



# Evolution, Creationism & Public Schools

*Surveying What Texas Scientists Think about Educating Our Kids in the 21<sup>st</sup> Century*





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By Professor Raymond A. Eve and Chawki A. Belhadi



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♦ F U N D ♦

*A Report from the*  
Texas Freedom Network Education Fund

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## AUTHOR'S PREFACE

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As a researcher who has studied the conflict over creationism and evolution for more than two decades – and as a resident of Texas with a vested interest in a strong public education system – I have for some time been aware of the brewing conflict over evolution at the Texas State Board of Education. When the Texas Freedom Network Education Fund approached me last year about surveying science faculty to find out what they think about this issue, I jumped at the chance. I did so thinking that otherwise the voice of scientists – a significant constituency in this debate – might be drowned out in the cacophony of political wrangling.

It is widely anticipated that the debate over curriculum standards for science education – particularly regarding instruction on evolution – will be subjected to unprecedented political pressures. Such a situation, of course, raises concerns for the scientific integrity of the results of the process. This is particularly true because the various political factions attempting to influence the outcome appear to have considerably better access to the mass media than has traditionally been the case for scientists. The purpose of the current report, then, is to let as many relevant scientists as possible have a voice in this debate through the mechanism of a questionnaire designed for such a purpose.

To be candid, I already suspected that the much ballyhooed lack of consensus and uncertainty about evolution held to exist among scientists is actually an illusion on the part of those making such a claim. Even in Texas, a state famous for conservative politics and religion, I suspected that almost no college or university faculty scientist would support the agenda of creationism and intelligent design advocates. Nor did I expect that they would perceive a need to highlight the “weaknesses” of evolutionary theory (at least not the weaknesses the proponents of intelligent design have in mind). As with credible science, however, one does not make good education policy based on guesses. So we set out to let faculty scientists speak for themselves.

I would very much like to thank Dr. Dan Bolnick from the University of Texas at Austin for acting as much of the catalyst for the initial decision by TFNEF to organize and fund this project. My thanks go out also to Dr. Shelley Smith, my colleague at the University of Texas at Arlington and a well-known biological anthropologist. Dr. Smith assisted

diligently with vetting the content of the survey seen in this report. I'd also like to recognize the co-author of this report, Chawki Belhadi, a master's degree candidate at UT-Arlington, without whose assistance on survey design, questionnaire distribution and statistical analyses this report might never have been completed.

I would also like to thank the Texas Freedom Network Education Fund for providing the resources and staff to take the lead in promoting this important effort to protect the integrity of science education in Texas, and thereby the futures of many of the young people of this state. I would especially like to thank Ryan Valentine, deputy director, for his tireless efforts to see this project through to the light of day. Further, thanks also should go out to Glenn Branch and Eugenie Scott of the National Center for Science Education for their reviews and suggestions as the survey was conceived and developed. I would like to acknowledge Professors David Hillis of University of Texas at Austin, Chris Nice of Texas State University-San Marcos and Alfred Gilman of UT Southwestern Medical Center for putting their lofty and unimpeachable credentials behind our initial solicitation of responses from their colleagues. It may be that many opinions would not have been seen here without the credibility of their participation.

And finally, I'd very much like to thank the survey respondents who gave freely of their time (often on weekends and holidays) to supply us with the feedback of those experts who deal with this issue daily in the trenches of the science classroom – where our hard-won knowledge of the ancient human past is disseminated well and tirelessly to the students of our state as they struggle to meet the stringent demands of science literacy that are so necessary for them to succeed in the 21<sup>st</sup> century.

Raymond A. Eve, November 2008



# INTRODUCTION

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In the spring of 2009, the Texas State Board of Education will vote to adopt new curriculum standards for the teaching of science in grades K – 12 in Texas public schools. (These guidelines are formally known as the Texas Essential Knowledge and Skills, or TEKS.) Many observers, both within Texas and around the country, anticipate a vigorous push by certain interest groups to make the debate over the Texas science curriculum the latest front in the running battle over evolution. The situation in Texas has a special significance because it will likely be the test case for the newest strategy in efforts to discredit or undermine the mainstream scientific consensus on evolution. Specifically, opponents of evolution, aided by conservative members on the state board, hope to force high school science classrooms to include a focus on the “weaknesses” of evolutionary theory. (Actually, advocates for this position commonly refer to “strengths and weakness,” but in reality that seems to be the end of any further mention of “strengths.”)

## ***From Scopes to Dover... to Texas?***

This “weaknesses” strategy has come to the forefront since 2005, a year that saw front-page coverage around the nation of the Kitzmiller vs. Dover Area School District (Pennsylvania) federal courtroom drama. In that trial, public school teacher Tammy Kitzmiller brought suit against the Dover school board for requiring that so-called “intelligent design” theory be presented as “an alternative explanation of human origins.” Proponents of intelligent design argue that life forms are so complex that they could not have evolved, but were instead created by an intelligent agent. They studiously avoid, however, any mention of God as that agent or religious terms in general when promoting the concept.

Dover’s intelligent design policy was intended as a challenge to the mainstream scientific consensus about evolution. Judge John E. Jones – a federal court judge appointed by George W. Bush – spared the defendants no degree of humiliation in his findings and soundly pronounced intelligent design to be a religious concept that was actually just the latest reconstituted form of creationism. In short, Judge Jones’ ruling made it clear that intelligent design is religion, not science, and that teaching it in public school science classrooms violates the Establishment Clause of the Constitution.

This defeat for intelligent design adherents was only the

latest in a long line of courtroom setbacks stretching back to the 1960s. The result of all these losses has been a steady tendency for creationists to sanitize their position of any reference to terminology such as God, the Bible, Scripture and the like – in the apparent hope that the courts will not notice the religious nature of their arguments.

After the setback in Dover, creationists and intelligent design advocates appear even to have abandoned the overt promotion of alternative explanations for human origins altogether – at least for now. Instead, the movement has rapidly shifted its focus to promoting a discussion of the “strengths and weaknesses” of evolutionary theory. (Note the use of the word “theory” – a word that is generally interpreted as a “hunch” or a “guess” by many in the general public. Scientists, on the other hand, typically mean by the term “theory” a set of previously supported facts that tidily fit together and allow for the deduction of new hypotheses.) Scientists have widely observed that the current discussion of “weaknesses” promoted by evolution opponents normally takes almost no notice of legitimate queries by mainstream contemporary researchers about the details of how evolutionary theory actually works.

