

Keeping Science & Religion Separate in Schools:

The Vigil after Dover

A Free Public Forum, May 17, 2006, Florida State University

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[crowd noise]

Deborah Blum (moderator): Welcome. Welcome to tonight's forum and panel discussion, "The Vigil after Dover." My name is Deborah Blum. I will be moderating this event, and I'd like to begin with some special thanks and a couple of announcements. We owe a debt of gratitude to our sponsors: the Florida State University Office of Research and the University Research Magazine Association in conjunction with the Tallahassee Scientific Society in celebration of URMA, that's the University Research Magazine Association's, 25th Anniversary conference, being held this week at Florida State. We welcome URMA members representing 42 institutions from the University of Saskatchewan to the University of Puerto Rico.

For those of you who are arriving late, there is an overflow room for this meeting; it's room 1200. There are people outside this room who can direct you there. For those of you in this room, and that room, the last half hour of this meeting is dedicated to questions from the audience. We have microphones at the back of these two aisles, so that if you want to ask a question, you need to go to those microphones in order to be recorded, in order to be part of the webcast, and in order to be heard in the overflow room.

For anyone who is in the overflow room now listening to me, if you think of a question you want to ask, at that point you should come to this room and line up at one of the microphones.

With that, I'm going to introduce our very distinguished panel, (and) give a brief statement of introductions. This particular forum is designed something along a Science Friday-type format, that is, it is unrehearsed. I will be asking our panelists questions, and they will spontaneously come up with brilliant answers or be booted off the panel.

[laughter]

Unidentified Panelist: American Idol.

[laughter]

Deborah Blum: Right. We'll be voting intermittently.

So, what I want to (do is) begin by introducing them from my left here and just going down (the row).

John Haught is a distinguished research professor at Georgetown University, an internationally known theologian, (and) an expert on topics related to science, theology and

ecology. He is the author of *God After Darwin: A Theology of Evolution; Science and Religion: From Conflict to Conversion*; (and) *Mystery and Promise: A Theology of Revelation*.

Eugenie Scott. Eugenie Scott is the executive director of the National Center for Science Education in Berkeley, California, a nationally acclaimed activist organization in favor of teaching evolution in the nation's science curriculum. She received her Ph.D. in physical anthropology from the University of Missouri and has worked as both a researcher and activist for more than two decades. Everyone from the American Humanist Association to the National Science Board has honored her work, supporting not only the teaching of evolutionary theory but (also) the raising of standards of science education.

[applause]

Deborah Blum: Now, I've lost my next thing. Robert Pennock, who – I've just managed to scramble up my introductions here – Robert Pennock is a professor of philosophy and engineering and computer science and science at Michigan State University. He is (a) widely known philosopher of science, he does experiments with digital evolution and he was an expert at the court case in question, *Kitzmiller v. the Dover School Board*.

Who's next? Dean Travis. Dean Joseph Travis is dean of the College of Arts and Sciences at Florida State University and the Robert O. Lawton Distinguished Research Professor in the Department of Biological Science. He is an evolutionary biologist and studies the ways in which natural selection plays a role in shaping the size, the life history and the sexual behavior of a wide variety of species.

Michael Ruse is a professor of philosophy, and – like everyone on this panel really – (is) one of the country's leading scholars in exploring the connections and disconnections between science and religion. He is a fellow of both the Royal Society of Canada and the American Association for the Advancement of Science. He was instrumental in the 1980s' creation science trials in helping the courts define or establish a definition for science. He is the author of last year's *The Evolution-Creation Struggle* and of a book to be published in July, *Darwinism and its Discontents*. And I should mention that he and Dean Travis are collaborating on the *Harvard Companion to Evolution*, which they've promised me will be out next year. Or which we hope will be out next year.

[laughter, applause]

Deborah Blum: And finally, last but not least: Professor

Steven Gey is the David and Deborah Fonvielle and Donald and Janet Hinkle Professor of Law at Florida State's College of Law. Considered one of the country's leading scholars on religious liberties and free speech, he is the author of the casebook *Cases and Materials on Religion and the State*. He teaches a church-and-state seminar, constitutional law and a First Amendment seminar. Before joining the Florida State faculty, he was an associate with the firm of Paul, Weiss, Rifkind, Wharton & Garrison in New York City. He received his J.D. from Columbia University and was editor of the *Columbia Law Review*.

And I hope you'll join me in welcoming ...

[applause]

Deborah Blum: ... a very distinguished panel. I'd like to begin with a quote, actually ... "It is so easy to hide our ignorance under such expressions as *the plan of creation, unity of design*, etc. and to think we give an explanation. The day will come when this will be seen as a curious illustration of the blindness of preconceived opinion." The person making that statement was Charles Darwin, in 1859, in the first edition of *On the Origin of Species*. And although the focus of our panel tonight is obviously a little more recent, I thought I would begin, as they say, in the beginning. Almost 150 years have passed since Darwin first proposed his revolutionary theory, and yet the questions, the struggles, the difficulties that we face are remarkably reflective of those raised in the mid-nineteenth century. We posed the same challenges to critics of the theory; we dismissed the theory as being able to only describe the tangible world, unable to enlighten us as to the intangible one. Science has advanced beyond measure since Darwin and his colleague, Alfred Russell Wallace, first put forth that controversial theory. They proposed evolution at a time before the science of genetics had been developed, the structure of DNA elucidated, the studies of RNA begun, fields and works, fields like ethnogenetics, had not yet exploded into excitement, and yet none of this has left Darwin behind. His work stands as a cornerstone of modern biology.

In a time when science claims enormous power over our lives from medicine to meteorology, it seems entirely logical that it must be taught well, and that it cannot be taught well without teaching its fundamentals, including Darwinian evolution. And yet we don't always make our decisions according to logic.

It's worth noting that within 10 years of the

publication of *On the Origin*, Alfred Russell Wallace, whose independent study of the theory of natural selection was the catalyst for Darwin's publication, had decided that mechanical evolution was not enough, that it could not adequately explain human intellectual development or address questions essential to moral development. Wallace proposed that an intelligent designer might be required for those aspects of evolution. In 1868, Darwin wrote to Wallace, warning him that he was doing nothing but harm to their joint endeavor. "You write like a retrograde naturalist," he said. "I defy you to deny your own theory."

It's the balance of fact and faith, physics and metaphysics, that yet confounds us. Again and again, since the days of Darwin and Wallace, we struggle, not always successfully, to resolve that conflict. So we get *Kitzmiller v. Dover School Board* last fall in Pennsylvania, a lawsuit provoked by officials who sought to require that intelligent design, the suggestion that nature is too complex to have occurred only through random evolution, be part of the science curriculum. The trial had a curious sense of déjà vu, a kinship to the 1925 Scopes trial, the 1987 Supreme Court decision against teaching creationism in the school, and hosts of less well-publicized rulings, such as the recent court decision in Georgia against allowing anti-evolutionary theory stickers to be pasted on textbooks.

In the Dover case, which is the focus of our, or at least the launching point for our discussion tonight, U.S. District Court Judge John Jones issued a ruling saying, in small part, that the trial had yielded overwhelming evidence that intelligent design is a religious view and not a scientific theory, and was, therefore, unconstitutional, a clear violation of separation of church and state. Dover has been hailed as a setback for advocacy groups seeking to weaken the teaching of evolutionary theory and by implication the teaching of science, but a setback only. There are still more than a dozen states openly considering ways to integrate intelligent design into the curriculum, or at least to demand that Darwinian natural selection be taught as a deeply flawed theory, lacking in key aspects. "To say that God did not play a role is arrogant," explains William Harris, a professor at the University of Missouri-Kansas City Medical School. "It's far beyond the data." And that's really why we're here today; having assembled what I think is one of the best national-caliber panels on the issue since the Dover decision itself. We're here in the shadow of a difficult history to assess the present in the light of these most recent decisions and to look to the future. The notion of a "Vigil after Dover" suggests that we should be watchful and wary, and to my mind, that there is no way to maintain watch without illuminating the shadows that surround us in this area. So

with that, I'm going to begin to address my questions to the panel.

Dr. Scott, I'm curious as to your assessment of the Dover decision in this way: Your Center not only tracked that but monitors intelligent design activities around the country. Do you believe that this decision has affected other states?

Eugenie Scott: Oh yeah, there's no question that *Kitzmiller v. Dover* definitely threw sand in the gears of efforts to get policies like Dover's requiring the teaching of intelligent design to be passed. Of course, the Discovery Institute, which is the major think tank for intelligent design, did not want the Dover policy, and tried to get the Dover School Board to change the wording, so that it would be more bullet-proof legally, and failed. And for a number of years, they've understood that intelligent design is legally vulnerable because any judge is going to ask, "Who's the designer?" and it will become very obvious the designer is God, and you just can't say, "God did it," as part of the science class in the public schools. So intelligent design isn't going to work legally. What I think is going to happen, what we've seen happening and what we predict more of in the future, is the current strategy of the Discovery Institute, which is not to say, "teach evolution and balance it with intelligent design," but, "teach evolution and balance it with evidence against evolution," the bad science that Dover was talking about. That appears to be less legally vulnerable, and depending on who your judge is, it *might* be less legally vulnerable. But one of the things that many don't notice or didn't notice about *Kitzmiller v. Dover* is that not only was intelligent design struck down by this judge, but also the "evidence against evolution" approach. He did address that in the decision, which you can read on our webpage and I would encourage you to do so, because it's a very, very well-written and understandable decision. So I'm hoping that *Kitzmiller* will throw sand in the gears both of intelligent design as well as the "evidence against evolution" approach.

Deborah Blum: Professor Pennock, you were a witness in the trial. Did you (yourself) see this sending, from a very small school district in Pennsylvania, a national message about what is science and what is not?

