A Briefing Packet on Critical Analysis of Evolution

In this packet:

Teaching About Evolution in the Public Schools: A Short Summary of the Law

By Prof. David K. DeWolf, J.D., and Seth L. Cooper, J.D.

Few educational issues have sparked such continuing controversy and debate as the teaching of evolution. In the past, the debate has been polarized between those who advocate teaching only the positive case for evolution and those who ask either to remove evolution or from the curriculum or to require teaching some form of creationism alongside evolution. (By "evolution" we mean both neo-Darwinian evolutionary theory in biology and chemical evolutionary theories for the origin of the first life from non-living chemicals.) School boards have been forced to address concerns about good science education as well as conflicting claims about constitutional limitations. But in the last decade a new approach to teaching about evolution has been developed to meet the test of good science and satisfy the courts' standards of constitutionality. This new approach uses the phrase "teach the controversy." The idea is to use scientific disagreements over evolution to help students learn more about evolution, and about how science deals with controversy. According to this approach, students should learn the scientific case for evolution, but in doing so they should study the scientific criticisms of various aspects of evolutionary theory.

The Constitution permits scientific critiques of prevailing scientific theories.

It is clear from U.S. Supreme Court precedents that the Constitution permits both the teaching of evolution as well as the teaching of scientific criticisms of prevailing scientific theories. Those who would like to remove evolution from the curriculum altogether have been told in no uncertain terms that the right to teach about this subject is inherent in the First Amendment. (*Epperson v. Arkansas*, 1967) At the same time, the U.S. Supreme Court has made clear that criticism of the theory of evolution may also be a required part of the curriculum. In the case of *Edwards v. Aguillard* (1987), the Court explicitly stated: "We do not imply that a legislature could never require that scientific critiques of prevailing scientific theories be taught."

Public schools have broad discretion in developing curricula. Including more scientific information about evolutionary theory, even scientific information that raises questions about its explanatory power, can satisfy the goal of improving science education. Particularly where the effect of a "teach the controversy" approach is to help both advocates and critics of evolutionary theory to have a better understanding of the claims of evolutionary theory and its supporting evidence, the test of constitutionality can easily be met.

It is important to note that legal scholars and groups with differing views about evolution have conceded the constitutionality of presenting scientific criticisms of evolutionary theory. In 1995 a broad range of legal, religious and non-religious organizations (including the American Civil Liberties Union, Americans United for Separation of Church and State and the Anti-Defamation League) signed a statement called "Religion in the Public Schools: A Joint Statement of Current Law." The joint statement of over 30 organizations agreed that "any genuinely scientific

evidence for or against any explanation of life may be taught." (See http://www.aclu.org/ReligiousLiberty/ReligiousLiberty.cfm?ID=9007&c=139.)

At the same time, school boards and administrators need to bear in mind that any presentation of a science curriculum dealing with evolutionary theory should focus on scientific evidence and theories reasonably inferable from that evidence, rather than upon claims that rest upon religious beliefs. Resources discussing scientific criticisms of aspects of neo-Darwinian and chemical evolutionary theories include *Explore Evolution The Case For and Against Neo-Darwinism* (Hill house Publishers 2007, www.exploreevolution.com), the *Icons of Evolution Study Guide* and the DVD *Investigating Evolution.*

The Constitution prohibits the censoring of scientific ideas.

In *Epperson v. Arkansas* (1967), the Supreme Court stated that while shaping public school curricula is within a state's power, that power "does not carry with it the right to prohibit, on pain of criminal penalty, the teaching of a scientific theory or doctrine where that prohibition is based upon reasons that violate the First Amendment." To be sure, that case dealt with a statute that prohibiting the teaching of "…the theory or doctrine that mankind ascended or descended from a lower order of animals…" But the same principle could be applied to the prohibition of teaching any criticism of such a theory.