The latest strategy does, however, share one element in common with its creationist and intelligent design predecessors. It rests upon the assumption that evolution is not, in fact, a settled issue in the scientific community. Instead proponents of the latest anti-evolution approach claim that there is an ongoing debate among scientists about the basic validity of evolution. It is further said that evolution is a “theory in crisis” and one that is rife with weaknesses. While clearly this position has gained some measure of support among the general public in the United States – and certainly among politicians (sometimes cynically, for its value as a “wedge issue”) – is it actually true that scientists question the fundamental validity of evolution? This argument that many professional scientists in relevant fields are dissidents who doubt the validity of evolution is so central to the position of the anti-evolutionists that we have chosen to make it the basic question that underlies this report. Instead of relying on conjecture, we have tried to enable Texas scientists to speak for themselves.

## ***The Survey: What Do Texas Scientists Really Think?***

In late fall 2007 and early spring of 2008, a lengthy survey



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(59 questions – some open-ended) was sent to 1,019 individual biology and biological anthropology faculty members from all 35 public universities plus the 15 largest private institutions in Texas. In the end 464 survey recipients submitted completed questionnaires. ***This represents better than a 45% response rate*** – almost unheard of for the remote return of a lengthy questionnaire of this type. The diversity of the response was also surprisingly robust, with respondents participating from 49 different institutions. Presumably this high response rate reflects the sense of eagerness and importance that the respondents attached to expressing their actual opinions on this issue. The overwhelming response rate provides the first unambiguous finding of this survey: we can now say with certainty that scientists are extremely invested in the issue of creationism/intelligent design generally and in the political debate over science standards in the state of Texas specifically. The following comment from a professor at Stephen F. Austin University in the east Texas city of Nacogdoches captures well the uneasiness and concern many scientists at Texas colleges and universities feel about the larger issue of science education in the state:

My students are woefully unprepared. They report that their high school teachers are often 1) afraid to teach evolution properly because of parent reaction, 2) unsupported by their principals and admin, who "let them slide," 3) ignorant of actual information on evolution, or 4) belligerently unwilling to teach the material and make snide comments about how their religion says evolution is for atheists. Their understanding of science as a whole is damaged by this environment.

### ***Survey Findings***

The report presented here is an overview of the findings from this survey of Texas science faculty. The opinions of our state's science faculty must surely be crucial to education policy makers and the State Board of Education. Texas scientists working today in areas that make them well-qualified to address the evolution issue almost unanimously, and strongly, reject any need to "teach the weaknesses" of evolutionary theory. Further, the claim of broad support in the science community for intelligent design/creationism so often trumpeted by evolution skeptics simply does not exist in the biology and biological anthropology departments at Texas colleges and universities. Depending on how one measures

faculty sentiment, only about 2 percent (or a little more) of Texas scientists express even the slightest sympathy toward creationism/intelligent design. (It is also worth noting that even among the small handful of intelligent design sympathizers in our sample, not one of them teaches even a single graduate class in which evolution is a component.) Indeed, an overwhelming percentage of our science faculty respondents believe discussion of the talking points put forward by creationism/intelligent design advocates should be specifically excluded from state science curriculum standards. A strong majority also worry that teaching alleged "weaknesses" of evolution is harmful to students' future prospects for college and 21<sup>st</sup>-century jobs.

It is no exaggeration to say that Texas colleges and universities have a world-class science faculty and boast some of the most respected science educators found anywhere. These scientists should be an invaluable resource in crafting curriculum standards that prepare Texas schoolchildren for college and for the jobs of tomorrow. But is anyone listening? The State Board of Education would do well to heed the advice from these professors. The science education of a generation of students hangs in the balance.

# TEXAS SCIENTISTS OVERWHELMINGLY REJECT INTELLIGENT DESIGN AS VALID SCIENCE

Science is a discipline which asks and seeks answers to questions about the natural world that can be falsified by experimental tests and measurements. By definition, science cannot and should not address questions in regards to religious faith, the existence of God or a supreme being as these things are immeasurable and therefore not valid scientific questions. Intelligent design is a matter of faith not science and therefore should be left to the theologians and not to biology teachers.

- Professor at University of St. Thomas (Houston)

Proponents of intelligent design regularly assert that a vigorous controversy over the validity of evolution exists among scientists who study human origins. Indeed, a recently released film that played to audiences around the country made this its central premise. The film, *Expelled*, attempted to argue that numerous qualified scientists have been expelled from academia due to their beliefs favoring intelligent design. The movie's central claims have been widely discredited, but the assertion that a significant percentage of mainstream scientists support intelligent design has remained a key weapon in the arsenal of evolution rejecters.<sup>1</sup> Scientists and science advocates have regularly disputed this notion, but until now there existed no formal published research quantifying exactly how much – or little – support exists among biology and biological anthropology faculty for intelligent design.

The verdict is in. The response to this survey unequivocally establishes that nearly all qualified scientists in Texas colleges and universities firmly support the current mainstream consensus on the validity of evolutionary processes and reject intelligent design as representing a scientifically credible alternative.

### Texas Scientists' Views on Evolution

When asked to "select the statement that most closely mirrors your view of evolutionary biology," the responses shown in the chart to the right clearly indicate that the vast majority of biologists and biological anthropologists who responded to the survey accept the main tenets of evolutionary theory.

<sup>1</sup>See *Expelled Exposed: Why Expelled Flunks*, a Web site created and maintained by the National Center for Science Education: [www.expelledexposed.com](http://www.expelledexposed.com), and *Skeptic Magazine*, Vol. 14, No.2.

### WHAT DO TEXAS SCIENTISTS THINK ABOUT EVOLUTION?

89.7%

"Modern evolutionary biology is largely correct in its essentials, but still has open questions for active scientific research."

8%

"Modern evolutionary biology is correct in some respects. While further scientific research will require some major alterations to current theory, these advances will not invoke intervention by any supernatural agent."

1.4%

"Modern evolutionary biology is right about the common ancestry of all extant organisms, but it is necessary to supplement it by invoking periodic intervention by an intelligent designer."

0.9%

"Modern evolutionary biology is mostly wrong. Life arose through multiple creation events by an intelligent designer, although evolution by natural selection played a limited role."

0.0%

"Modern evolutionary biology is completely wrong. Life was created essentially as we see it today."

## FINDING ONE

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Adding together responses to the final three categories should capture all faculty who regard creationism/intelligent design as a valid part of their explanation for human origins.

**Only about 2% of Texas science faculty, then, can properly be said to express any degree of sympathy for creationism or intelligent design.**

This is an important and resounding confirmation of what biologists often refer to as the “mainstream scientific consensus” surrounding evolution. In Texas that consensus approaches 98% of all faculty currently teaching in the field.

It is also interesting to note that this consensus remains strong even among instructors at private religious institutions. A solid 89.2% of faculty at religious colleges and universities (such as Baylor, Abilene Christian and Dallas Baptist) placed themselves in one of the first two categories, affirming their support for evolution.