Robert Pennock: This was a trial that, I think, from the beginning everyone recognized had national import. It was covered nationally; it was covered internationally. I

mean this was a big, big story. It's often the case that the turning place on which these stories happen is a little town. The Scopes trial occurred in a little town, and big ideas can sort of be shown there. The intelligent design group may not have wanted *this* to be the particular place, but they had wanted some court case, and they had been looking from the very beginning. The whole strategy had been crafted to try to get around the problems that the earlier strategy of creation science had stumbled into. *It* was clearly a religious view, and they thought that they had a strategy that would stand up in court. And they were almost cocky about it beforehand. One of the main intelligent-design leaders, William Dembski, sort of boasted that should it ever come to trial, he would bet a bottle of single-malt scotch that it would stand up against the constitutional test. And he owes us a bottle of scotch now.

[laughter]

Deborah Blum: And he hasn't delivered.

[laughter]

Robert Pennock: Yeah, he hasn't delivered on that either.

Deborah Blum: Actually, you raise a point that I think is an interesting one, and it certainly was true in Dayton, Tennessee, although there were a lot of complicated reasons for Dayton, Tennessee. Do you see this as being driven more by small, rural districts than urban districts – if you looked at Altaone, California, or some of the other school districts, do you see the drive toward ID being an urban versus rural kind of effect in the same way that some have argued is the real story rather than red state, blue state, urban versus rural politically?

Eugenie Scott: Yeah, yeah, for years I've been saying this: that it's not so much a demographic; it's not so much a regional problem. The creation and evolution issue is really a demographic problem. It occurs in suburbs and small towns rather than in big cities. You're not going to see it in Atlanta, but you can see it in Cobb County. And the reason for this, I think, is because you have to realize how incredibly politicized education is in the United States, unusually so. This is not the case in other developed countries, but our school system is decentralized and it's run by these elected school boards and *elected* school boards – notice the emphasis there – are looking over their shoulders to see who's

voting. And so that politicizes education here much more so than (in) any other country. So what happens is because you're dealing with politics, large cities – which are very heterogeneous and have a lot of different entities vying for some sort of authority or power in the community – basically swamp religious conservatives. They're only one voice in many and they never get the upper hand. Suburbs, small towns, are smaller and more homogeneous just by nature. Where that homogeneity is religiously conservative, that's where you're likely to find creation and evolution issues. You're not going to find it in Berkeley, California, where I come from ...

[laughter]

Eugenie Scott: ...but you can find ...

Robert Pennock: Except for Phillip Johnson.

Eugenie Scott: Well, yeah, we have Phil, but he's not going to influence the school board and that's the issue. But you don't have to go very far outside of the Bay Area into the Central Valley of California to find these issues cropping up. And it's because of the homogeneity and religious conservatism of these smaller communities. And the South and the Midwest are chockfull of small towns, which is why we tend to have more problems there than we have, say, in New England.

Deborah Blum: Do you agree with that, Professor Haught? Do you see a complicated theology in this country? I mean, we tend to say "religious" or "religious right" as if it's a monolithic thing. Do you see this being driven by small-town rural conservatism, say, versus ...?

John Haught: Well, I'm not an expert in the demographics of it, but it certainly seems to me to be the case that that's happening.

Deborah Blum: And did you, when you assessed the Dover decision, (find) anything that might predict a way, a change in the way we try to balance these issues, anything that looked like something the theologians could wrestle with and move forward on?

John Haught: Well, I see the whole issue as a problem that arises partly from inadequate science education in this country mixed with inadequate religious education, and when you put the two together, it's a rather noxious

mixture.

[laughter, applause]

John Haught: So this is only the beginning. I hope that it excites people enough to start thinking about just exactly what science is and that's a major problem – what scientific explanation consists of, what the limits of science are. And before we can have a meaningful discussion of the relationship between science and religion, we have to do what the medieval philosopher said: We have to distinguish in order to relate, and much of the conversation on this issue, it seems to me, betrays a kind of conflation of all explanation into one explanatory slot. And if science is filling that slot for some people, then there's no room for theology or religion. If religion fills that explanatory slot, then there's no room for science. So to me, what needs to be done is to develop a taste for what I would call "layered explanation," by which I mean that almost everything in our experience admits of a plurality of levels of understanding, of levels of explanation, and that would be a starting point. I won't develop that now, but that's where I would start.

Deborah Blum: But I would like you to explore one point you raised slightly more in depth and that's the idea of an adequate religious education. How would you define that and how, in our society given the restrictions of teaching religion, really, would you facilitate that?

John Haught: Well, I think in the Catholic schools, for example, we learn very early not to take the Scriptures with scientific, literal presuppositions, and that is something that I think is going on in the mainline churches all over the country. But it's not going on everywhere. For many people, the whole story of the meaning of their existence is something that's deeply connected to a scriptural text. I've seen this not just in our country but elsewhere. I just came back from a trip to Iran and there, much more than in our country, the meaning, significance of everything is tied to a holy book. So, and I don't know how long it will take for the Muslim world to come to grips with evolution, but I think a first step in all of this is to develop a kind of taste for interpreting holy books in which you seek depth and meaning and not necessarily something that you can map clearly and directly onto a scientific picture of things. We have to learn to distinguish different levels of interpretation.

Deborah Blum: Professor Ruse, you were an expert witness at one of the earlier and very influential trials looking at creationism in the schools in the Arkansas case in the early '80s. Do you have a sense that ID is more of the same, a more sophisticated version of the same? Did the Dover trial suggest to you any significant differences between creationism and intelligent design?

Michael Ruse: Well, I'm glad you asked that question. That means I'm not quite sure I've got a good answer to it, so

Deborah Blum: You could answer another one ...

[laughter]

Michael Ruse: Before I get to that question, can I disagree quite strongly with some of the comments made by the earlier panelists?

Deborah Blum: Yes.

Michael Ruse: I really think that this evangelical, biblical literalism is more a phenomenon of the South and the West than it is of the North and say the Pacific areas. I agree that you're going to get an urban-rural divide; there's no question about it. But to say that there's no intelligent design in Atlanta is just plain wrong. I mean, I spoke earlier this year at a large Southern Baptist church which has 7,000 members, and there were 1,000 people there that night. And (Bill) Dembski and I were there and all I can say is that at the end of the session, they bought and signed a lot more of his books than they bought and signed of my books.

[laughter]

Michael Ruse: So ... speaking with some feeling, I really think that the divides of the, let's say the divides of the Civil War era are still with us on this. And I think this leads actually into the question that you asked me, because I personally don't think that this whole debate about evolution versus religion is really so much a question about gaps in the fossil record or fruit flies or the sorts of things that Joe Travis does as a scientist. I think that this, these are litmus tests if you like, for deep moral, social, cultural divides that we've got in this country, that we saw, for instance, in the last election. And for that reason, although clearly intelligent design *is*

different from scientific creationism, a lot of intelligent designers, in fact, take on board a lot of evolution; they certainly don't think that the earth is only 6,000 years old. So there are differences, but nevertheless, I see this as a movement which is a face for an anti-naturalist, anti-modernist, anti-Enlightenment movement which is deeply opposed, I would say, to the gifts that Enlightenment has given us. For instance, understanding that men and women are both human beings, that men are not superior to women, that heterosexuals are not superior to homosexuals and that whites are not superior to blacks. And I really feel that the whole intelligent design-creationist movement is, in fact, a manifestation of what I can only describe as a pre-Enlightenment movement and moral values "you make me sick." This is not the moral values of Jesus of Nazareth.

[*applause*]

Eugenie Scott: Deborah, can I make a quick clarification ...

Deborah Blum: Would you like to respond to that?

Eugenie Scott: I wasn't saying that there are no intelligent design supporters in Atlanta; I don't want to mislead you. There are intelligent design supporters in Berkeley.

Michael Ruse: They might even be in this room, Eugenie!

Eugenie Scott: I would not be at all surprised.

Michael Ruse: But they're very nice.

Eugenie Scott: Oh yes, I get along fine. The point that I was making had to do with the political pressures on elected school board members and the fact in, that I will defend, in large communities, large cities, religious conservatives have a lot tougher time getting the upper hand, whereas in small, more homogeneous communities, they do (get the upper hand). So I think we understand each other on that; I don't think we're greatly different. And I don't ... I'm sure you ... just (be)cause this is going to show up on a creationist blog tomorrow, I'm sure. I don't think you're saying that all the creationists are racist and homophobic, etc. etc. I don't believe that's actually what you said, right?

[*laughter*]

Eugenie Scott: [*laughing*] Professor Ruse?

[*laughter*]

Eugenie Scott: Because I think that would be a gross generalization, which one could not make without better empirical data.

Deborah Blum: Uh, do you want to respond to that, Professor Ruse?

Michael Ruse: Well, you know, I'm sure if we looked long and hard, we will find examples of creationists who are not homophobic, you're quite right. But, if you read, for instance, the mentor – the *éminence gris* behind the intelligent design movement is the retired law professor from Berkeley, Phillip Johnson – and if you read his books, you know, it's the fossil record in the first chapter, and then he settles in to what he really wants to talk about: anti-abortion, anti-gay marriage, pro-capital punishment, and dear God, cross-dressing. I think he thinks that every evolutionist goes home at night, you know, Larry Abele and Joe Travis go home at night and say, "Dear, I've had a hell of a day. Can I have a dry martini, stirred not shaken, and is my pink chiffon back from the cleaners?"

[*laughter; applause*]

Deborah Blum: I feel that we should give Dean Travis a chance to respond, but also ...

Michael Ruse: Did you want me to explore this theme further?

Joseph Travis: Pink is not my color ...