In his analysis of *Epperson*, Dr. Francis J. Beckwith stated the following: "the Court is not saying that publicly supported criticism of Darwinism (or evolution) is unconstitutional, but rather, that prohibiting academic discussion of these issues in the classroom—discussions necessary for the advancement of human knowledge—is inconsistent with the First Amendment if the prohibition has the effect of advancing sectarian religious or antireligious beliefs." (Francis J. Beckwith, *Law, Darwinism, and Public Education: The Establishment Clause and the Challenge of Intelligent Design* (Rowman and Littlefield, 2003), p. 12.)

Under *Epperson*, it is unconstitutional to exclude a theory simply because it is incompatible with the religious or anti-religious beliefs of a dominant group. At the same time, as noted above, curriculum must be chosen based upon the educational needs and resources available to the school board. Thus, the ideal standard for science education regarding evolutionary theory is to present both the case for mainstream evolutionary theory as well as the salient criticisms that are appropriate for the age group under consideration. Teaching students both the scientific strengths and weakness of neo-Darwinian and chemical evolutionary theories is consistent with academic freedom and avoids the problematic approach to the issue that the Court faced in Epperson.

States have called for critical thinking about evolutionary theory, following Congress's advice.

The No Child Left Behind Act (NCLB) required all states to implement state-wide science standards by the 2005-06 school year.

The Conference Committee Report of the No Child Left Behind Act of 2001 addressed the question of whether the implementation of state standards should result in a narrowing of science

education. The Report stated that where controversial topics like biological evolution exist, students should be able to "understand the full range of scientific views that exist."

Six states (Alabama, Minnesota, Missouri, New Mexico, Pennsylvania, South Carolina) currently have science standards that require learning about some of the scientific controversies relating to evolution. In a March, 2003 letter on science curriculum under NCLB, the Acting Deputy Secretary of the U.S. Department of Education stated that “The Department…embraces the general principles—reflected in the [NCLB report language]—of academic freedom and inquiry into scientific views or theories.” It also made clear that “The NCLB does not contain any language that requires or prohibits the teaching of any particular scientific views or theories either as part of a state’s science curriculum or otherwise…” (See: http://www.discovery.org/a/1899 and http://www.discovery.org/a/1897).

Questions about Evolution

Q: What should public schools teach about evolution and intelligent design?

Answer: *Students shouldn't be required to learn about intelligent design, but they should learn about the scientific strengths and weaknesses of Darwin's theory. And students and teachers certainly should have the academic freedom to raise honest questions about evolution. This is a common-sense approach that people from all sides should be able to accept.*

Explanation: The key public policy question today is not whether intelligent design should be required in classrooms (something even its major proponents don't want), *but whether scientists, teachers, and students should have the academic freedom to discuss the scientific evidence that challenges Darwin's theory as well as the evidence that supports it.* In short, the current public policy debate over the teaching of evolution is about *academic freedom and free speech.* Science journals are already filled with debates over whether microevolution can be extrapolated to explain macroevolution, whether random mutations are a true source of major evolutionary innovations, and whether a gradual Darwinian process can account for events in the history of life like the Cambrian explosion some 500 million years ago. If scientists can debate these issues in their science journals, why can't students discuss them in the classroom?

Q: Do you believe in evolution?

Possible Answers:

- *What do you mean by evolution?*
- *Yes, depending on what you mean by evolution.*
- *Yes, but not the Darwinian view that evolution is a blind and undirected process.*

Explanation: In order to answer a question you need to clearly understand what the question is. Evolution has several different meanings. Asking if someone believes in the generic term 'evolution' will not solicit a meaningful answer. There are three simple, but very different definitions of biological evolution. When speaking with people about the issue it is important to ask them which definition of evolution they are using:

- Species adapt and change over time;
- Common ancestry, all forms of life evolved from a single original life form;
- Natural selection acting on random mutation is the primary, unguided mechanism by which life forms have evolved.

No serious scientists disagree with definition #1.

There is some debate among scientists over definition #2.

Definition #3, commonly referred to as *Darwinian Evolution (Darwinism),* is a specific part of evolution of which a growing number scientists are becoming skeptical. In fact, more than 700 Ph.D. scientists (including science faculty at such institutions as MIT, University of Michigan, University of Georgia, Ohio State University, and Tulane) have signed a statement expressing their skepticism of the ability of random mutations and natural selection to account for the intricate complexity and diversity of life in the universe. So be sure you know what people mean when they say "evolution."