These results are a direct rebuttal to claims that a substantial proportion of college and university faculty have serious doubts about the validity of evolution. Even in Texas, a state famous for conservative politics and religion, the science community is nearly unanimous in its rejection of intelligent design as valid science.

## EXAMINING THE CHARACTERISTICS OF THOSE WHO DO SUPPORT THE TEACHING OF INTELLIGENT DESIGN

What can we say about the small minority of Texas science faculty (2%) who evidence some measure of support for intelligent design/creationism? (For purposes of this analysis, intelligent design/creationist supporters are all respondents who indicated either “Modern evolutionary biology is right about the common ancestry of all extant organisms, but it is necessary to supplement it by invoking periodic intervention by an intelligent designer” or “Modern evolutionary biology is mostly wrong. Life arose through multiple creation events by an intelligent designer, although evolution by natural selection played a limited role.”)

The educational profile of this group is revealing. Ten supporters of intelligent design/creationism responded to the question, “Have you taught a course that included a substantial block of material on human evolution?”. Of the ten, seven persons replied “no,” as compared to three who replied “yes.” So we readily see that most intelligent design supporters identified in this survey do not teach courses that address evolution. **Even more strikingly, no person in the subsample of those supporting intelligent design reported teaching graduate students about human evolution within the past five years.** (Another way of phrasing this last point is to say that there was no person out of the total sample of 464 respondents who said they both supported intelligent design and had taught graduate students within the past five years.) We are therefore safe in concluding that the already thin support for teaching intelligent design vanishes to essentially zero when looking at established Texas biology and biological anthropology faculty who teach at the graduate level.

## FINDING ONE

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### ***Intelligent Design – Creationism or Science?***

Responses from Texas scientists debunk another oft-repeated claim by evolution opponents – specifically the claim that intelligent design is not a religiously based concept like creationism. This assertion holds no weight among the vast majority of Texas scientists. When asked whether there is a significant difference between “creationism” and “intelligent design,” scientists responded as follows:

IS THERE A SIGNIFICANT DIFFERENCE  
BETWEEN CREATIONISM AND  
INTELLIGENT DESIGN?

78.2% No difference between “creationism”  
and “intelligent design”

15.5% Yes, there is a difference

6.3% Not sure

Well over three-quarters of scientists working in relevant fields believe intelligent design to be a variation of traditional creationism.

This is a significant finding because it undercuts the crucial distinction intelligent design supporters must make in order to avoid legal censure. The courts have consistently ruled that teaching creationism in public schools is a violation of the Establishment Clause of the U.S. Constitution. If, therefore, intelligent design is indeed no different than creationism, it cannot be taught in a public school.

This is precisely what federal Judge John E. Jones ruled in the landmark *Kitzmiller vs. Dover (PA) Area School District* decision in 2005:

The overwhelming evidence at trial established that ID [intelligent design] is a religious view, a mere re-labeling of creationism, and not a scientific theory.

If intelligent design advocates hope for a more sympathetic reception in Texas than they received in Pennsylvania, this study makes clear that they will find precious little support in the Texas science community.

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## TEXAS SCIENCE FACULTY INSIST THAT NEITHER INTELLIGENT DESIGN NOR CREATIONISM BE TAUGHT IN SCIENCE CLASSES

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My daughter's high school biology teacher admitted to me that they don't even touch evolution for fear it will upset some parents. This is outrageous and totally unacceptable... The current generation of new students is less well prepared than our own generation, and they will be the ones who suffer in competition for jobs with students from other countries where this is not an issue. I find it amazing and unconscionable that we are even considering introducing non-science into the science classroom...

- Professor at University of Texas at El Paso

**W**hile evolution opponents often concede that their arguments have not swayed the mainstream science community to accept intelligent design (nor even come close – see Finding 1), many will nevertheless maintain that students should still be exposed to “both sides” of this debate. The “teach both sides” or “teach the controversy” argument, appealing to the public’s sense of fairness, has been a key political and public relations talking point. So how much credibility does it receive with those who teach biology at Texas colleges and universities? Do faculty surveyed in this study believe high school science teachers should teach intelligent design to Texas students?

### ***To Teach or Not to Teach***

Our survey asked science faculty about the extent to which they agreed with several statements, as measured on a scale of 1 (strongly disagree) to 5 (strongly agree). Disagreement meant that the respondent thought that the Texas State Board of Education should not allow creationism/intelligent design to be presented in public school science classrooms as scientifically credible.

The results of this question are summarized in the chart to the right.

It is important to note that the overwhelming majorities who oppose teaching all three varieties of creationist beliefs may actually understate to a degree scientists’ opposition to these views. A number of survey respondents indicated (in their open-ended responses) that they preferred to include

***To what extent do you agree with the following statements? The Texas State Board of Education should allow the following viewpoints to be presented in public school science classrooms as scientifically credible:***

**Young Earth Creationism (which holds that the earth is less than 10,000 years old and all species were created essentially as they are today)**

**98%** say they disagree with including this material in a biology classroom. A full 96.3% disagree strongly with teaching young Earth creationism. This compares to a mere 1.6% of Texas scientists who strongly agree or agree somewhat that it should be covered.

**Old Earth Creationism (which holds that the earth is ancient but that evolution occurs only within narrow/divinely ordained limits)**

**94%** disagree that old Earth creationism should be included, including 92% who disagree strongly with teaching this concept in a biology classroom. This figure can be compared with 3.4% who strongly agree or agree somewhat.

**Intelligent Design (which holds that some intelligent agent intervened in the creation or evolution of life)**

**92%** disagree that intelligent design should be presented as scientifically credible in a public school classroom. 89.4% strongly disagree with teaching it. We can compare this figure to the 5.3% who strongly agree or agree somewhat.

## FINDING TWO

instruction on creationism/intelligent design in order to overtly debunk such concepts.

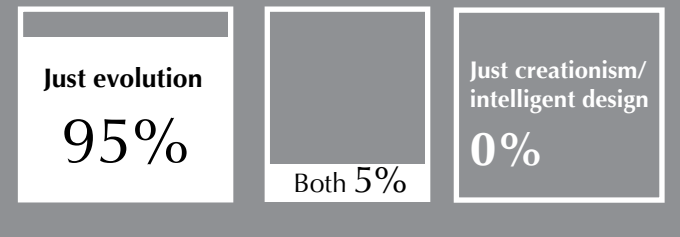
In all there were 23 respondents (out of a total of 436 in the sample who expressed an opinion) who answered “agree somewhat” (14 respondents) or “strongly agree” (9 respondents) when asked if the State Board of Education should allow intelligent design to be presented in a public school science class as scientifically credible. Seven members of the subsample were supporters of young Earth creationism – which holds the Earth to be less than 10,000 years old – and two more were “not sure” about this issue. So approximately a third of these intelligent design supporters also hold to scientific claims far outside the mainstream of current consensus about the age of the Earth.

