and other primates, and countless other features of the biological and physical world.

Nat’l Acad. Of Sciences at viii.

The scientific evidence in support of evolution is legion. Hundreds of thousands of fossil organisms demonstrate that life has grown more complex over time, ranging from the simple microbial life that existed 3.5 billion years ago to today’s human beings. *Id.* at 13.

Comparative anatomy supports evolutionary ideas of common ancestry by demonstrating that

life suited for survival in diverse environments nevertheless maintains strikingly similar skeletal characteristics. *Id.* at 14-15. However, many specialized forms of life also exhibit structures developed to meet the demands of survival in their unique ecological environments. *Id.* at 15-17. DNA evidence has made it possible to use genes to reconstruct the evolutionary history of organisms and measure evolutionary timelines using the “molecular clock.” *Id.* at 17-19. Finally, “pseudogenes” carried in an organism’s DNA demonstrate common ancestry and also provide a method to measure the relatedness in ancestry of various organisms. *Id.* at 20.

Given the explanatory power of evolution and the wealth of scientific evidence supporting the theory, its validity is beyond question in the scientific community. The occurrence of evolution “has been tested or observed so many times that there is no longer a compelling reason to keep testing or looking for examples” to support it. *Id.* at 28. Indeed, “[s]cientists no longer question whether descent with modification occurred because the evidence supporting the idea is so strong.” *Id.* As Dr. Patricia Princehouse, the Board of Education’s expert witness, explained:

There is no scientific controversy over whether or not evolution happens currently, has happened in the past, whether it produced the diversity of life that we see all around us and was responsible for the changes that we see in the fossil record, things like that. It is, in fact, the foundational concept of scientific biology.

Ex. 6 (Hearing Tr. at 1561:24-1562:6). Indeed, the only contemporary debate among scientists concerns the manner in which evolution occurs, not whether it occurs. *See* Ex. 4 (Hearing Tr. at 806:10-18); Ex. 5 (Hearing Tr. at 914:11-915:15); Ex. 6 (Hearing Tr. at 1562:7-1565:7).

There is, therefore, no pedagogical purpose served by misrepresenting to students the validity of evolution or its acceptance in the scientific community. On the other hand, classroom instruction that undermines students’ belief in evolution or implies that the validity of

evolution is the subject of debate or controversy among scientists is entirely consistent with the third generation of anti-evolution tactics used by Christian fundamentalists.

**C. The “Alternatives” To Evolution
Freshwater Taught Are Not Scientific Theories.**

Despite the overwhelming consensus among the scientific community regarding evolution’s validity, creation scientists and intelligent design proponents nonetheless advance various arguments to attack evolution or offer “alternatives” to it. Although these arguments are divorced from the scientific method and the supposed alternatives are not scientific theories, the evidence in this case established that Freshwater taught certain of these creation science or intelligent design views to his eighth grade students.

One argument frequently offered in support of an “alternative” to evolution is the “watchmaker” argument often attributed to the Reverend William Paley in the 19th century. *See* William Paley, D.D., *Natural Theology* 9-19 (American Tract Soc.) (1881). Paley argued that the complexity of a watch demonstrates that its pieces were put together to serve a purpose, and similar levels of complexity are reflected in the biological composition of life on earth. *Id.* Accordingly, Paley believed that life on earth was designed to fulfill a particular purpose and that apparent design necessitates a designer. *Id.* Paley’s argument is a classic example of what philosophers call the argument from design, or the teleological argument (from the Greek work *telos*, meaning goal), for the existence of God. Modern proponents of this intelligent design argument contend that it presents an alternative to evolution because it proposes that life forms were created by a designer (who they are reluctant to identify as God) in a form substantially similar to how they appear today.