A Summary of Scientific Problems with Biological and Chemical Evolution

[1] Genetics: Mutations Cause Harm and Do Not Build Complexity.

- Darwinian evolution rests on the concept that random mutations propelled evolutionary advances. But observations of the world around us show that most mutations are harmful, and the rare mutations that are beneficial (such as those causing antibiotic resistance in bacteria) produce only minor changes within existing species.

- As biologist Lynn Margulis has said, "new mutations don't create new species; they create offspring that are impaired." Similarly, past president of the French Academy of Sciences, Pierre-Paul Grasse, contended that "[m]utations have a very limited 'constructive capacity'" because "[n]o matter how numerous they may be, mutations do not produce any kind of evolution."

[2] Biochemistry: Unguided and random processes cannot produce the complexity of biology.

- Our cells contain incredible complexity, similar to machine technology but dwarfing anything produced by humans. Cells use circuits, miniature motors, feedback loops, encoded language, and even error-checking machinery used to decode and repair our DNA.

- As two biologists wrote in *Annual Rev. of Genomics and Human Genetics*, "it remains a mystery how the undirected process of mutation, combined with natural selection, has resulted in the creation of thousands of new proteins with extraordinarily diverse and well optimized functions. This problem is particularly acute for tightly integrated molecular systems that consist of many interacting parts…"

[3] Paleontology: The fossil record generally lacks intermediate fossils.

- The fossil record's overall pattern is one of abrupt explosions of new biological forms, and possible candidates for evolutionary transitions are the exception, not the rule.

- This has been recognized by many paleontologists such as Ernst Mayr who explained in 2000 that "New species usually appear in the fossil record suddenly, not connected with their ancestors by a series of intermediates" or Niles Eldredge who observed that "there are all sorts of gaps: absence of gradationally intermediate 'transitional' forms between species, but also between larger groups—between, say, families of carnivores, or the orders of mammals … the higher up the Linnaean hierarchy you look, the fewer transitional forms there seem to be."

[4] Taxonomy: Biologists have failed to construct Darwin's Tree of Life.

- Biologists hoped that DNA evidence would reveal a grand tree of life where all organism are related. It hasn't. Tree describing the alleged ancestral relationships between organisms based upon one gene or biological characteristic very commonly conflict with trees based upon a different gene or characteristic.

- The eminent microbiologist Carl Woese explained that such "phylogenetic" conflicts can be seen everywhere in the universal tree, from its root to the major branchings within and among various taxa to the makeup of the primary groupings themselves.

[5] Chemistry: The Chemical Origin of Life remains an Unsolved Mystery.

- The mystery of the origin of life is unsolved and all existing theories of chemical evolution face major problems. Basic deficiencies in chemical evolution include a lack of explanation for how a primordial soup could arrive on the early earth's hostile environment, or how the information required for life could be generated by blind chemical reactions.

- As John Horgan, a writer for *Scientific American* wrote in 1995: "the origin of life … is by far the weakest strut of the chassis of modern biology." Similarly, Greg Easterbrook more recently comment in *Wired* magazine, "What creates life out of the inanimate compounds that make up living things? No one knows. How were the first organisms assembled? Nature hasn't given us the slightest hint. If anything, the mystery has deepened over time."

State Science Standards that Support the Critical Analysis of Evolution

Alabama

"[E]volution by natural selection is a controversial theory. ... Instructional material associated with controversy should be approached with an open mind, studied carefully, and critically considered." *Alabama State Board of Education, Resolution (Nov. 8, 2001), available at http://www.alsde.edu/html/boe_resolutions2.asp?id=309.*

Minnesota

"The student will be able to explain how scientific and technological innovations as well as new evidence can challenge portions of or entire accepted theories and models including... [the] theory of evolution...." *Minnesota Academic Standards, History and Nature of Science, Grades 9-12, available at tis.mpls.k12.mn.us/ Science.html (last visited Sept. 9, 2005).*