Scientists in the survey were also asked if they would prefer to teach “just evolution,” “just creationism/intelligent design as a valid account of origins,” or “both.”

### TEACH WHAT CONTROVERSY?

Proponents of intelligent design often claim that all they want is to “teach the controversy” over evolution. Politicians, including President George W. Bush and Texas Governor Rick Perry, have also taken up this mantra, arguing that students should learn intelligent design alongside evolution in the classroom. The emergence of this tactic is not accidental. “Teach the controversy” has been vigorously promoted by the Seattle-based Discovery Institute, an intelligent design think tank handsomely funded by politically conservative benefactors. This new survey data should prove discouraging to the promoters of this claim because it exposes the “controversy” as a political fiction. The “controversy” is strictly a creation of intelligent design backers. There is, in fact, essentially no controversy in the mainstream science community.

### WHAT WOULD SCIENTISTS PREFER TO TEACH?



A solid 95% of respondents said that they would prefer to teach “just evolution.” The remaining 5% would prefer to teach both. Note that **no** respondent indicated a preference to teach “just creationism / intelligent design as a valid account of origins.” Further, detailed subsequent analyses indicated that some of the 5% who want to teach both were not now, nor ever had been, teachers who were expected to cover evolution as an appropriate topic in their courses. Therefore, as measured by this question, the percentage of relevant respondents is somewhat **below 5%** who would prefer to teach “both.” Even then, we can not rule out the possibility that some who would prefer to teach “both” wish to do so in order to debunk the claims made by opponents of evolution. **So the real number of Texas scientists who support the “teach both sides” argument cannot be more than 5% and is probably somewhat lower.**

It would seem clear that most biologists and biological anthropologists in Texas agree with the opinion expressed by a biology professor at the University of Texas at Austin:

Teaching science is critical and fundamental to education. Teaching logic and critical thinking is fundamental to education. “Intelligent Design” and “Creation Science” are neither scientific, logical, or examples of critical thinking. They represent dogmas with answers first, justification second. Science begins with questions and searches for understanding processes and implications.

No matter how the question was posed to our sample, no more than 5% express support for teaching any variety of creationism in science classrooms. Getting more than nine out of ten of scientists in a field to agree on anything is remarkable. These results represent a definitive rejection by scientists of the “teach both sides” argument.

# SCIENTISTS REJECT TEACHING THE SO-CALLED 'WEAKNESSES' OF EVOLUTION

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There aren't many (or maybe no) weaknesses in the basic tenets of evolution. It happens, it is the way the world of living things works, and presenting ideas as "weaknesses" distorts the truth. To be sure, there are areas and mechanisms left to be discovered, but the basic foundation is as solid as the sunrise.

- Professor at University of North Texas

The adoption of new science curriculum standards at the Texas State Board of Education in the spring of 2009 is shaping up to be the next showdown in the nation's long-running "evolution wars." Opponents of evolution will test their newest strategy – forcing public school students to learn about the "weaknesses" of evolutionary theory. Before looking at what scientists in our survey think about these so-called "weaknesses," it should be helpful to briefly review the history of creationists' strategy that led to the current debate over "weaknesses" in Texas.

### ***The Evolving Tactics of Creationism***

A succession of federal court cases in recent decades has forced evolution opponents to continue crafting new strategies for promoting creationism in public schools. Early efforts focused on expelling evolution from the science classroom altogether. In 1968, however, the U.S. Supreme Court in *Epperson v. Arkansas* threw out a state law that prohibited the teaching of evolution in public schools. The court agreed that the law was unconstitutionally based on religious opposition to evolution. Creationists then insisted that public school science classes give equal time to the study of evolution and of creation as described in the Bible. When federal courts ruled (as in *Daniel v. Waters*, 1975, in Tennessee) that teaching biblical creationism was also a violation of the First Amendment's Establishment Clause, creationists renamed the concept "creation science" and removed overt biblical references. The U.S. Supreme Court remained unconvinced, ruling in *Edwards v. Aguillard* (1987) that teaching creation science also violated the Establishment Clause. Following that landmark decision, creationists – with the help of the Seattle-based Discovery Institute – again pivoted and began

promoting the concept of intelligent design. In 2005, however, Pennsylvania federal court Judge John E. Jones III agreed in *Kitzmiller v. Dover Area School District* that intelligent design is essentially creationism dressed up in a lab coat. Judge Jones ruled that public schools may not teach this religious concept, regardless of its secular name.<sup>1</sup>

Even as intelligent design was going down in flames in Pennsylvania, however, creationists were already refining an alternate strategy: insisting that public schools teach what creationists claim are "weaknesses" of evolution (such as alleged "gaps in the fossil record" and other cases where creationists say evidence for evolution is lacking). In the late 1980s, the Texas State Board of Education actually approved new science curriculum standards requiring that students analyze the "strengths and weaknesses" of scientific theories. That language was the result of a compromise between supporters of evolution and creationists. Now creationists have made "weaknesses" the primary strategy for attacking the science behind evolution, and the coming battle over Texas science curriculum standards represents a key test case for this strategy. "I like the present language on strengths and weaknesses," Texas state board chairman Don McLeroy, R-Bryan, recently told one reporter.<sup>2</sup> He also told the *New York Times*: "Why in the world would anybody not want to include weaknesses?"<sup>3</sup>

<sup>1</sup>The first place intelligent design appears in a textbook is traceable to Texas. The Foundation for Thought and Ethics of Richardson, Texas, founded in the late 1990s, produced a book in 1999 entitled *Of Pandas and People*. (Presumably the title was chosen in partial retaliation for the famous biologist Stephen Jay Gould's very popular book entitled *The Panda's Thumb*. Indeed, it's possible that the Foundation hoped people might confuse the one book for the other). *Of Pandas and People* was a presentable biology textbook with just one problem. Near the end, the authors suddenly draw a line in the sand of human evolution and comment, in effect, that of course human evolution is too complicated to have occurred by chance alone. Instead, it was said to obviously reflect the will of a Designer. *Of Pandas and People* declined to name the designer (to do so would clearly violate the Establishment Clause once again). Consequently, the reader was left to fill in the word "God" for themselves. Not coincidentally, it was the second edition of *Pandas* that much of the controversy in the Dover trial nearly twenty years later centered around.