Freshwater advanced such intelligent design arguments in his classes through, for example, the use of “Giraffe” and “Woodpecker” handouts, which at the same time trivialized

the prevailing scientific views of evolution, consistent with the two-prongs of the third generation of anti-evolution tactics of denigrating evolution and proposing a supposed alternative to it. Ex. 12 (Board Ex. 6 at Attachment 8). These handouts highlight the complexity inherent in the biological world, trivialize the idea that such complex anatomical structures could result from natural selection, and advocate for the existence of an intelligent designer to explain them.

The “Giraffe” handout, for example, notes that the giraffe has complicated biological structures that protect the animal’s brain from changes in blood pressure that result when the animal raises or lowers its head. Ex. 12 (Board Ex. 6 at Attachment 8). It notes that without these protections, the giraffe could not survive and adds that “we all know that [dead] animals don’t evolve anything, even though evolution demands its creatures realize they need an improvement before that improvement begins to evolve.” *Id.* The handout states that “a giraffe is a giraffe” and not a creature “emerging from some other creature or changing into a ‘higher’ or more [complex] animal.” *Id.* And it concludes with the question “is there an I.D. involved?” The “Woodpecker” handout focuses on a woodpecker’s ability to penetrate bark with its beak and collect insect larva from within using its tongue. *Id.* Like the “Giraffe” handout, the “Woodpecker” handout focuses on the organism’s inability to consciously select the physiological improvements it needs to adapt and concludes with the question “is there an I.D. involved?” *Id.*

These handouts represent an adaptation of Paley’s teleological arguments favored by proponents of intelligent design. The handouts highlight the specialized anatomical structures these animals possess and argue that complex structures could not have developed solely through

natural processes. In so doing, they replace Paley's watch with a giraffe's circulatory system and a woodpecker's beak and ask "is there an I.D. involved?"⁴

The concept of an intelligent designer responsible for the complexity of the living world, however, is a theological concept, not a scientific one. *See Kitzmiller*, 400 F. Supp. 2d at 726. Appealing to the actions of a supernatural intelligent designer to explain phenomena in the natural world undermines science, because "[s]pecial creation or supernatural intervention is not subjectable to meaningful tests, which require predicting plausible results and checking those results through observation and experimentation." Nat'l Acad. Of Sciences at 8. Instead, intelligent design doctrines "reverse the scientific process" because "the explanation [they provide] is seen as unalterable, and evidence is sought only to support a particular conclusion by whatever means possible." *Id.* Accordingly, permitting intelligent design in the classroom stops science in its tracks, because there is no need for scientific inquiry if the answer to each question posed about the natural world is simply "The designer did it."

Another alleged alternative explanation offered by evolution's critics is the so-called water vapor canopy theory, which Freshwater taught under the name "hydrosphere theory." Proponents of this view contend that when the earth (and the universe) was created there was a canopy of vapor or water that existed in a gaseous form above the atmosphere. At a certain point this canopy condensed, producing the deluge biblically described as Noah's flood. *See* Ex. 6 (Hearing Tr. at 1566:11-1567:5).

The record establishes that Freshwater provided his students with classroom discussion and handouts promoting the hydrosphere "theory" as an alternative to the established

⁴ The overwhelming consensus is that these handouts were inappropriate or misrepresented the state of science, and Freshwater himself conceded that they "were not good science." *See* Ex. 6 (Hearing Tr. at 1522:10-1537:6, 1547:13-1561:20); Ex. 9 (Hearing Tr. at 4522:14-4523:21).

geological consensus about the history of the earth. Ex. 2 (Hearing Tr. at 456:25-457:3); Ex. 13 (Board Ex. 6 at Attachment 9). He described to his students that “the earth was[] surrounded by . . . a dome of . . . condensed water” that made it sufficiently humid for dinosaurs to live in Alaska and Antarctica. Ex. 2 (Hearing Tr. 347:22-348:10). This dome broke, the planet flooded so much that “fish would be stuck on top of mountains,” and the water flowed back out, “kill[ing] a lot of dinosaurs and [other] species” in the process. *Id.* Freshwater also provided his students with handouts, which argued that “[d]inosaur extinction is a recent phenomenon” and that “[m]any of the great sea and land monsters went extinct in a global flood 4400 years ago.” Ex. 13 (Board Ex. 6 at Attachment 9). Freshwater admitted that he told his class that dinosaurs may have walked the earth at the same time as humans. Ex. 2 (Hearing Tr. at 463:12-14).