Missouri

"Identify and analyze current theories that are being questioned, and compare them to new theories that have emerged to challenge older ones (e.g., Theory of Evolution…)." *Missouri Science Standards, at http://www.dese.mo.gov/divimprove/curriculum/GLE/SciGLE_FINAL-4.2005.pdf.*

New Mexico

Students will "critically analyze the data and observations supporting the conclusion that the species living on Earth today are related by descent from the ancestral one-celled organisms." *New Mexico Science Content Standards, Benchmarks and Performance Standards, Standard II (Life Science) (Biological Evolution) (9), available at nmlites.org/standards/science/index.html (last visited Sept. 9, 2005).*

Pennsylvania

Critically evaluate the status of existing theories (e.g., germ theory of disease, wave theory of light, classification of subatomic particles, theory of evolution, epidemiology of aids). *Pennsylvania, Academic Standards for Science and Technology, Standard 3.2.12.*

South Carolina

"Summarize ways that scientists use data from a variety of sources to investigate and critically analyze aspects of evolutionary theory." *South Carolina Biology Science Standards, indicator B-5.6 available at: http://www.myscschools.com/offices/cso/standards/science/documents/ScienceStandardsNov182005trackingremovedwbiofootnote_000.doc*

State Standards that have been repealed

Ohio

"Describe how scientists continue to investigate and critically analyze aspects of evolutionary theory."
Ohio Science Standards, Life Sciences, Benchmark H. Adopted in 2002, repealed in 2006.

Kansas

"Regarding the scientific theory of biological evolution, the curriculum standards call for students to learn about the best evidence for modern evolutionary theory, but also to learn about areas where scientists are raising scientific criticisms of the theory. These curriculum standards reflect the Board's objective of: 1) to help students understand the full range of scientific views that exist on this topic, 2) to enhance critical thinking and the understanding of the scientific method by encouraging students to study different and opposing scientific evidence, and 3) to ensure that science education in our state is 'secular, neutral, and non-ideological.'"

"...Evolution is accepted by many scientists but questioned by some. The Board has heard credible scientific testimony that indeed there are significant debates about the evidence for key aspects of chemical and biological evolutionary theory. All scientific theories should be approached with an open mind, studied carefully, and critically considered. We therefore think it is important and appropriate for students to know about these scientific debates and for the Science Curriculum Standards to include information about them. In choosing this approach to the science curriculum standards, we are encouraged by the similar approach taken by other states, whose new science standards incorporate scientific criticisms into the science curriculum that describes the scientific case for the theory of evolution.

"We also emphasize that the Science Curriculum Standards do not include Intelligent Design, the scientific disagreement with the claim of many evolutionary biologists that the apparent design of living systems is an illusion. While the testimony presented at the science hearings included many advocates of Intelligent Design, these standards neither mandate nor prohibit teaching about this scientific disagreement."
"Rationale of the State Board for Adopting these Science Curriculum Standards," Kansas Science Education Standards, adopted November 2005. Repealed in 2007.

Sample State Academic Freedom Bills

Louisiana (2008)

http://www.legis.state.la.us/billdata/byinst.asp?sessionid=08RS&billid=SB733

SENATE BILL NO. 733 (Substitute of Senate Bill No. 561)

BY SENATORS NEVERS, CROWE, RISER AND THOMPSON

AN ACT

To enact R.S. 17:285.1, relative to curriculum and instruction; to provide relative to the teaching of scientific subjects in public elementary and secondary schools; to promote students' critical thinking skills and open discussion of scientific theories; to provide relative to support and guidance for teachers; to provide relative to textbooks and instructional materials; to provide for rules and regulations; to provide for effectiveness; and to provide for related matters.

Be it enacted by the Legislature of Louisiana:

Section 1. R.S. 17:285.1 is hereby enacted to read as follows:

§285.1. Science education; development of critical thinking skills

A. This Section shall be known and may be cited as the “Louisiana Science Education Act.”

B.(1) The State Board of Elementary and Secondary Education, upon request of a city, parish, or other local public school board, shall allow and assist teachers, principals, and other school administrators to create and foster an environment within public elementary and secondary schools that promotes critical thinking skills, logical analysis, and open and objective discussion of scientific theories being studied including, but not limited to, evolution, the origins of life, global warming, and human cloning.