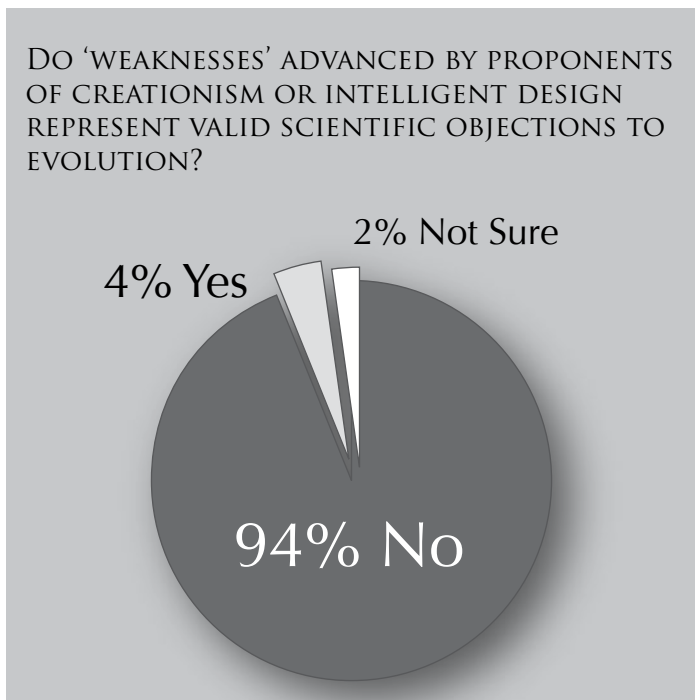
## FINDING THREE

The board's vice chairman, David Bradley, R-Beaumont, has echoed McLeroy's comments. "If some of my associates want to believe their ancestors were monkeys, that is their right. I believe God is responsible for our creation.... I do want to make sure the next group of textbooks includes the strengths and weaknesses of evolution."<sup>4</sup>

Creationists claim "weaknesses" of evolution are supported by mainstream scientific research. Yet no valid survey of biology researchers was available to confirm or disprove this claim. Our survey set out to determine whether biologists and biological anthropologists think that creationists' claims of "weaknesses" are valid science supported by mainstream research. We also sought to learn whether those scientists believe claimed "weaknesses" of evolution should be taught in public school science classrooms.

### A Weak Argument

When our survey asked whether "'weaknesses' in evolutionary theory advanced by proponents of creationism or intelligent design represent valid scientific objections," responses indicated strong opposition from biologists and biological anthropologists. In fact, **94% of Texas scientists indicated that claimed "weaknesses" are not valid scientific objections to evolution (with 87% saying that they "strongly disagree" that such weaknesses should be considered valid).**



Only 4.3% agreed either "somewhat" or "strongly" that weaknesses claimed by evolution opponents should be considered as valid challenges to the mainstream scientific consensus regarding evolution.

### Excluding 'Weaknesses' from Curriculum Standards

Our survey sought to learn more than simply what Texas biologists and biological anthropologists think about the "weaknesses" argument. The survey further queried respondents about whether the State Board of Education "should amend the [state's science] curriculum standards to **exclude** discussion of the 'weaknesses' of evolution as advanced by proponents of creationism and intelligent design theory."

Of all respondents, 67% said either that they strongly agree or agree somewhat with excluding such discussions. Another 6% said "not sure," while 13% replied they "disagree somewhat" and 15% of the respondents chose "strongly disagree."

Even here, we must consider the possibility that some giving a "disagree" answer actually did so because they would wish to be able to include discussion of the "weaknesses" in order to debunk such claims. Indeed, some open-ended comments from those who do wish to include discussion of "weaknesses" indicate that they hope to discredit such claims:

Perhaps dissecting a proposed "weakness" could be a good tool to demonstrate a flaw in the logic of the "weakness."

- Professor at University of Texas at Brownsville

We must again be mindful that respondents are likely making a meaningful distinction between legitimate scientific discussions on the one hand and creationist buzzwords on the other.

Clearly, the latest shift in strategy from promoting intelligent design to pushing "weaknesses" of evolution has not made any significant inroads into the science community. Just as with intelligent design, the vast majority of relevant university and college faculty in Texas do not buy into the "teach the weaknesses" concept now favored by supporters of

<sup>24</sup>Proposed standards would give evolution a boost," *The Associated Press* (story published by the *Houston Chronicle*), Sept. 24, 2008.

<sup>30</sup>Opponents of Evolution Are Adopting New Strategy," *The New York Times*, June 4, 2008.

<sup>40</sup>Intelligent Design? Ed board opposed," *The Dallas Morning News*, August 24, 2007.



### ARE SCIENTISTS OPPOSED TO CRITICAL THINKING?

Creationists often accuse scientists – and other opponents of teaching intelligent design or “weaknesses” of evolution – of being dogmatic or closed-minded. They further charge that by withholding creationist claims in high school science classrooms, such scientists oppose helping students develop critical thinking and analytical skills. The results of our survey do not support that contention. The survey asked respondents: “To what extent do you agree that the Texas State Board of Education should explicitly encourage coverage in high school classrooms of areas of genuine uncertainty and active research within the scientific community regarding evolution (e.g., whether speciation can occur sympatrically, neutral theory, punctuated equilibrium)?”

- Nearly 85% of faculty either agreed somewhat or agreed strongly.
- Just under 11% disagreed somewhat or strongly.
- 4.5% said they were “unsure.”

An overwhelming majority of scientists surveyed here are not “closed-minded” about addressing legitimate areas of active research in the classroom. Scientists do, however, recognize a clear distinction between scientifically valid research and “weaknesses” of evolution advanced by creationists and advocates of intelligent design.

creationism. The fact that scientists make a distinction between truly scientific evidence and what they consider phony arguments against evolution was clear in this comment submitted by a professor at the University of North Texas:

Teachers, students and the general public should be aware that scientist[s] always strive to evaluate scientific findings. The goal is to increase our understanding of the natural world by critical analysis, discussion and peer review. Thus, the term “weakness” is not valid in terms of discussions regarding evolution. Rather, scientists discuss evidence, conclusions, interpretations of the conclusions, and next scientific approaches and studies. This approach will increase our understanding of the natural world.

A biology professor at Texas A&M University goes even further and pronounces the alleged “weaknesses” of evolution a political argument – not a scientific one:

“Strengths and weaknesses” exist in any scientific theory or paradigm. Scientific skepticism and challenging is central to how science gets done. But this component of scientific methodology is being exploited by the creationists/ID types to attempt to insert their ideas into the curriculum. These attempts are not being done in the professional scientific realm, where they are supposed to be done, but in the political realm, so their approach is a distortion of how science reaches a consensus of understanding. I don’t hear calls for discussion of the “strengths and weaknesses” of quantum theory, or gravitational cosmology.