Deborah Blum: But also, Dean Travis, what I wanted to do was to return more to the issue of the so-called science of intelligent design. Taking it out from, reducing it from, the really fascinating large, social, cultural issues we've got going here, back down to science for a minute, do you feel that this is more directed to an attack on science, a lack of knowledge of science – I mean, did you have a sense of science education going the wrong way in this trial?

Eugenie Scott: Who are you addressing?

Deborah Blum: This is to Dean Travis, sorry.

Joseph Travis: Yeah, in terms of intelligent design as an attack on science?

Deborah Blum: Right ...

Joseph Travis: It's an interesting phenomenon – intelligent design, to my eyes, has two components. The first is an interesting question, which is: Some features of organisms are so complicated that natural selection can't explain them. And at some level that's a scientific issue – is that true or isn't it? And the job of the scientist is to answer that, much as we might have said: "Gee whiz, the Rutherford atom, the Rutherford conception of the atom, gee, is inadequate to explain all the observations we make." And sure enough, we modify our conception of the atom. That's fair game as science. It's the second part that I think is the attack on science – that is, because we can't explain it, we must invoke a designer. And that's really where there's a misconception of what science is and is not. Science, and here I'm very sympathetic to John Haught's opinion that I think there's a bad problem with how so many people understand science as a collection of facts and a collection of statements that are absolutely, positively true, rather than a broad idea like evolution or the atom. Our theory, if you will, is our best explanation for all the available facts and that's what people often miss. And so because there is a perception, and I would emphasize *perception*, that some facts don't fit the prevailing idea, well, pfft, it must be wrong; we'll have to discard the whole thing and invoke a completely different explanation which is outside the realm of science as it's come to be defined from the Enlightenment and the scientific age to which Michael refers, that is, an explanation based on naturalistic phenomena and not the invocation of something we can't observe, test, examine.

Deborah Blum: So, if I'm following you, you're saying that a basic misunderstanding of what science is opens this door to allow people to propose a supernatural alternative.

Eugenie Scott: Well, it's more than that, because the intelligent design people know very well that science as it is practiced today – as Rob very clearly identified in

his expert testimony – science as it is practiced today restricts itself to natural cause. They are absolutely explicit about trying to change that, I mean they, it's really true, they want a revolution in science. They want to change science so that for certain kinds of things—they call it origin science, which translates to those aspects of science that have implications for their particular religious interpretations that they don't like; that's origin science—for certain aspects of science, you have to allow in the supernatural and still call it science. And that would be truly a science stopper, because once we allow ourselves to say, "Gee, this problem is *so hard*; I can't figure out how it works – God did it." Then we stop looking for a natural explanation; and if there is a natural explanation, we're not going to find it if we stop looking. So the scientific community is very strongly on the side of retaining what Rob defined as methodological naturalism, restricting science to explanation through natural causes and not letting in theistic science, as the intelligent design people call it.

Deborah Blum: I want to take a slight bend and then come back to science, because I wanted to ask Professor Gey (a question), while we were still talking directly about the Dover decision. The ID proponents predicted that this approach might meet the constitutional church-state barrier. If they could sell it as science, it would work, and obviously that failed in this particular case. What is your sense of how those advocates are reacting to that and how they might be refining their approach, so they could come in and yet get past the separation of church and state?

Steven Gey: Well, how they're responding is that they're depressed, because this was a massive failure of the theory when it came into conflict with the First Amendment. And first of all, you have to understand why ID is what it is. ID is what it is because, in a way, it's a classical example of evolution at work, because ID is creationism that evolved in response to a series of legal decisions, which said "Creationism isn't going to fly under the First Amendment." And so the first generation of these statutes said, "You can't teach evolution," and the Supreme Court in 1968 said, "Well, that's not going to fly, under the First Amendment." So then it evolved into a kind of equal time sort of statute that said, "Well, if you teach evolution, you've got to teach creationism." And the Supreme Court in 1987 said, "Well, you can't do that either." And so it evolved again into what we now know as ID. And ID is simply

creationism stripped of all the details but one, and the problem is the one detail that they leave in the theory is the very detail that makes it unconstitutional, because the detail they leave in the theory is God. And so, they've got a real problem here.

And you have to understand also that the science, from the legal perspective, the science comes into play not directly but indirectly, because the claim that this is science really comes into these cases as a defense to the claim of the, in this case, the parents in Dover, that this is religion. And so the parents say, "You're teaching religion to our kids in class; that's a violation of the First Amendment." And their response is, "Oh no, this is not religion; this is science." And so all the science is really part of their defense. It's not really part of the case directly at all. And how they're going to respond to this, I suspect, is, well, two ways: One way is: Do it again. They're going to re-litigate this in another jurisdiction, with another set of judges that are more amenable to their perspective on the world and hope for a better result, in which case, they'll have a conflict in the circuits and they'll take it up to a Supreme Court that they hope is more friendly toward their side. And by the way, they haven't got that yet, but they may have it soon if you lose one of the five justices that I suspect is still in what would be a majority to strike this stuff down. So I think one response is to just re-litigate this again in another circuit, maybe the circuit that we live in, the 11th Circuit, because the Cobb County case is pending right now in the 11th Circuit Court of Appeals. And there is a very good chance that we will lose that case on some ground or another, and if we lose that case, then depending on what the court says, you may actually have a Dover and a non-Dover, and their perspective is going to be, "Oh see, it was just some wacky judge in Pennsylvania; he got it wrong."

Deborah Blum: Does everyone here know the Cobb County case?

Steven Gey: Yeah, the Cobb County case is a case being litigated in Georgia right now in federal court, in which the Cobb County School Board put a much less specific sticker on biology books in Cobb County that basically said, "Evolution is a theory, not a fact, and we urge students to critically analyze this when they think about it." It's much less specific than the Dover sticker because the Dover sticker referred specifically to intelligent design, specifically referred students to a book called *Pandas and People*, which is sort of an ID tome, 60 copies of which were donated anonymously, sort of, to the Dover School Board. The Cobb County

sticker is much more benign than the Dover sticker and, therefore, is easier to uphold from the perspective of the courts. And also, there's not the kind of, certainly not the kind of, record we have in Dover. I mean, Dover, you had a school board that would stand up at meetings and say, "Someone died on the cross 2,000 years ago; can't we do something for him now?" Well, when you've got a record like that, and when you've got a judge that says that they're lying in their depositions to hide their religious perspective, it's not hard to win the case. I mean you've got a record that says they're doing something religious. The Cobb County School Board record is much less extensive in that regard, and the evidence of religious purpose, which, by the way, the district judge – well, step back for a second. Under the constitutional standard to win one of these cases, the government has to show that its policy has a secular purpose, has a secular effect, and that there's no entanglement between church and state. Historically, we've always (tried) these cases on the "secular purpose" analysis. In other words, we've been able to go to court and prove that the policy was motivated by a religious purpose, which makes it unconstitutional. In Dover, one of the remarkable things about the Dover opinion is that the judge ruled that the policy violated both the "secular purpose" requirement *and* the "secular effect" requirement. So the Dover policy actually was motivated by an impermissible purpose and had an impermissible effect. In the Cobb County case, the trial judge ruled actually in favor of the school board on purpose grounds and ruled against the school board on effect grounds. And just in terms of practical litigation strategy, the problem with that is that that sort of a holding requires the plaintiffs in the case to demonstrate that the policy actually had a religious effect in the classroom. And that's very tough to do in the absence of an extensive record demonstrating that teachers were actually saying religious things before their students in the classroom. So...

Deborah Blum: That's really helpful. Professor Haught, we hear a lot, in fact, of the religious right and the enormous political influence of conservative Christianity. We hear far less of the enormous influence of moderate theologians. There was, in fact, organized out of Wisconsin, a clergy letter which – endorsed by 10,000 clergymen and (clergy) women, from around the country – that endorsed the teaching of evolution in the schools. Why is that? Why is it that in the religious establishment, the rational majority, if

you want to call it that, has been so poorly heard on these issues?

John Haught: There are probably many reasons, but what stands out to me is the failure of the media to recognize that between the extremes in this debate there has been, ever since Darwin himself, a whole spectrum of alternatives in which theologians have, in a sense, given thanks to Darwin for enhancing our sense of the grandeur of creation. Charles Kingsley, for example, a contemporary of Darwin, famous Anglican theologian, wrote to him pretty soon after the publication of *Origin of the Species*, in effect, thanking him for that, because he says this ultimately enhances the authority of the Creator, that a Creator who can make things that can make themselves is much more impressive than a Creator who is pulling things like puppet strings, as it were. And that's only one example; there are many examples of theologies of evolution that I've come across in my own studies to which most people have not been exposed. You don't read about these in the (literature), even in the literature of the churches themselves, and in many cases the suburban pulpit really ignores this whole thing too. So in many ways it's a failure of our seminaries. And a point I try to get across to seminary presidents everywhere: You've got to start teaching seminary students to get into this whole issue of science and religion, or we're just going to perpetuate this whole problem, ad infinitum.

Deborah Blum: Do you get any receptiveness to that, I mean ...

John Haught: Yes, in principle, and I think, but most people just simply have not been frankly exposed to these more, I would call them "urbane" interpretations of theology in an evolutionary world.

Deborah Blum: Dean Travis, I'd like you to address then, the sort of comparable scientific side of this issue. Many people have mentioned the reluctance of scientists to take on some of these conflicts directly, and I was recently, in the last few months, talking to a reporter from Kansas, who mentioned the fact that the Kansas textbook discussions were largely boycotted, essentially, by scientists at a national level. And his take was that the research establishment felt itself too good to go to Kansas and, therefore, didn't show up. That's not necessarily true, but that was his interpretation. I wonder if you think that the scientific reluctance to

sometimes enter this issue has affected this debate, and if you see that changing.