The hydrosphere argument is not a scientific theory, lacks any demonstrable basis in fact, and is contradicted by the geological record. *See* Ex. 6 (Hearing Tr. at 1566:11-1567:5). “[I]ntertidal and terrestrial deposits demonstrate that at no recorded time in the past has the entire planet been underwater” and “a universal flood of sufficient magnitude to form the sedimentary rocks seen today . . . would require a volume of water far greater than has ever existed on and in Earth” Nat’l Acad. Of Sciences at 8. Accordingly, there is no evidence “that the entire geological record . . . is the product of a single universal flood that occurred a few thousand years ago, lasted a little over a year, and covered the highest mountains to a depth of several meters.” *Id.* “The belief that Earth’s sediments, with their fossils, were deposited in an orderly sequence in a year’s time defies all geological observations and physical principles concerning sedimentation rates and possible quantities of suspended solid matter.” *Id.*

The teaching of untestable religious views and “theories” that are soundly refuted by the geological record and rejected by the scientific community does not advance science

education. To the contrary, it miseducates students and steers them away from science and therefore serves no legitimate pedagogical purpose.

**D. Freshwater's Classroom Instruction Was Designed
To Undermine Science That Contradicts Creationism.**

The record also reflects that Freshwater instructed his students in ways that further undermined evolution and other areas of established science that are perceived to be inconsistent with creationism. For example, he instructed his students that the scientific means of estimating the age of the earth and its life forms is unreliable. *See* Ex. 13 (Board Ex. 6 at Attachment 9) (stating that radiometric dating is erroneous and suggesting that humans and dinosaurs existed simultaneously on earth). Some creationists believe that the earth is relatively young, perhaps only 6,000 to 10,000 years old, and that all living beings were miraculously created essentially in their present form. *See* Nat'l Acad. of Sciences at 7. Scientists, however, through radiometric dating and other means, confidently estimate that the earth is approximately 4.54 billion years old. *Id.* at 5. In light of this temporal disparity between scientists' estimates of earth's age and the age ascribed by "young earth" creationists, the latter often criticize radiometric dating as inaccurate and unreliable. These criticisms, however, do not reflect the scientific consensus and instead are contrary to it.

In his classroom, Freshwater employed a rhetorical technique by which his students called out the word "here" whenever they read a passage of their science textbook that concerned topics that could not have been witnessed by a human being and therefore, in Freshwater's view, may not be true. *See* Ex. 9 (Hearing Tr. 4505:9-4507:14). He provided an example of such a passage by referring to textbook passages that explained that the earth was 4.6 billion years old and that the Precambrian era lasted until 540 million years ago, stating that

“there was no eyewitness there” and “[i]t’s extrapolated information in order to get that date, so a kid could say ‘here’ on that.” Ex. 9 (Hearing Tr. at 4509:4-4510:2).

Although Freshwater’s use of the word “here” may be novel (while entirely consistent with the third generation of anti-evolution tactics), the criticism it implies has already been considered and rejected by the scientific community. Arguing that “no one has seen evolution,” for example, misses the point about how scientists tests hypotheses. *See Nat’l Acad. Of Sciences* at 21. Scientists do not have to “see” atoms or the earth going around the sun; instead, they “infer that atoms exist and the earth revolves because they have tested predictions derived from these concepts by extensive observation and experimentation.” *Id.* Moreover, the effects of natural selection can be witnessed on a minor scale. For example, microorganisms with short generation times can demonstrate specific changes from immediately preceding generations. *Id.* This rapidity of evolution is “of great medical significance.” *Id.*

E. Freshwater’s Pedagogical Techniques Had A Demonstratively Negative Impact On His Students’ Understanding Of Science.

Freshwater’s pedagogical techniques were accompanied by real-world results: a detrimental impact on his students’ understanding of science.