(2) Such assistance shall include support and guidance for teachers regarding effective ways to help students understand, analyze, critique, and objectively review scientific theories being studied, including those enumerated in Paragraph (1) of this Subsection.

C. A teacher shall teach the material presented in the standard textbook supplied by the school system and thereafter may use supplemental textbooks and other instructional materials to help students understand, analyze, critique, and review scientific theories in an objective manner, as permitted by the city, parish, or other local public school board.

D. This Section shall not be construed to promote any religious doctrine, promote discrimination for or against a particular set of religious beliefs, or promote discrimination for or against religion or nonreligion.

E. The State Board of Elementary and Secondary Education and each city, parish, or other local public school board shall adopt and promulgate the rules and regulations necessary to implement the provisions of this Section prior to the beginning of the 2008-2009 school year.

Section 2. This Act shall become effective upon signature by the governor or, if not signed by the governor, upon expiration of the time for bills to become law without signature by the governor, as provided by Article III, Section 18 of the Constitution of Louisiana. If vetoed by the governor and subsequently approved by the legislature, this Act shall become effective on the day following such approval.

Missouri (2008)

http://www.house.mo.gov/billtracking/bills081/bills/HB2554.HTM

HOUSE BILL NO. 2554

94TH GENERAL ASSEMBLY

INTRODUCED BY REPRESENTATIVE COOPER (155).

Read 1st time April 1, 2008 and copies ordered printed.

D. ADAM CRUMBLISS, Chief Clerk

5620L.01I

AN ACT

To amend chapter 170, RSMo, by adding thereto one new section relating to teacher academic freedom to teach scientific evidence regarding evolution.

Be it enacted by the General Assembly of the state of Missouri, as follows:

Section A. Chapter 170, RSMo, is amended by adding thereto one new section, to be known as section 170.335, to read as follows:

170.335. 1. The state board of education, public elementary and secondary school governing authorities, superintendents of schools, school system administrators, and public elementary and secondary school principals and administrators shall endeavor to create an environment within public elementary and secondary schools that encourages students to explore scientific questions, learn about scientific evidence, develop critical thinking skills, and respond appropriately and respectfully to differences of opinion about controversial issues, including such subjects as the teaching of biological and chemical evolution. Such educational authorities in this state shall also endeavor to assist teachers to find more effective ways to present the science curriculum where it addresses scientific controversies. Toward this end, teachers shall

be permitted to help students understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of theories of biological and chemical evolution.

2. Neither the state board of education, nor any public elementary or secondary school governing authority, superintendent of schools, or school system administrator, nor any public elementary or secondary school principal or administrator shall prohibit any teacher in a public school system of this state from helping students understand, analyze, critique, and review in an objective manner the scientific strengths and scientific weaknesses of theories of biological or chemical evolution.

3. This section only protects the teaching of scientific information and this section shall not be construed to promote any religious or nonreligious doctrine, promote discrimination for or against a particular set of religious beliefs or nonbeliefs, or promote discrimination for or against religion or nonreligion.

4. No later then the start of the 2008-2009 school year, the department of elementary and secondary education shall notify all public school superintendents of the provisions of this section. Each superintendent shall then disseminate to all employees within his or her school system a copy of this section.

Florida (2008)

http://www.flsenate.gov/Session/index.cfm?Mode=Bills&SubMenu=1&BI_Mode=ViewBillInfo&BillNum=2692

SENATE BILL 2692

A bill to be entitled

An act relating to the teaching of chemical and biological evolution; providing a short title; providing legislative intent; defining the term “scientific information”; providing public school teachers with a right to present scientific information relevant to the full range of views on biological and chemical evolution; prohibiting a teacher from being discriminated against for presenting such information; prohibiting students from being penalized for subscribing to a particular position on evolution; clarifying that the act does not require any change in state curriculum standards or promote any religious position; providing an effective date.