Joseph Travis: I think the reluctance to enter the debate is a function of two things: First of all, scientists, by and large, are nerdy little people who have achieved ...

[laughter, Joseph Travis sbrugs]

Michael Ruse: ... in pink chiffon ...

Joseph Travis: Exactly, achieved tremendous success ...

Deborah Blum: In a nice way.

Joseph Travis: Oh, harmless, nerdy little people ...

[laughter]

Joseph Travis: Charming, loveable, nerdy little people ...

[laughter]

Joseph Travis: Endearing, nerdy little people, who have actually achieved a great deal of success by being very focused on very narrow things. And they're very much at home talking to other people like them.

[laughter]

Joseph Travis: Heaven knows, as a dean and a department chair, many of my colleagues are not even at home talking to students – feel very uncomfortable, have a great deal of difficulty.

[laughter]

Joseph Travis: So, first of all, scientists themselves have been, in a more serious vein, scientists themselves have gone through a process of natural selection that has ...

[laughter]

Joseph Travis: ...that has molded them into being very good at communicating with one another, but perhaps less good at communication to those who are not scientists. As a result, many well-meaning scientists feel, recognize that they really are ineffectual at this. There's also a second problem, which is the fact that many scientists feel that there's no reward in it for

them. There's no reward in being a public promoter of science, which is very striking, because Darwin was nothing if not a great public promoter of science. He wrote *The Origin of Species* to a popular audience, to a literate, popular audience. And all of his work was addressed to, and I learned all of this from Michael Ruse, I'm just parroting what Ruse says ...

Michael Ruse: And you're getting a B+ so far ...

[laughter]

Joseph Travis: I don't know if the TV camera picks up the strings [gestures between himself and Michael Ruse]. But I think there's a reluctance on the part of many scientists to engage in the public debate because they feel as though it's not worth their time. You know, you're only as good as your last grant, your last publication in *Genetics*, and this is just, well, "My chair is going to give me an official concern on my evaluation if I do this sort of thing." And I think that's a real concern, even if it's not well-articulated by many scientists.

Michael Ruse: Yeah, I just have to jump in here, because you're absolutely right about this. I mean, the simple fact is that if an untenured faculty member comes to his chair and says, or her chair, and says, "I'm going to spend the summer working to fight ID," the answer is going to be, "Well, don't look for a good third-year review." And I think we can do something about this. I really think we must. I've seen, since I've been a teacher over 40 years, I've seen an unbelievable sea change in the seriousness with which we take teaching. When we started, when I started, when Larry Abele started, we know that, you know, people paid lip service to teaching, but by and large it went nowhere. Now, people really take teaching a lot more seriously. Now I'm not saying that everybody's going to be a good communicator at the public level, but I think that we've really got to make big efforts here, and, as you say, reward, encourage people who've got those abilities to do that, and recognize that this is an important part of being a university professor.

[applause]

Deborah Blum: Professor Pennock, would you like to also respond?

Robert Pennock: Yes. Just to give one additional reason

for why scientists would decline the invitation to participate in Kansas was that those sorts of venues were sponsored by the creationists on the school board. It was recognized upfront as sort of a kangaroo court that would legitimize what they wanted to have happen in the end anyway, and I think scientists, not just in that case but in general, think that by responding, you are legitimizing them inadvertently. They (scientists) don't want to waste their time because there isn't something there that's worthy. But the fact that you engage in a debate, just by its very format, makes it *appear* as though there's something there to debate. And I think there's a difference between choosing one's venues, right? Those sorts of venues, I think, are not really appropriate. There isn't something to debate there anymore. But there is a huge venue that scientists ought to properly engage in, which is public education. And I actually think that there's some sea change that's happening, in part because of the Dover case, where scientific societies have now recognized, "You know, we've been failing on the job." If you take a look at statistics on Americans' views on this since the '80s, since the Gallup has been following this, there's no statistically significant change. The same 47 percent, plus or minus 3 (percent), still thinks that human beings were created about 10,000 years ago in their present form. And, you know, all of the education that we do in the universities seems to have made no dent in that. And I think they now, when you get things like these policies being put into place, and Dover in particular really alerted scientists to this, I think they really thought seriously about how they're doing that job of educating people about not just evolution, but about the nature of science. And I think a lot of societies now are taking that seriously, and I think that's a great thing.

Deborah Blum: And they didn't do that in the 1980s, when this issue went to the Supreme Court?

Robert Pennock: There was a little blip of interest there, but not really in the same way that we're seeing now. And I hope that this isn't a blip, I hope that this becomes a sustained change.

Steven Gey: You know there's also, you've got to keep in mind again, the way that the standard is changing. The reason they didn't participate to a great extent in the '60s and the '80s, when the two previous cases came up, was because they didn't have to. Because, again, those cases were litigated primarily on secular purpose

grounds, which means the main objective of those cases was demonstrating the intent in the minds of the legislatures passing the statute. It is going to be different soon, because we have a different Supreme Court now. The Court has been politicized in a way that it hasn't been in my lifetime, and you have basically a 5-to-4 split on the Court on these issues. The crucial fifth vote is Justice Kennedy; Justice Kennedy does not like the secular purpose component of the present analysis. If you get another case within the next two, three, four, five years, I strongly suspect that that part of the analysis is going to be dropped out, and what you're going to be left with is basically a standard that says, "It is illegal to coerce, on religious grounds, anyone in a public school classroom." What that's going to mean, in terms of the practical litigation strategy, is that we're going to have to go into these cases and demonstrate, as we did effectively in Dover, that this is not science, that the only thing it is, is religion. But what you're going to have to do to demonstrate that is to put the Ken Millers of this world and the Rob Pennocks of this world on the stand, and they're going to have to communicate to an audience comprised largely of lawyers. And you know, bless our hearts, we're a loveable breed, but

[laughter]

Steven Gey: ... but we're scientifically illiterate. I mean, the reason we're in law school instead of medical school is because we don't know anything about science.

[laughter]

Steven Gey: So, you're going to have to communicate to a group of people who are genetically predisposed against anything scientific. And you're not just going to have to talk to the general public, you're going to have to talk to us, and that's worse. But this is something that is going to have to happen. And I think what you've seen in the recent couple of years, the American Association for the Advancement of Science, the National Academy of Sciences have been much more aggressive in getting involved in these cases and putting their name on the letters and petitions and briefs, and saying, "We think this stuff is bogus." They have to do that, and they have to do it aggressively and relentlessly, in every single case.

Deborah Blum: Did you want to respond also, Dr. Scott?

Eugenie Scott: Yeah, because the National Center for Science Education is the organization that focuses 100 percent on this issue, and so to some degree – I have a very grassroots perspective on what's going on, and I, in support of my fellow scientists, the backbone of the anti-evolution movement, at the grassroots, in Dover, and in states where there's legislation, and other states where there are community problems – is the scientific community. There's no question but that the first people to step up to the plate are scientists and teachers. Scientist participation in this issue is absolutely necessary. Scientists are the ones who can stand up there before the school board and the state legislature or wherever these problems arise, and make the point, "This is what science is. This is what creationism is. Creationism is not science. We should be teaching evolution. We should not be teaching these religious views as science." And scientists are the only ones who can legitimately make that claim.

That is necessary; that is not sufficient because, frankly, this is not – the creation-evolution problem is not – a problem that can be solved by throwing science at it. You can pile the science higher and deeper, but you are not going to change the position of a school board member if that school board member believes that the majority of the people in the community want to have evolution disclaimed or dismembered in some other fashion or some sort of religious view taught. In addition to the scientific community, we absolutely depend on the civil liberties community, the sort of things that Steve Gey is talking about. The law has kept these subjects largely, well, it's kept these subjects from being taught by statute. I assure you there is plenty of creationism being taught around the country. I hear stories from teachers. But the faith community needs to step up to the plate in this as well, and here my friend, John Haught, and I are in complete agreement. We need to have the mainstream clergy being much more explicit about explaining mainstream Christian theology to the people on the other side of the pulpit, which largely is that, "Yes, evolution happened, we're (in agreement with) science in that regard, but it is part of God's plan; God is involved. You don't have to have this dichotomous view of either evolution or God: Either evolution happened and everything is materialistic, or God had nothing to do with it. It's possible to combine the two." But scientists have taken an important role, they continue to take an important role, and – just one last point – the most important sci-, the most important role scientists can play in this controversy is to teach evolution better to those undergraduate students in their classes. Because those students are the ones who are going to

grow up to be schoolteachers and teach the next generation of high school and junior high students about this topic or not, as the case may be. And those students are going to be college graduates who will be people voting for school boards, or serving on school boards, or running for state legislatures, and unless we have a – I’m echoing Bob’s, or Rob’s, point here – unless we have a better educated citizenry in terms of nature of science and the particular science of evolution, we will continue to have this problem.

So I’m always haranguing university science faculty: The buck stops with you. Clean your own house first. Think about how you can bring evolution into every single week of your biology semester, regardless of whether you’re teaching biochemistry, molecular biology, organismic biology, whatever it is. You can think of how you can bring the principle of common ancestry into that topic. And once you do that, your students, by the end of the course, will be saturated with the idea that, “Yeah, living things had common ancestors, I get it now. Oh, that’s evolution.”

[*applause*]

Deborah Blum: Why don’t we talk a little more generally then, about the state of science education? I’m inclined to also bring in K-12 as well as university undergraduate. And I thought I might run through first one of these obvious science literacy, science literacy surveys for U.S. citizens. And many of these are graduates, actually of American universities. And this is from an NSF survey, a recent NSF survey; it’s about two years ago.

“How long does it take the earth to orbit the sun?” In this survey, 54 percent got the right answer: They said one year; that was up from 50 percent the previous year. Next question: “Is this true or false? Lasers work by focusing sound waves.” Fifty-five percent got that wrong; 45 percent correctly said, “No, light waves.”