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### TEXAS SCIENCE FACULTY BELIEVE THAT EMPHASIZING ‘WEAKNESSES’ OF EVOLUTION WOULD SUBSTANTIALLY HARM STUDENTS’ COLLEGE READINESS AND PROSPECTS FOR 21<sup>ST</sup> CENTURY JOBS

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A precise understanding of evolution will be critical for achieving energy independence, new drugs for the treatment of drug resistant bacteria and [an] understanding [of] the species to species jumps of bird flu and cancer. You need to know evolution to be [a] player in the next century. Failure on this account will mean that the next generation of research breakthroughs will be coming from China and India and not the US.

- Professor at Rice University

In 1987 the primary author of this report wrote a book (with Dr. Francis B. Harrold) that was entitled *Cult Archaeology and Creationism: Understanding Pseudoscientific Beliefs about the Past*. We presented findings in that volume documenting a massive ignorance among samples of college students regarding minimal scientific literacy and even a basic understanding of the ancient human past. As a result, we concluded that “if a foreign power had done this to the minds of our nation’s children, Americans would consider it an act of war.” The rhetoric seems excessive at first encounter, but upon consideration such ignorance can in fact be expected to rob many young people of both prestige and livelihood at the most fundamental level. It has recently become commonplace among those who write about science to note that biology will be to the United States in the 21<sup>st</sup> century what the space program was in the 20<sup>th</sup> century.

#### ***The Importance of Evolution***

About 1960, as a result of lagging behind the Soviet Union’s space program, the United States committed itself to the improvement of basic science education in all areas of science, including biology. The National Science Foundation (NSF) hired the best minds it could find to revise textbooks and curricula in various high school science courses so that the youth of the nation would remain competitive in a globalizing economy. In the area of biology, NSF largely provided the impetus that led to the creation of the Biological Sciences Curriculum Study (or BSCS), which is still with us today. The BSCS was quick to note that the teaching of biology simply made little or no sense if taught as a mere collection of discrete facts. Unless one hung all these facts on some coherent framework, then the study of biology was

hopelessly about the rote memory of complex, confusing and isolated facts. The coherent framework that makes these facts all hang together is, of course, evolution. The courts have even acknowledged this unique importance of evolution. In the 1982 *McLean v. Arkansas Board of Education* decision that rejected the equal treatment of creationism alongside evolution, a federal court held that equal treatment of creationism would:

...have serious and untoward consequences for students, particularly those planning to attend college. Evolution is the cornerstone of modern biology, and many courses in public schools contain subject matter relating to such varied topics as the age of the earth, geology and relationships among living things. Any student who is deprived of instruction as to the prevailing scientific thought on these topics will be denied a significant part of science education.

That statement is at least as true today as it was at the time.

#### ***Handicapping Students***

Science faculty at institutions of higher education are uniquely positioned to fairly assess students’ readiness for college. The results of our survey indicate a significant concern among Texas scientists about how changes to the science curriculum standards will affect prospects for their students. We asked, “To what extent do you agree that teaching high school students that these ‘weaknesses’ are scientifically valid impairs their readiness for college?” **79.6% of the respondents either agreed strongly or agreed somewhat**

## FINDING FOUR

**that presentation of presumed “weaknesses” of evolution in a high school classroom will impair students’ readiness for college**, as compared to 15.5% who think students will not be harmed by these discussions. This is a particularly noteworthy finding given that many of the scientists who responded to the survey sit on admissions committees at Texas colleges and universities, where they are charged with evaluating the college readiness of students who apply for admission. Parents who care about prospects for their children’s education might wish to take note – nearly eight out of ten Texas professors believe teaching alleged “weaknesses” of evolution handicaps students’ ability to succeed in college classrooms.

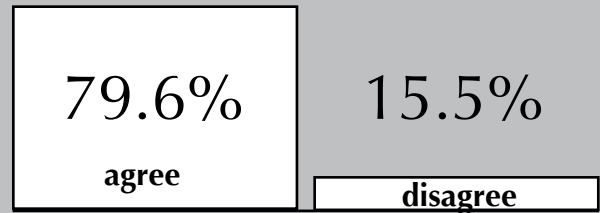
Scientists in our survey are also concerned about the effect of a watered-down evolution curriculum on students’ prospects in the workforce. We asked our respondents, “To what extent do you agree that teaching high school students that these ‘weaknesses’ are scientifically valid impairs their ability to compete for 21<sup>st</sup> century jobs?” **72% of respondents said they either strongly agreed or agreed somewhat that teaching high school students about presumed “weaknesses” will impair their ability to compete for 21<sup>st</sup> century jobs**, while 16.3% do not.

This question about 21<sup>st</sup> century jobs is not merely an academic one. Already it is easy to see some nations in Europe and the Pacific Rim challenging – and beginning to surpass – the United States in job growth related to new fields of biology, such as stem cell research and recombinant DNA exploration. The major growth areas of the current U.S. economy are the service sector and the high technology sector. Unfortunately, the largest majority of new jobs in the service sector tend to be of a low-wage character (food workers, remodeling jobs, etc.), meaning science and technology jobs represent the real core of high-paying, new job growth. Consequently, if our children are to remain competitive, they need first-rate exposure to biology – and this will inevitably require them to have a detailed familiarity with the principles of evolution.<sup>1</sup>

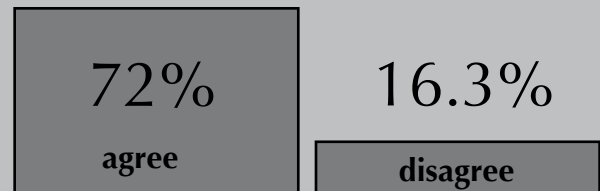
Clearly a very large majority of the Texas scientists in our survey think that including a discussion of the so-called “weaknesses of evolutionary theory” would do real harm to

<sup>1</sup>For a fuller treatment of the exploding need for highly skilled workers in biology and related areas, see the latest data in the National Science Foundation’s “Science and Engineering Indicators” – found at: <http://www.nsf.gov/statistics/seind08/>.

### TEACHING ‘WEAKNESSES’ OF EVOLUTION IMPAIRS COLLEGE READINESS



### TEACHING ‘WEAKNESSES’ OF EVOLUTION IMPAIRS ABILITY TO COMPETE FOR 21<sup>ST</sup> CENTURY JOBS



their students. Indeed, there seems to be real concern among scientists that this latest creationist strategy creates distrust among children for science in general, as this comment from a professor at the University of Mary Hardin-Baylor indicates:

Students who have discussed the “weaknesses” of evolution with me want to believe evolution is wrong because of their religious convictions. They generally have a distrust of all science because they perceive scientists as trying to eliminate God. I fear the addition of the “weaknesses” of evolution to high school science standards will simply add credibility to their distrust of science.