Be It Enacted by the Legislature of the State of Florida:

Section 1. (1) This section may be cited as the “Evolution Academic Freedom Act.”

(2) As used in this section, the term “scientific information” means germane current facts, data, and peer-reviewed research specific to the topic of chemical and biological evolution as prescribed in Florida's Science Standards.

(3) The Legislature finds that current law does not expressly protect the right of teachers to objectively present scientific information relevant to the full range of scientific views regarding chemical and biological evolution. The Legislature finds that in many instances educators have experienced or feared

discipline, discrimination, or other adverse consequences as a result of presenting the full range of scientific views regarding chemical and biological evolution. The Legislature further finds that existing law does not expressly protect students from discrimination due to their positions or views regarding biological or chemical evolution. The Legislature finds that the topic of biological and chemical evolution has generated intense controversy about the rights of teachers and students to hold differing views on those subjects. It is therefore the intent of the Legislature that this section expressly protect those rights.

(4) Every public school teacher in the state's K-12 school system shall have the affirmative right and freedom to objectively present scientific information relevant to the full range of scientific views regarding biological and chemical evolution in connection with teaching any prescribed curriculum regarding chemical or biological evolution.

(5) A public school teacher in the state's K-12 school system may not be disciplined, denied tenure, terminated, or otherwise discriminated against for objectively presenting scientific information relevant to the full range of scientific views regarding biological or chemical evolution in connection with teaching any prescribed curriculum regarding chemical or biological evolution.

(6) Public school students in the state's K-12 school system shall be evaluated based upon their understanding of course materials through normal testing procedures. However, students shall not be penalized for subscribing to a particular position or view regarding biological or chemical evolution.

(7) The rights and privileges contained in this section apply when the subject of biological or chemical evolution is part of the curriculum. This section does not require or encourage any change in the state curriculum standards for the K-12 public school system.

(8) This section does not promote any religious doctrine, promote discrimination for or against a particular set of religious beliefs, or promote discrimination for or against religion or nonreligion.

Section 2. This act shall take effect October 1, 2008.

Sample School Board Policies

Grantsburg, Wisconsin (2004)
"Students shall be able to explain the scientific strengths and weaknesses of evolutionary theory. This policy does not call for the teaching of Creationism or Intelligent Design."

Ouachita Parish, Louisiana (2006)
http://www.opsb.net/downloads/forms/Ouachita_Parish_Science_Curriculum_Policy.pdf
Ouachita Parish Science Curriculum Policy Adopted November 29, 2006
RESOLUTION ON TEACHER ACADEMIC FREEDOM TO TEACH SCIENTIFIC EVIDENCE REGARDING CONTROVERSIAL SCIENTIFIC SUBJECTS:

WHEREAS, the Louisiana Constitution declares that among the legitimate ends of government is "to promote the education of the people" (1), and;

WHEREAS, Congress in 2001 declared that "Where topics are taught that may generate controversy (such as biological evolution), the curriculum should help students to understand the full range of scientific views that exist, why such topics may generate controversy, and how scientific discoveries can profoundly affect society." (2), and;

WHEREAS, the U.S. Supreme Court has declared that it is possible for "scientific critiques of prevailing scientific theories [to] be taught" (3), and;

WHEREAS, the Fifth Circuit Court of Appeals has found that it is legitimate for school districts to pass curricular policies for such purposes as advancing critical thinking, fostering informed freedom of belief, and to disclaim any intent to impose an orthodoxy of belief on students (4), and;

WHEREAS, diverse organizations including Americans United for Separation of Church and State and American Civil Liberties Union have acknowledged that "any genuinely scientific evidence for or against any explanation of life may be taught" (5), and;

WHEREAS, the Louisiana Board of Elementary and Secondary Education has promulgated certain Science Framework, and;

WHEREAS, the Louisiana Science Framework at page 11 holds that, "scientific information is continuously open to review and modification" (6), and;

WHEREAS, the Louisiana Science Framework at page 11 further states that, "for scientific ideas to become widely accepted, peers must review, analyze, and critique results" (7), and;