“Antibiotics kill viruses as well as bacteria.” Fifty-one percent got that correct (and) said, “No, antibiotics don’t affect viruses.”

“The earliest humans lived at the time of the dinosaurs.”

Forty-eight percent said no.

And finally, “Human beings developed from earlier species of animals.” Fifty-three percent said no.

Dr. Scott, I don’t think we can account for this solely due to a complicated attitude toward teaching evolution. So how do you rate the teaching of K-12 science in this country?

Eugenie Scott: Well, it, the teaching of K-12 science in the United States, needs a lot of work; there’s no question about that. It needs funding; it needs instructional materials; it needs better training for teachers; it needs more in-servicing for teachers; it needs more opportunities for teachers to talk to each other. If you talk to high school teachers and junior high teachers, they will tell you that the real, the thing that they miss most of all and that they really want most of all is being able to get together with their peers and talk about the things that work and share ideas with each other. Teachers are very isolated, and part of that is, of course, funding, because you pay them to come to school for six hours a day and then send them home to do a whole lot of work at home on their own. But you don’t give them any opportunity, any scheduled opportunity, to actually get together and share ideas, which is what they do in Japan, and what they do in most other developed countries. So there (are) a lot of things that we need to do. But again, to harp at one of my favorite topics, the buck stops at the university professor, because if a high school teacher doesn’t know enough about the nature of science to teach it well, that’s not the fault of the education school; that’s the fault of the arts and sciences departments. If a high school biology teacher doesn’t know enough about evolution to teach it with confidence, that is the fault of the biology and geology and astronomy departments, not the fault of the education school. So I think we all have plenty of work to do, both at the university level as well as the K-12 level. And as citizens, we need to have a great deal more support for public school education than we have offered in the past. And the way we do that is to pass those bond measures, which tend to fail around the country when local education needs support. And you’re hearing this from a Californian; Prop(osition) 13 was the evil bellwether for too many states passing similar legislation around the country, and it’s made a huge difference in the quality of education across the board, not just science education.

Deborah Blum: Do you agree with that, Dean Travis? That the buck stops at the way universities, colleges of arts and sciences train their graduates to go out and spread the scientific word?

Joseph Travis: Absolutely, because we, as I think we’ve said, the students in the classrooms today are the citizens who vote tomorrow. They’re the ones who actually elect the people who make the policy

decisions. And if we're not sending people out with the knowledge that lasers focus light and not sound, that the earth takes a year to go around the sun, we're doing something really wrong. Now, one of the things I think we do, I personally think, we do wrong is when we teach evolution as a course, we tend to teach it to biology majors. So when I, I taught it for 20 years here, and I often would have science education majors in the same class as the biology majors, and I failed to appreciate at the time that those two groups of students probably need to know it at different levels. That is to say, the arcane population genetics details that might be appropriate for a biology major are completely inappropriate – to a significant extent, not completely – for a science education major. And so we don't do a very good job, I think, of teaching evolution as a process to the students who are not biology majors or deep science majors. And I think that's where our failing begins. But I couldn't agree more – the buck stops here.

Michael Ruse: But it stops with us, too, Joe. I mean, speaking as someone from the other side of the campus, the humanities side, I think we've got a job to do, too. Because if what I'm saying is right, that this is not just an issue of science, but an issue, a deep issue of culture, and I think it is. I'm, obviously, I'm 100 percent in favor of better evolution teaching. That's partly why, mainly, *completely* why you and I are doing this volume for Harvard, because that's what we want to do to hit good high school students. But at the same time, I think that we philosophers and people in departments of religion, people in English, these areas, we've got to help America to frame – what shall I say – a moral vision, which I think, we're not getting across at the moment. I mean, to think that moral values – what Karl Rove was pushing in Kansas in the last election – I mean it's a travesty, it's heretical, and I think that we've got to do much more to show people that moral values [are] not th[ese] narrow, simplistic solutions: marching to Iraq, support Israel because you're in fav-, you think it's bound up with end times, and these sorts of things. And I think that if you do that, then we can start to whittle away at this sterile, biblical literalism. And part of whittling away, of course, is getting away from Revelations, and Daniel, and Genesis, and starting to look at the Gospels.

Deborah Blum: Professor Ruse, how would you have a state-funded university teach morality?

Michael Ruse: A state-funded university do what?

Deborah Blum: Teach morality.

Michael Ruse: Well, I don't know. I've been doing it for, well, for 41 years now. I don't think that teaching morality, I mean, it violates the distinction between church and state, for instance. I don't think that in pushing a morality, I'm doing that at all. I think that in pushing morality, I try to find the common values that we've got in our society, that women and blacks and gays are equal human beings, that not having socialized medicine is deeply morally wrong, and I think that what we've got to do is ...

[*applause*]

Michael Ruse: ... what you've always got to do with these things is you reach out to your students with the best that we've got in the past, to try to speak them, to their concerns and needs, to give them the tools, so that, frankly, they're going to do a lot better than we've done in our generation.

Deborah Blum: Professor Pennock, you also are a philosopher of science. Would you agree that the best way to approach this then is in a full and comprehensive sense, rather than teaching science better here, teaching morality and ethics over here?

Robert Pennock: So, I teach in a unit [whose] mission statement involves showing the relationship between science and the humanities. And that's a mission that I think is crucial to this debate. I mean, we've heard it here already: It's not the one or the other. Both of these things have to be done simultaneously for the reasons we've already heard. One is the abysmal state of science understanding in the country, but more than that, this particular issue has to do with the culture wars; it has to do with values; it has to do with the meaning of life. If you take a look at creationist writings – and this goes all the way through from creation science, you'll see exactly the same things in intelligent design writings – in the end it has to do with a worry that somehow if you accept evolution, it's equivalent to thinking that there's no meaning and purpose and ... it's an existential worry here. That's something that has to do with philosophy and values and religion and so on. And no amount of evidence that you present scientifically is going to be sufficient if someone thinks that they're going to lose

the meaning of life. So somehow you've got to be able to present both sides, so that you can show that there is value and meaning and beauty in science, but also the kind of values that you have on the other side, the moral values, the religious values are not lost by appreciating that value in science. So I think if you try the one without the other, you're bound to lose. This has to be something where there's cooperation across the board.

Eugenie Scott: I agree...

Robert Pennock: And there's actually, it's sort of interesting I think, that one of the things that's really come out – not just of Dover, but really the escalation of creationist activity – is the waking up of scientists and science educators and now hopefully others as well, about the need to do this. I mean, I'm certainly seeing a change now, where people are starting to say, "How can we do this better? How can we incorporate not just: 'here are the facts to learn', but 'let's understand why scientists accept these facts.?'” I mean, otherwise, it sounds like something you're supposed to memorize and believe, as opposed to understanding the methods of science. Similarly, on the humanities (side), I mean, there's much more interest now in talking about these things. So there's a sense in which we should thank the creationists for sort of bringing us together and to wake people for the need to do that. It's like in Kansas, when they said, "Well, you're not going to teach evolution there. We'll take it all out." I think that students during that year in Kansas in '99 and so on, probably learned a lot more about evolution – there's nothing like the forbidden fruit of, "Oh, don't study that," to make them do it.

Deborah Blum: Professor Haught, would you like to respond to that?

John Haught: Yes, I completely agree with almost everything that's been said tonight, and just to pick up on some points that Rob made, I think it would be helpful if the scientific community, the university community in general, would be perhaps a bit more sensitive to what is at stake for so many religious people in this whole discussion. And that means that, we have to recognize that for many of them, their most cherished belief – that there's a providential God who cares for the universe – a lot of people simply can't reconcile that immediately with what they hear

in biology classes, as well as the sense of values that we've been talking about. And I think the reason for that is, I think we all have to admit that, historically, our sense of the divine, our religious sensibilities, as well as our ethical sensibilities were sculpted historically, primarily in a pre-evolutionary, pre-scientific world that was essentially hierarchical in organization – vertical, static – so that you have a scale of values, a great chain of being running from matter, through plants, animals, humans, angels, up to the divine. And there was a sense in this hierarchy that some things are more valuable than others. There was a sense of discontinuity between and among the levels, and for many people, when they first look at the Darwinian story, of the evolutionary story of life, they're going to ask, "Where is the *scala naturae*, the scale of values?" What evolution seems to present is a picture of nature in which matter existed dominantly for billions of years, and then grudgingly gave rise to life, and there's no real, sharp discontinuity between matter and life, between life and mind, between mind and values. And in that setting, it's very possible and easy for many intellectuals to look upon values as nothing more than what we humans project back onto what seems to be an indifferent universe. So it is, in many ways, it is a question of, "How are we going to ground values in a post-Darwinian world?" So, that is the issue for theology and evolution, but it's also something that I think science needs to be aware of.

Deborah Blum: That's a good point, and it reminds me that although we have some very rational reasonable scientists on this panel, there are outspoken scientists – I'm thinking of Richard Dawkins as sort of being the standard-bearer for this – who take a much more hard-line position, and would in fact say, "You have to choose – you have to choose evolution or faith." And they're louder – again, in the same way that some of the right-wing conservatives are louder – than you all are, normally. How does the scientific community deal with Dawkins or even, I'm thinking of another philosopher of science, Daniel Dennett's most recent book, which was pretty hard-line. Would you like to address that, Professor Haught, again?