Such an outcome would be a real tragedy. The science community is rightfully alarmed that an entire generation of students might be taught that science is not reliable, or worse, that it is something to be feared. As the survey responses suggest, such a situation would be likely to create tangible and lasting damage to Texas students’ prospects for the future.

## TEXAS SCIENTISTS STRONGLY BELIEVE THAT SUPPORT FOR EVOLUTION IS COMPATIBLE WITH RELIGIOUS FAITH

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When a faith-based doctrine is taught as though it represents science, both faith and science suffer. It is important for students to fully appreciate that science is not devised to support or refute their religious beliefs.

- Professor at Southern Methodist University

“Can one be a good Christian and still believe in evolution?” Hearing that question at the beginning of each semester is not unusual for those who teach university courses that include information on human evolution. The question seems to reflect a fairly common concern among students, as well as the general public, that science and faith are incompatible. Indeed, it is not all that unusual to find anti-evolution commentators arguing that science itself is somehow intrinsically hostile to faith. Numerous politicians have seized on this divisive argument in their attacks against evolution. During the debate over evolution in the Kansas science curriculum standards in 2005, Kansas State Board of Education Chairman Steve Abrams made clear that he views science and religious as adversaries:

At some point in time, if you compare evolution and the Bible, you have to decide which one you believe.<sup>1</sup>

Texas State Board of Education Chairman Don McLeroy adopted a similar position when explaining his 2003 vote against proposed new biology textbooks that did not water down discussions of evolution:

It was only the four really conservative, orthodox Christians on the board [who] were willing to stand up to the textbooks and say they don't present the weaknesses of evolution.<sup>2</sup>

Both of these politicians depict the relationship between evolution and faith as a clash of irreconcilable worldviews. Some opponents of evolution go even further and argue that scientists are committed to an agenda intended to destroy faith. Is this true? Do most scientists believe that an acceptance of evolution requires students to abandon their faith? Like many of the popular myths surrounding this issue, it is clear from the data below that Texas science faculty members do not fit the stereotype proffered by opponents of evolution.

### *Religion Versus AND Science*

Despite arguments by evolution opponents that one cannot be a "good Christian" and still accept evolution as valid, our survey failed to find a hostility to faith among scientists. In fact, more than nine out of ten scientists surveyed endorse the compatibility of religious faith and evolutionary biology. When asked if it is "possible for someone who accepts evolutionary biology to have religious faith," 74.4% strongly agreed, and 16.6% agreed somewhat, for a total of 91%. Only 3.5% of respondents disagreed strongly, and a further 2.8% disagreed somewhat.

Although Americans have been repeatedly subjected to the claim that "you can't be a Christian and believe in evolution," the data above make it clear that this statement is soundly rejected by all but a very small number of the Texas scientists surveyed. Several scientists chose to elaborate on this very point in the open-ended response portion of the survey. A number of respondents made a clear distinction between the domains of science and faith, adopting the position of famous biologist Steven J. Gould's "Non-overlapping

<sup>1</sup>"Finding a Middle Ground," *Topeka Capital-Journal* (Kansas), September 28, 2005.

<sup>2</sup>From a presentation Don McLeroy delivered in 2005 at Grace Bible Church in Bryan, Texas, on the debate over teaching intelligent design. An audio recording and transcript of the lecture are available at <http://www.tfn.org/site/PageServer?pagenamemclerolyecture>.

## FINDING FIVE

Magisteria,” in which Gould argues that there is no inherent conflict between science and religion.<sup>3</sup> One professor from Angelo State University put the matter this way:

I firmly believe that a belief in evolution (as I have) and a faith in a higher being are not mutually exclusive. However, I also firmly believe that in “science” classes one teaches only “science.” Creationism and Intelligent Design are, by definition, not “science.” They are not testable. Teach science in public schools. Teach faith and religion in church and/or at home.

A professor from Texas A&M echoed that point:

It needs to be pointed out that scientists operate by testing hypotheses. Any statement that explains everything, such as “God made it that way,” is not a legitimate hypothesis. I don’t have a problem with people believing that God created everything, but their religious beliefs should not be taught in schools as valid science.

Yet others, such as a professor from Baylor University, made the point that many scientists themselves hold to a religious belief and have no conflict also accepting evolution:

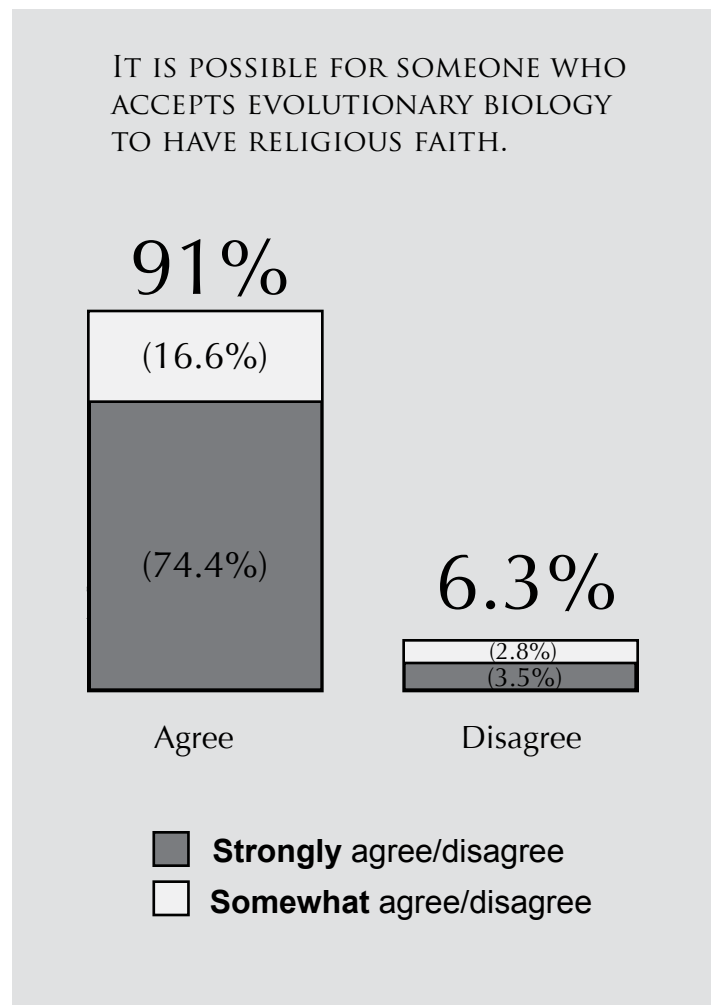
The problem is not in the teaching of evolution but that the public perceives evolution as a direct attack on the existence of God or that God played an active role in the creation of the universe, life, etc. God and evolution are completely compatible – evolution is not the origin of life, but rather the origin of species. I would personally like to see schools teaching students the difference between science and faith, and their respective strengths and weaknesses (i.e., what science cannot answer, etc). To me, an understanding of evolution has strengthened my faith but only because I was not forced to choose God or chimps. Science must do a better job of teaching evolution in a manner that does not threaten people’s personal beliefs in God. This will be a slow process that must also be supported in churches.