The record in this case reflects that as early as 2002, the chair of the Mount Vernon High School science department recognized that students were being misinformed about evolution, and he suspected Freshwater was to blame. Ex. 5 (Hearing Tr. at 908:16-909:8). In addition, a high school science teacher who taught certain of Freshwater’s former students when they graduated to the ninth grade noticed that a number of these students had difficulties understanding the differences between a theory and a law, since they believed “that a theory is a guess and a law is true.” Ex. 4 (Hearing Tr. at 783:1-10). Some also brought with them “a misunderstanding about accuracy of dates in science” and “seem[ed] real uncomfortable with the

idea that we can say the earth is around 4.3 and 4.5 billion years” old. Ex. 4 (Hearing Tr. at 783:17-784:2). Others recalled debating evolution and creationism in Freshwater’s class, and noted that he provided “both sides” of the story in teaching evolution. Ex. 4 (Hearing Tr. at 784:3-10), Ex. 14 (Board Ex. 6 at Attachment 11).

In class, these students would often interrupt with critiques like “that’s not true, Mr. Freshwater said it’s not true” and comments such as “we can’t know what happened in the past because we weren’t there,” “carbon dating . . . isn’t accurate,” “[t]here’s no evidence for [the] Big Bang,” and “Romans killed the dinosaurs.” Ex. 4 (Hearing Tr. at 796:25-797:14). The high school teacher found it necessary to “reteach the science” Freshwater’s former students learned in his class before moving on to the ninth grade science curriculum. Ex. 4 (Hearing Tr. at 797:25-798:6).

In sum, Freshwater’s attempts to teach his students “alternatives” to evolution and to undermine its validity fit soundly within the long tradition of anti-evolution teachings that lack any basis in science or sound pedagogy. His students, however, still in the early stages of intellectual development, were susceptible to these teachings, because they came from their teacher, an authority figure and role model whose views they naturally would seek to emulate. *See Pelozo*, 37 F.3d at 522 ; *Edwards*, 482 U.S. at 584; *Webster*, 917 F.2d at 1007.

Unsurprisingly, the end result of such instruction was students who misunderstood the theory of evolution and even what a scientific theory is, who mistakenly believed that “theories” based in Biblical creationism are scientific alternatives to evolution, and who, quite literally, were taught to believe that dinosaurs roamed the earth along with humans.

The deleterious effect on science education of such sectarian teaching methods is perhaps most clearly seen in the conclusion one eighth grader reached after attending

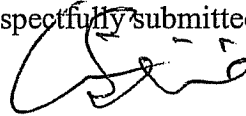
Freshwater's class: "you can't trust science because science can't tell you anything." Ex. 3 (Hearing Tr. at 671:25-672:25). Surely there is no valid pedagogical purpose in teaching students that science cannot be trusted.

CONCLUSION

Freshwater's classroom instruction and teaching methods concerning evolution have no basis in science and serve no valid pedagogical purpose. They are reflective of third generation anti-evolution efforts intended to devalue the theory of evolution in order to promote religious beliefs. Given the importance of evolution as a fundamental, unifying, explanatory theory and its well-established place in science education, Freshwater's teaching practices should not be tolerated. For all of the above reasons, the NCSE urges this court to uphold the decision of the court below.

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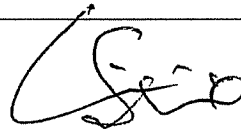
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National Center for Science Education

CERTIFICATE OF SERVICE

I, hereby certify that on this 10th day of January, 2012, I have caused a copy of the foregoing Brief of Amicus Curiae National Center for Science Education with exhibits cited therein to be served by first class mail, postage prepaid, on the following counsel for parties of record:

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