John Haught: Yes, it's, what has happened is that evolutionary explanations are extremely powerful and extremely robust, and it's understandably natural that we would want to take evolutionary explanations as far as we possibly can. But as you just suggested, it's something I can't go into too great detail right now, but

there are prominent scientific thinkers and writers, who (themselves) have, unconsciously I think, have folded their evolutionary science into a kind of worldview that goes by different names. The name I would give it is scientific naturalism, which is the view that nature is all there is, and, therefore, there simply cannot, a priori, be any other explanations than purely scientific ones. So that means that if you're a scientific naturalist, when you look at the world of religion, you're going to have to look for purely natural explanations for why we are religious, for why we are ethical and so forth. And all I would, I mean, I think it's important to push evolutionary explanations as far as we possibly can, but we have to be careful of when an evolutionary science makes the kind of gradual slippage into a kind of materialist or naturalist world view. And the irony of this is that it sabotages and subverts the whole mission of science education when in a culture where 90 percent of the people are theistic, some of the most readable and popularized presentations of biology, in effect, tell them, "Logically, you have to be a materialist or an atheist if you're really going to understand the science." So it's very important that the scientific community, the science education process, become aware of the distinction between scientific method, or what Eugenie called methodological naturalism and metaphysical naturalism, which is a world view that nature or matter is all there is.

Michael Ruse: John, you know, you're just too nice to these people. ...

[laughter]

Michael Ruse: I mean, you know, your Christian niceness keeps coming out. Let me speak as a non-believer – Dennett and Dawkins are absolute bloody disasters for our side at the moment. That what they're doing is they tie atheism, hard-line atheism and Darwinism just like this. Every time they open their mouths, the creationists, the ID people, cheer. These people make no effort whatsoever to look at what religious people are saying, to try to have any understanding of how the average American mind works. They call themselves brights, and everyone else then, I take it, is a thicky, starting with Joe Travis. I mean, you know, I defend to the death their right to say this, but they are not helpful; they are deeply not helpful. I mean, Dennett's recent book starts out by talking about parasites in the first chapter and the

first paragraph, and in the second paragraph is, "and religion is one too." Until we evolutionists make a real effort to reach out to American culture, to try to understand what motivates average people in Dover or Pennsylvania or Tallahassee, we're going to lose and we bloody well deserve to.

[applause]

Deborah Blum: One of the things that we hear – and this is really for the whole panel – up on the Wisconsin tundra where I live – is that after Dover, there's a sort of subtle shift in how the intelligent design folks might approach this issue. And what we hear is less intelligent design and more "let's teach Darwinian theory as a flawed theory, and let's look at it in full context, all the: here's the theory, here's some alternatives, here's societal views to it, let's teach it as a rich educational experience." And the folks up my way think that's a pretty persuasive approach on some interesting levels and perhaps a Trojan horse. Could you address that, Dr. Scott? And also Professor Gey, I'd be interested to hear your sort of legal take on that approach in the K-12 system.

Eugenie Scott: At NCSC we talk about the pillars of creationism, which are three. These are three categories in which any creationist argument can be fit. One: that evolution is a theory in crisis – scientists are giving up on evolution – well, [that] comes as a surprise to the science faculty. Two: that science and Christianity, excuse me, *evolution* and Christianity are incompatible and that's one they work at a lot. And the third one is the one you're talking about, and this is the fairness argument, or its various permutations. "Well, it's only fair to balance evolution with something." First it was balance evolution with creation science, and as Steve pointed out, that didn't work in the courts. And then it was balance evolution with intelligent design, and that is not working out well in the courts either. And now it's balance evolution with the evidence against evolution, the strengths and weaknesses of evolution, a critical analysis of evolution or "teach the controversy." Whenever you hear language like that, what you are hearing is, "balance good science with bad science," which doesn't strike me as a pedagogically very good way to go in a country which needs a great deal more improvement of science education, rather than deliberately mis-educating students. But it's incredibly powerful in a country like the United States, where

fairness and town hall meetings and being able to speak your mind and everybody has to get their day in the sun and so forth. This is an enormously powerfully, culturally powerful argument to make and we have a tough time in the science community, because the answer that we automatically come back with is, “but science isn’t a democratic process.” We cheerfully discriminate against those ideas that don’t work – it’s not like this is a meri-, this is a true meritocracy in the sense that those ideas, explanations, theories that really do explain nature are the ones that last and the ones that we, that trickle down into high school. But teaching something that is completely outside the canon, so to speak, just because it would be fair to do so in the minds of some individuals who don’t like a particular subject matter, is hardly defensible pedagogical policy. But make no nevermind about it; this is an extremely powerful argument, and in the scientific community, we need to have better ways of addressing this than we have. “Teach the controversy,” says the Discovery Institute and that’s a very snappy phrase, and it resonates. If you dissect it, what they mean by “teach the controversy” is, “teach students that scientists are arguing about whether evolution took place.” Well, we don’t argue about whether evolution took place; we argue about the mechanisms of evolution; we argue about the patterns of evolution. But it’s a category error to say that because we argue about details of evolution, we are, therefore, doubting whether living things have common ancestors. But it’s a powerful, powerful argument, and we don’t have any good, snappy responses to that.

Deborah Blum: Good point. Professor Gey?

Steven Gey: Yes, first of all, this is an argument that’s been around for a long time. If you go back and read the 1987 opinion from the Supreme Court dealing with creation science, it was a 7-2 case, one of the two dissenters was Justice Scalia, and Justice Scalia’s perspective on the case was, “Well, it’s not really an unconstitutional thing for them to teach this, because it wasn’t really religiously motivated at all; maybe they’re just stupid.”

[laughter]

Steven Gey: “Maybe there’s selection, maybe they’re just dumb. And there’s nothing unconstitutional about being stupid. And so, if they’re just teaching stupid

stuff, okay, that’s fine; it’s maybe a bad idea, but it’s not unconstitutional.” And it’s true. I mean, if what it amounts to is them saying things and us responding by saying, “They’re just stupid,” then we lose the case, because to win these cases, under the constitution, you have to demonstrate that what they’re doing is religious in nature and, therefore, a violation of the First Amendment’s establishment clause. Now, the way you do this – the way you litigate the new generation, if that’s where they’re going, which I suspect you’re right, I suspect that’s exactly where they’re going – the way you litigate this stuff is, I suspect, not that differently than you litigated KM. And in fact if you look at KM, if you go and read the decision in KM, it’s a thumbnail description of all of these arguments and the responses to them, because in KM there was testimony about the various empirical claims that the ID folks are making about the flaws in evolution. And the judge sat there during the testimony and listened to it, and said, “It’s just wrong. It’s embarrassingly wrong. And it’s embarrassingly wrong because of the standards that they used to get to those conclusions.” If you look at the testimony of Michael Behe for example, Michael Behe was led down the garden path by Eric Rothschild, one of the lawyers for the plaintiffs, and Eric got him to admit first that you really had to change the definition of science from natural explanations for natural phenomena, to broaden it to include supernatural explanations for natural phenomena. And Eric said, “Well, that’s an interesting definition, and under that definition then, astrology is science.” And Michael Behe thought about that for a second and said, “Yeah, that’s right.” Okay ... keep talking. If that’s where you’re going, if that’s what you’re going to say, and if you’re going to raise these arguments, the logical conclusion of that to a judge that’s not already predisposed in favor of ID is, “Look, something else is going on here, other than a legitimate discussion about scientific disputes. This ain’t science; this is something else, and the only other something else it can be is religious, religion.” And frankly, they know it, we know it, the judges know it, and after a day or two of testimony by the likes of Behe, everybody’s going to know it. And I know that from just talking to reporters who covered the trial and had no scientific background, had no legal background, but were called up for comment on the trial and would say, “You know, that guy was just an embarrassment.” Yeah ... so, the answer is, it is going to make it tougher to litigate the cases because they’re hiding the ball deeper and deeper and deeper, and what we’re going to

have to do it again, as a lawyer who litigates this stuff and writes briefs for the National Academies of Science on this, and various other groups – you’re going to have to help me out here, you’re going to have to give me scientific testimony and scientific explanations that can communicate these ideas clearly to laypeople, or the category beneath that, which is lawyers.

[laughter]

Steven Gey: You’re going to have to help me do that, all right? But it can be done, and KM, I think, gives us the model for doing it. But it’s going to be more expensive; it’s going to be harder, frankly, if you’ve got a hostile judge. That’s going to make it an even bigger problem.

Deborah Blum: Professor Pennock?

Robert Pennock: Yeah, I just want to say one other reason that this new strategy of not mentioning intelligent design and instead talking about teaching the arguments against evolution and things of that sort ... did appear in the Dover case, because [the policy] talked about, “Students will learn gaps and problems in evolution.” So it was actually a hybrid policy that had part of the old ID strategy of mentioning explicitly and part of the new strategy of approaching it in this way. And the judge’s decision did address that. But one of the reasons that I think is important to keep in mind here, that the name change isn’t going to make the difference. What we need to always do – this is a basic thing when you’re teaching philosophy of science, or any philosophy, of course – is to get past just looking at the words and to try to get to the concepts. And what has happened over time here is: the names have changed, but the concepts have stayed the same, right? So, “creation science – oh, well, the Supreme Court said that that’s not acceptable. Let’s just do a little word shift.” And in the Dover case, one of the nice revelations was looking at the drafts of the textbook that was at issue, *Of Pandas and People*. And you could see how, in the early drafts prior to 1987, [before] the Supreme Court decision against creation science, they used creationism, creation science, they used that terminology explicitly and said, “Here’s what it is” and gave the definition. And you could see the switch in the draft from before the decision in ’87 to right afterwards, “Oh, well, that didn’t work. Well, let’s call it intelligent design.” And literally, the definition is the same, but they just changed the word. Okay. Well, critics have now

shown that it’s the same thing. So what are they going to do now? “Oh, well let’s change the name; we’ll call it something else.” And if you take a look at the content – creation science, intelligent design, which was truly always just a series of objections: “Here’s something you can’t explain” -- it’s always a series of negative arguments, and really, (they’re) talking about “arguments against evolution,” although it doesn’t say the name there; it’s really just a way for them to bring in their (same) arguments again, under this new heading. And I think, were anyone to try to do that, and bring in their arguments in this way, it would actually be just obvious, because people are now alerted to that – that this is a change in name, but not a change in content. And if a teacher were to say, “Oh, well, let me use Michael Behe’s stuff as a criticism of evolution,” one would see, this is what the judge has already ruled on; this isn’t real science, it’s a challenge; it’s not anything positive for their view at all. And the name change doesn’t make the difference.