WHEREAS, the Louisiana Science Framework at page 19 declares that, "the process of scientific inquiry involves 'thinking critically and logically about the relationships between evidence and explanations, constructing and analyzing alternative explanations, and communicating scientific arguments'" (8), and;

WHEREAS, the Louisiana Science Framework at page 12 indicates that science should be "presented as a... continuing process for extending understanding of the ultimate, unalterable truth" (9), and;

WHEREAS, it has come to the attention of this Board that some science teachers in the parish school system are uncertain of what can be taught about particular scientific theories;

THEREFORE, the Board of Education of Ouachita Parish School District adopts the following policy and directs that it be inserted in the District's listing of curriculum and instruction policies which is posted online at www.opsb.net.

TEACHER ACADEMIC FREEDOM IN SCIENCE EDUCATION WHEN COVERING CONTROVERSIAL SCIENTIFIC SUBJECTS:

The Ouachita School District understands that the purpose of science education is to inform students about the scientific evidence and to help them develop critical thinking skills they need in order to become scientifically minded citizens. The District also understands that the teaching of some scientific subjects, such as biological evolution, the chemical origins of life, global warming, and human cloning, can cause controversy, and that some teachers may be unsure of the District's expectations concerning how they should present information on such subjects.
The District shall endeavor to create an environment within the schools that encourages students to explore scientific questions, learn about scientific evidence, develop critical thinking skills, and respond appropriately to differences of opinion about controversial issues. The District shall also endeavor to assist teachers to find more effective ways to present the science curriculum where it addresses scientific controversies. Toward this end, teachers shall be permitted to help students understand, analyze, critique, and review in an objective manner the scientific strengths and weaknesses of existing scientific theories pertinent to the course being taught.

Notes
(1) Louisiana Constitution, Preamble; (2) H.R. 1 – "No Child Left Behind Act of 2001": Joint Explanatory Statement of the Committee of Conference, Title I, Part A, item 78, edworkforce.house.gov; (3) *Edwards v. Aguillard*, 107 S.Ct. 2573, 2583 (1987); (4) *Freiler v. Tangipahoa Parish Board of Education*, 185 F.3d 337, 344-46 (5th Cir. 1999); (5) Joint Statement of Current Law on Religion in the Public Schools (4/12/1995) *Religion In The Public Schools: A Joint Statement Of Current Law* http://www.aclu.org/religion/schools/16146leg19950412.html (Accessed July 20, 2006); (6) Louisiana Science Framework, page 11; (7) Ibid; (8) Ibid, page 19; (9) Ibid, page 12.

Lancaster, California (2006)

LANCASTER SCHOOL DISTRICT SCIENCE PHILOSOPHY

The Science curriculum of the Lancaster School District is standards-based and reflects the fundamental belief, as stated in the 2004 Science Framework, "that all students can acquire the science knowledge and skills needed to succeed in the world that awaits them." To provide students with a high degree of science literacy the following expectations should be met:

The goal of science education is to encourage inquiry, investigation and understanding.
The domain of the natural sciences is the natural world. Science is limited by its tools—observable facts and testable hypotheses.

The character of science is open to inquiry. The curriculum promotes student understanding of how we come to know what we know and how we test and revise our thinking.

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

Students should learn that science never commits itself irrevocably to any fact, hypothesis, or theory, no matter how firmly it appears to be established. Evolution, then, should be taught as theory, as opposed to unalterable fact. Discussions that question the theory may be appropriate as long as they do not stray from the current criteria of scientific fact, hypothesis and theory. Science instruction must respect the private beliefs of students, but discussion in this regard should not be part of the science curriculum.

Students are given opportunities to construct the important ideas of science, which are then developed in depth, through inquiry and investigation.

The three basic scientific fields of study—earth, life and physical sciences—are taught and connections among them developed.

Science is presented with its applications in technology and its implications for society.
Science is presented in connection with the students' own experiences and interests, frequently using hands-on experiences that are integral to the instructional sequence.

Instructional strategies and materials allow several levels and pathways of access so that all students can experience both challenge and success.