### Challenging the Stereotype

Religious denominations and people of faith have moved in recent years to push back against the stereotype that faith is hostile to science. One example of such pushback is the Clergy Letter Project.<sup>4</sup> The Clergy Letter Project has gathered more than 12,000 signatures from Christian and Jewish clergy on a petition that states that “evolution is a foundational scientific truth” and it can comfortably coexist with religious belief. It appears that these clergy have a strong ally in their cause among scientists at Texas institutions of higher learning. Like these religious leaders, an enormous majority of Texas scientists do not feel that there is any need to fear that science and religion are in some way incompatible.

<sup>3</sup>Nonoverlapping Magisteria,” *Natural History* 106 (March 1997): 16-22.

<sup>4</sup>For details of the Clergy Letter Project, see: [http://www.butler.edu/clergyproject/rel\\_evolution\\_sun.htm](http://www.butler.edu/clergyproject/rel_evolution_sun.htm)



## APPENDIX : RESEARCH METHODOLOGY

In the summer of 2007, Raymond A. Eve, Ph.D., one of the authors of this report, was approached by the Texas Freedom Network Education Fund (TFNEF) to conduct an unbiased survey of faculty who teach human evolution at Texas colleges and universities. TFNEF intended the survey to evaluate faculty views about the level of preparation of incoming college students for college level biology courses and, more specifically, their preparation for courses on evolution. Additionally, the survey asked science faculty about their attitudes toward controversies involving evolution, creationism and intelligent design, particularly pertaining to the affect of that debate on the public school science curriculum in Texas.

With the help of TFNEF staff and graduate students acting as interns, we collectively compiled contact information for all faculty members who teach either biology or biological anthropology at 50 Texas institutions of higher learning. (Biological anthropologists specialize in the study of the evolution of ancient hominids and often teach courses that include human evolution.) The final list included 1,019 individual faculty members from all 35 public universities and the 15 largest private institutions in the state. (See full list at right.)

On October 22, 2007, TFNEF sent a 59-question survey to this full list of 1,019 names. An electronic version of the survey went out to all who did not respond to the initial mail survey. The survey was closed on January 30, 2008.

In the end, we received 464 completed questionnaires. This represents **better than a 45% response rate** – almost unheard of for the remote return of a lengthy questionnaire of this type. The diversity of the response was also extremely robust, with respondents from 49 different institutions. (Only Sul Ross State University was unrepresented among the 50 institutions included in the sample.) Presumably this high response rate reflects the sense of eagerness and importance that the respondents attached to expressing their actual opinions on this issue.

The report authors at the University of Texas at Arlington entered all responses into the Statistical Package for the Social Sciences (SPSS). All statistics and accompanying analyses found in this report have been drawn from this data set. While not appearing in detail here, the findings were sub-

jected to advanced parametric and nonparametric analyses, including relevant measures of strength of association and examination of levels of statistical significance. Where these are relevant, they are discussed in lay terms in the body of the report.

It should be noted here that this survey is funded by the Texas Freedom Network Education Fund. While the research process was reviewed and approved by the human subjects review board of the University of Texas at Arlington, the funding, the actual conduct of the survey and the interpretation of the results are solely due to, and the responsibility of, the authors of this report and the Texas Freedom Network Education Fund and do not necessarily reflect the opinion of the University of Texas at Arlington.

### Texas Colleges & Universities Surveyed\*

01. ABILENE CHRISTIAN UNIVERSITY
02. ANGELO STATE UNIVERSITY
03. BAYLOR UNIVERSITY
04. DALLAS BAPTIST UNIVERSITY
05. HARDIN-SIMMONS UNIVERSITY
06. HOUSTON BAPTIST UNIVERSITY
07. LAMAR UNIVERSITY
08. MIDWESTERN STATE UNIVERSITY
09. OUR LADY OF THE LAKE UNIVERSITY
10. PRAIRIE VIEW A&M UNIVERSITY
11. RICE UNIVERSITY
12. SAM HOUSTON STATE UNIVERSITY
13. SOUTHERN METHODIST UNIVERSITY
14. ST. EDWARD'S UNIVERSITY
15. ST. MARY'S UNIVERSITY
16. STEPHEN F. AUSTIN STATE UNIVERSITY
17. SUL ROSS STATE UNIVERSITY
18. SUL ROSS STATE - RIO GRANDE COLLEGE
19. TARLETON STATE UNIVERSITY
20. TEXAS A&M UNIVERSITY
21. TEXAS A&M UNIVERSITY - COMMERCE
22. TEXAS A&M UNIVERSITY - CORPUS CHRISTI
23. TEXAS A&M UNIVERSITY - GALVESTON
24. TEXAS A&M INTERNATIONAL
25. TEXAS A&M UNIVERSITY - KINGSVILLE
26. TEXAS A&M UNIVERSITY - TEXARKANA
27. TEXAS CHRISTIAN UNIVERSITY
28. TEXAS SOUTHERN UNIVERSITY
29. TEXAS STATE UNIVERSITY
30. TEXAS TECH UNIVERSITY
31. TEXAS WOMAN'S UNIVERSITY
32. TRINITY UNIVERSITY
33. UNIVERSITY OF HOUSTON
34. UNIVERSITY OF HOUSTON - CLEAR LAKE
35. UNIVERSITY OF HOUSTON - DOWNTOWN
36. UNIVERSITY OF HOUSTON-VICTORIA
37. UNIVERSITY OF MARY HARDIN-BAYLOR
38. UNIVERSITY OF NORTH TEXAS
39. UNIVERSITY OF ST. THOMAS
40. UNIVERSITY OF THE INCARNATE WORD
41. UNIVERSITY OF TEXAS - ARLINGTON
42. UNIVERSITY OF TEXAS - AUSTIN
43. UNIVERSITY OF TEXAS - BROWNSVILLE
44. UNIVERSITY OF TEXAS - DALLAS
45. UNIVERSITY OF TEXAS - EL PASO
46. UNIVERSITY OF TEXAS - PAN AMERICAN
47. UNIVERSITY OF TEXAS - PERMIAN BASIN
48. UNIVERSITY OF TEXAS - SAN ANTONIO
49. UNIVERSITY OF TEXAS - TYLER
50. WEST TEXAS A&M UNIVERSITY

\* RESPONSES RECEIVED FROM FACULTY AT ALL INSTITUTIONS EXCEPT SUL ROSS STATE UNIVERSITY

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