Eugenie Scott: But that’s exactly why it’s going to be tried – because it doesn’t look like you’re saying, “Go forth and teach creationism.” It’s a backdoor way of slipping creationism in. So there are going to be school boards around the country who think, “Oh good, this is our way of teaching creationism. We’ll just teach the evidence against evolution.” Because students think dichotomously – they think there’s either evolution or creationism. Disprove evolution; what’s the default? So you don’t have to call it creationism; you don’t have to call it intelligent design. You just prove to students that evolution is crappy science and they themselves will conclude, “Well, therefore God did it. Therefore special creation.” It’s a very clever strategy and it’s going to be very tough to deal with, because in order to convince a judge of this, as Steve has described, you really have to go into the whole history of this movement, which is what they did in *Selman v. Cobb County*, the textbook sticker case that Steve mentioned. The judge actually has a very nice discussion in there – he listened to the testimony and went off and read a bunch of law review articles which traced this “evidence against evolution” approach, this dichotomous “disprove evolution and creationism wins by default,” and was convinced that the “theory not fact” disclaimer sticker in Selman and Cobb County was really a way of bringing creationism in through the backdoor. But you have to be able to get a judge who’s able to recognize that. And then, like Steve said, make a very careful case. It’s, you know, the

ante keeps getting raised; it doesn't get any easier.

Deborah Blum: So I think it's clear, if we listen to the panel, that no one thinks that Dover was the last time that we're going to be confronting this issue, and I'm wondering, this is now the part of our program in which we are open to questions from the audience. If you have a question you'd like to ask anyone or all of the panel, we have microphones at the back of the room. Please address your questions into the microphone so that you can be heard in the overflow room and be recorded and be broadcast and all of those things. Or they can just leave.

Mark Hessen: Good evening. Can you hear me?

Deborah Blum: And we'll begin over here. State your name and let us know your question, and I'll repeat it up here if it's difficult to hear.

Mark Hessen: Alright, my name's Mark Hessen. I have two children in the public school system right now, and I am a creationist and I do acknowledge, and I believe most informed creationists do acknowledge that natural selection and mutations do exist, they have been proven scientifically. However, the going from lower life forms to higher life forms, that's where we have a problem, the genetic information – I've never seen or heard of any sound evidence to show that there's a new genetic information added to the gene pool to create new species or highly complex life forms. And I would like to know, particularly Dr. Scott, if you acknowledge that there are problems with that – evidence where there's actually new information being added to the gene pool to provide higher li-, or to increase a process of higher life forms.

Eugenie Scott: What I believe you are referring to is the concept of the created kinds, in which you can have variation and natural selection within a kind, but it is impossible to go from one kind to another; there's no common ancestry of kinds. That's

Mark Hessen: Actually I believe there's, it provides for changes within species or within kind, but not to create a new kind. And also, the Second Law of Thermodynamics also seems to support ...

Eugenie Scott: Well, that's point two. We've got to deal with one point at a time here. Your statement that

there's no way that new genetic information can be formed, I'm afraid, is simply wrong. There are, there's quite an extensive literature in genetics – and I'm sure Joe could elaborate on this and give you some good sources for it – showing how new genes can arise by a variety of different, a half a dozen or so different methods, including duplications and translocations and a variety of things like that. We have experimental evidence of this, and we have observational evidence of this. But the big issue, I think, for most creationists with whom I've conversed and discussed this issue, is the inability to visualize “kinds” of organisms – which are more than species, as I understand it from the creationist point of view – as having common ancestors. But yet, the evidence we have from so many different sources of information – comparative anatomy, comparative embryology, the biochemical similarities and differences, the fossil record, lots and lots of different sources of information – allow us to make this inference. And evolution is an inference; it is definitely an inference – we infer common ancestry from all these different sources of information. But there's no reason, from what we understand about genetics or other areas of biology, that we cannot make that inference on very solid grounds. And we do.

Mark Hessen: So you don't acknowledge that there's a loss of genetic information through these mutations?

Eugenie Scott: No. And it is actually a way that new genetic information can be introduced into the gene pool.

Deborah Blum: You also wanted to respond, Professor Pennock.

Robert Pennock: Yeah. This is actually one of the most common arguments and especially characterized within the ID movement, although not distinct to them, it was made by creation science before that, that you can't get, through natural selection and random mutation, new information. Where's it come from? How do you get complex, functional traits? And this is something where you can do experiments and make measurements and see it happen. So some of the work that I do and – not just me, but many folks do – with what's called evolutionary computation, which essentially takes that Darwinian process, Darwin's Law, and implements it in a computer and lets computer viruses randomly mutate, as they self-replicate, have them compete with one

another and be subject to natural selection. Essentially, it's Darwin's process happening in the computer environment. You can watch them go from things that can't do something to something that can. And you can tell, "Hey! There's something new here that happened through that process." And [there are] graduate students who are working on that and [who] can track the information increase. So this is something that's measurable, and I think that that type of argument has just been totally shown to be false.

Deborah Blum: Dean Travis?

Joseph Travis: Your question is a good one, because as Rob points out, one of the early criticisms of Darwin's notion of selection was that it really would just shuffle around existing variation. How do you make something new? And, so it's a legitimate question. The evidence is really striking, though. For example – and a lot of this evidence comes to light only with the advent of molecular methods – for example, you have a phenomenon known as pseudogenes. For example, in hemoglobins, there [are] a lot – there [are] a number of different hemoglobin genes. (Hemoglobin is) the molecule that carries oxygen in the blood. And one of the forms of hemoglobin that is the functional hemoglobin in goats and in ungulates is actually present in primates – humans and monkey genome – but is silenced. It's actually the same gene but is turned off. A different gene is actually functioning to do the hemoglobin carrying in us. Fish have pseudogenes – you can trace the evolution of the pseudogenes through the vertebrates, which are the organisms that I know personally the most about. So it's a fascinating case of new genes actually being added, and old genes being turned off. And the process by which this occurs is now reasonably well-understood through gene duplication and divergence. So it's a striking example at the molecular level of new genetic information being added that produces some very different types of adaptations to different oxygen environments. It's a good point.

Deborah Blum: We're going to move on to this gentleman here.

Arthur Washington: Yes, I like your last comment, Dr. Travis. There's something that I'm concerned about. I'm Arthur Washington from Florida A&M University, a molecular biologist and biochemist. A few minutes ago you mentioned that we should think of a way, or

not simply think of a way, but teach science differently to non-science majors and science majors. But when we get to the point of talking about evolution, especially when we get from the non-descriptive part of it down to the molecular level, cytochromes, genes and etc., that is, the different type of genes being turned on and off, aren't you weakening science by not talking to non-science majors about that detail? It leaves sort of a fantasy world out there. "Well, realistically, these things didn't happen, so I'll go back to the book of Genesis, Chapter 1, 'God created the earth'" and all. Isn't that where we're losing students?

Joseph Travis: That's an interesting question. Are we losing them because we don't give them the depth necessary to appreciate what's going on? Or are we losing them because we don't give them positive examples that they can understand? And that's a dilemma. One of the things that's hard for me to wrestle with in my own statement, and you point this out, so much of the new and very exciting evidence is at the molecular level, at the genomic level. And it's very hard, not impossible, but very hard to communicate that to a group of students who really didn't do well in high school biology and are still struggling to understand some of the fundamentals. It's very difficult to communicate that. My own approach has been to use different examples and to use, rather than the example I just used at the molecular level, the novel morphological features, and the transformation of morphological features, because even students even at the more basic levels understand the structure of bones and the structures of muscles and ligaments. And I usually tell them, "Look, if you've eaten a fried chicken and can pick out the bones, and you're sure it's not a rat, then I can give you some really good examples that will motivate you along." But it's a good point, I wrestle with it, and therefore I don't end up, or I end up perhaps not portraying the true power of the evidence, but I have to figure out where do I compromise between losing them to tales they don't understand and perhaps not giving them the full power of the evidence. That's a tough question.

Deborah Blum: That's a good answer. Over here?

Unidentified Questioner: My question is for the two scientists on the panel. Basically, I'm wondering if you can discuss the collision probability of, basically, let's give something with a very high Stokes-Einstein

diffusion coefficient, let's say a hydrogen atom, two hydrogen atoms, in a primordial soup on the order of 10 to the ninth cubic kilometers and then extrapolate that to the complexity of three billion base pairs, 200,000 genes, 40,000 proteins, and discuss your calculation within the context of the entropic contribution to the free energy of this process.

Eugenie Scott: What on earth are you talking about?

[laughter]

Unidentified Questioner: Thank you.

Eugenie Scott: This sounds very much like something from Kent Hovind's web page. I mean, is this, are you, is your point that evo- that the origin of life is incredibly improbable, therefore...

Unidentified Questioner: My point is that you know I'm not disputing, you know, I'm not disputing the evolution, but what I am disputing is that it doesn't explain, it still doesn't explain the origin of the species.

Eugenie Scott: Oh, what, the origin of species?

Unidentified Questioner: Yes. I would like to see I, I challenge...

Eugenie Scott: What's your understanding of species?

Unidentified Questioner: I challenge any one of the scientists to...