Textbooks are the major, but not sole, source of the curriculum; everyday materials and laboratory equipment, video and software, as well as other printed materials such as reference books and periodicals provide a substantial part of the student experience.

Assessment programs should be aligned with the standards-based instructional program. Student performance and investigation play the same central role in assessment as they do in instruction.

What does the Discovery Institute's Center for Science and Culture recommend for science education curriculum?

As a matter of public policy, Discovery Institute *opposes* any effort 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 objectively.

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 on.

Six states (Alabama, Minnesota, Missouri, New Mexico, Pennsylvania, and South Carolina) have science standards that specifically require or encourage learning about scientific controversies relating to evolution. A seventh state (Texas) requires biology students to "analyze, review, and critique scientific explanations... as to their strengths and weaknesses," a standard that has been understood to apply to evolution as well as other theories.

Although Discovery Institute does not advocate requiring the teaching of intelligent design in public schools, it does believe there is nothing unconstitutional about voluntarily discussing the scientific theory of design in the classroom. In addition, the Institute opposes efforts to persecute individual teachers who may wish to discuss the scientific debate over design in an objective and pedagogically appropriate manner.

The U.S. Supreme Court in *Edwards v. Aguillard* strongly affirmed the individual teacher's right to academic freedom. It also recognized that, while the statute requiring the teaching of creationism in that case was unconstitutional, "…teaching a variety of scientific theories about the origins of humankind to schoolchildren might be validly done with the clear secular intent of enhancing the effectiveness of science instruction."

Public Opinion Surveys on Teaching Evolution

Zogby International Nationwide Poll, US Adults (2006)

QUESTION: Which of the following two statements come closest to your own opinion?	
Biology teachers should teach only Darwin's theory of evolution and the scientific evidence that supports it.	21%
Biology teachers should teach Darwin's theory of evolution, but also the scientific evidence against it.	69%
Neither/Not Sure	10%

Random sample of 1,004 American adults. Conducted by Zogby International on Feb.27-Mar. 2, 2006. Margin of error is +/- 3.2%.

Zogby International Poll, Ohio Adults (2006)

QUESTION: Which of the following two statements come closest to your own opinion?	
Biology teachers should teach only Darwin's theory of evolution and the scientific evidence that supports it.	19%
Biology teachers should teach Darwin's theory of evolution, but also the scientific evidence against it.	68.8%
Neither/Not Sure	12%

Random sample of 601 Ohio adults. Conducted by Zogby International on Feb.2-3 2006. Margin of error is +/-4.1%.

Steinberg Poll, Recent California Voters (2004)

QUESTION: Which statement comes closest to your view about what biology teachers in public schools should teach about Darwin's theory of evolution?	
Teach Only the Scientific Evidence FOR IT	16.5%
Teach The Scientific Evidence For AND Against IT	73.5%
Other/Unsure	10%

Random sample of 551 voters from California voters living in a household in which at least one voter voted in the November 2002 general election for governor and the October 2003 special election for governor. Conducted by Arnold Steinberg and Associates from March 8-18, 2004. The margin of error for the survey is +/- 4%.

Zogby International Poll, Texas Adults (2003)

QUESTION: Which of the following two statements come closest to your own opinion?	
Biology teachers should teach only Darwin's theory of evolution and the scientific evidence that supports it.	18%
Biology teachers should teach Darwin's theory of evolution, but also the scientific evidence against it.	76%
Neither/Not Sure	6%

Random sample of 600 Texas adults. Conducted by Zogby International from Aug. 25-Aug. 27, 2003. Margin of error is +/- 4.1%.

Zogby International Poll, Ohio Adults (2002)

QUESTION: Which of the following two statements come closest to your own opinion?	
Biology teachers should teach only Darwin's theory of evolution and the scientific evidence that supports it.	19%
Biology teachers should teach Darwin's theory of evolution, but also the scientific evidence against it.	65%
Neither/Not Sure	16%

Random sample of 702 Ohio adults. Conducted by Zogby International on May 7, 2002. Margin of error is +/- 3.8%.