Eugenie Scott: Species are a dime a dozen; species are all over the place. Why are you having a problem? Speciation theory is a whole separate component of evolutionary biology, and it explains how isolating mechanisms can arise when genetic contact between populations is cut off.

Unidentified Questioner: I'm not arguing that.

Eugenie Scott: And that is how you get new species, through those kinds of...

Deborah Blum: I'm not sure what your question is either. Can you either state it more clearly, or we're going to move over here?

Unidentified Questioner: I'll take that you can't answer it.

Deborah Blum: No, I think that you didn't ask it.

Unidentified Questioner: Yes, I did.

Another Unidentified Questioner: [barely audible – calling from the audience] He's asking what is the origin of life? Can you prove the origin of life?

Eugenie Scott: No, that's not what he's asking 'cause I ...

Deborah Blum: Sorry, we need to get you on the mic. This gentleman believes you're asking what the origin of life is.

Unidentified Questioner: I'm asking for someone to put a single-celled organism into a test tube; it doesn't even have to be 10 to the ninth cubic kilometers, the volume of the primordial soup,

Eugenie Scott: Oh, pass.

Unidentified Questioner: ...put it in a test tube and make a human out of it.

Eugenie Scott: I'm sorry, but ...

Unidentified Questioner: Thank you.

Deborah Blum: No, thank you.

Eugenie Scott: ...but that would not prove or disprove evolution in the slightest.

Deborah Blum: Okay, over here.

Pete Dunkleberg: Hi, I'm Pete Dunkleberg, and I'm a member of Florida Citizens for Science, and I guess some of the questions so far, illustrate Dr. Travis' point, and some of the rest of you, we could use more science education. If I could help out just a teensy bit here, you know, on the question of information, there is no quantitative definition of information that you can apply to a genetic string that only allows mutations to decrease. You can clearly have a mutation that increases it if you apply any of the quantitative definitions of information. So that's not really a problem, and you

didn't answer the questions about the, "Oh, what about the Second Law of Thermodynamics?"

Deborah Blum: Right, I think ...

Pete Dunkleberg: We don't have a chance to go through any equations right now,

Eugenie Scott: [quieter] That's why I didn't answer ...

Pete Dunkleberg: ...but since we know that evolution is a process that goes on around us all the time, if it did violate the laws of thermodynamics we would just have to say to the physicists, "Well sorry fellows, that's not a law after all." Let's see here, I guess I'd better get to a ...

Deborah Blum: Question.

Pete Dunkleberg: ...question pretty soon here.

[laughter]

Pete Dunkleberg: I was going to mention that the whole evolution-creation struggle obviously relates to power of different church groups and power of different religious groups in society. In other words, it's a question of politics and church versus church politics. And it would clearly be a big coup of certain church factions to get their theology taught to everyone in school as science by teaching bogus science. And, do you agree, any of you, that this is a church versus church politics issue of different churches struggling for power? And in the future, might a panel such as yourselves include someone whose field is church politics?

Deborah Blum: Do you want to touch that one, Professor Haught?

John Haught: No, I don't really want to, but ...

[laughter]

John Haught: Let me just tie the last two questions together. The earlier question was about how to explain the origin of life and this question too, I think, admits of a similar type of response, and this is a good example of what I was talking about earlier. We need to develop a sense of explanatory pluralism, that

there can be a plurality of levels of approach to any particular phenomenon, including, say, the origin of life. From the point of view of physics, you know, you're going to talk about it in terms of thermodynamics, self-organizing properties of matter; all of that enters into the explanation of the origin of life. If you're a chemist, you'll talk about the, such things as the bonding properties of carbon with other atoms. If you're a biochemist, you'll talk about RNA cycles, protein replication, all sorts of things like that. And recently, you can bring in another science, astrophysics. If you ask Martin Rees, the Royal British Astronomer, to explain the origin of life, he'll say we can't hope to explain the origin of life until we go back and look at, what he calls, the six numbers that had to be established right at the time of the big bang and made it probable for evolution to come about. And if you're Harold Morowitz, you'll talk about the origin of life as one of 28 different chapters in the emergence of the universe. And my view is, let's push these explanations as far as we can. They don't overlap; they're incommensurate in many ways, and if you're theologically oriented, you can accept all those explanations as being accurate, and you don't have to look upon it as the more robust scientific explanations become, the less significant theological explanations would be. For example, you could take all those explanations, and in principle at least, make them compatible with the idea in religion and theology that there's a generous principle, ultimate reality, that wants the universe to emerge in a spontaneous way, in a manner compatible with rich diversity. The earlier questioner was a little bit disturbed about whether science is going to undermine the idea that theology, that God, is interested in a diversity of life, but you don't have to see con-, you don't have to see science as in any way competing with these fundamental religious positions. And you should not try. Second, this is my last word on this, we should not try to insert theological explanations at any of those levels where scientific explanation is going on. And all of this would be acceptable if we could just relax and accept the possibility that there could be many, many levels of understanding of the causal ingredients that enter into the explanation of almost anything that happens in our universe.

[applause]

Deborah Blum: Over here.

Wade Young: Yes, I, my name is Wade Young. I am a Catholic Christian. I do believe in science. I also believe in evolution. My faith tells me that it is okay to believe in that; it has always told me that. And I have a daughter who is in school and is well-educated in science, and I hope one day she'll be a physicist. I would like to ask the speaker if I could say a quote, since at the beginning you quoted from Darwin. I have a quote from a scientist that I would like to read before I ask Dr. Haught a question. Is that possible?

Deborah Blum: Is it a short quote?

[laughter]

Wade Young: It's a very short quote.

Deborah Blum: All right.

Wade Young: This is from Roger Bacon, who I believe is, he was a Franciscan who taught at Oxford. And I believe that's pre-Enlightenment, during the 13th century. He said in his *Opus Meius* that, "Without experiment, nothing can be adequately known. An argument proves theoretically, but does not give the certitude necessary to remove all doubt. Nor will the mind repose in the clear view of truth unless it finds it by way of experiment." He also went on in *Opus Tertium*, "The strongest arguments prove nothing, so long as the conclusions are not verified by experience." And my question to Professor Haught is: at the beginning you said how we need to be educated in both religion as well as science – and my biggest concern is, when, as me as a Catholic Christian, when I study history and science, and I look at my faith, and I go to the past, and I read all these things about religion and science were very integrated, including philosophy, all the way from the beginning of the Christian era, which included the Judeo-, I will say Judeo-Christian era – do you think the main cause of all this is because of the Enlightenment, the separation, the kind of science away from the church, created this conflict we're having today? When in fact, people don't go back and read history, and see that there really wasn't a conflict, that religion was very open to science as well as the arts, music, architecture.

Deborah Blum: Professor Haught?

John Haught: Well, just a brief word. I think that a lot

of people are unaware of the fact that historically, in the Middle Ages for example, there were many people, and then of course there was Roger Bacon, who instructed theologians to let experimentation, to let science, push natural explanations as far as they possibly can. These people, long before our own time, were aware that it's not the business of theology to come in and intrude into the work, the good work, the ongoing work of science. But if theology should do anything, it should encourage science to push natural explanations as far as they possibly can. And I'm not sure that the Enlightenment is the cause of the problem we have today. But what can happen is, and what has happened is, that some people have discovered that natural explanations are so powerful that they seem to render superfluous any, at any point, any invocation of the idea of divine wisdom as somehow underlying the universe. But when that jump takes place, you're no longer doing science; you're into philosophy; you're into your own worldview. So the worldview of scientific naturalism is, I think, inevitably going to conflict with the worldview of religion. But I don't want to mistake that conversation with a real and important and enlivening conversation between science and theology.

Eugenie Scott: Yeah, and I'd just like to underscore that because I am one of those scientific naturalists. I am a materialist in my personal philosophy, but I don't believe that science compels that conclusion. I believe that science is an equal opportunity substratum for religion or any philosophy you want to come up with – and I think Jack would agree with me here – there's a very ... we can learn a phenomenal amount about the natural world by applying this methodologically naturalistic approach that we call science, by restricting (ourselves) to natural cause even when it's really tough. One of the things scientists get very used to saying is, "I don't know yet." And you might have to wait before you can explain some phenomenon until you develop better instrumentation or other theories or something. And sometimes you just have to say, "I don't yet know how the bacteria flagellum evolved." You don't come to the conclusion that, "Because I don't yet know, it's unexplainable." But I think that the basic idea that because science is incredibly powerful, because we have explained so much through science, it is not unreasonable to take from that the conclusion, "Therefore, there is no God." It's also not unreasonable to take from that conclusion that, "Science says nothing about the existence of God." Science does not compel

you to a naturalistic *or* a non-naturalistic conclusion, and I think that is the mistake that people like Dawkins make. They believe that there is this necessary tie, but even someone who disagrees with Dawkins philosophically can agree with him on the nature of science.

Deborah Blum: Over here.

Tom Clorick: My name is Tom Clorick. I have a question about a slightly different angle on the relationship between religion and science. And I don't have anyone I'm addressing it to, so, whoever is interested, I'd be interested in everyone's response. There have been some scientists who have made a pretty good effort in the direction of trying to explain religion with their scientific skills. I'm thinking about David Sloan Wilson, who has looked at religion as an adaptation of a group which has conferred selective advantage to groups, so there's basically an evolution, and religion is something which has been good for humans in that regard. And then I'm thinking of Pascal Boyer, *Religion Explained*, who looks at, a little bit more at the psychological mechanisms that we all share as humans which tend to make us religious creatures. And both of those books, I was struck by how these scientists were so respectful of religion, when I was through reading, I was left wondering, which church do they go to? You know, there was a love of their subject matter – what my question is, is what place might this have in bringing some rapprochement, or resolving some of the tensions or enlightening us about the nature of religion and science?

Deborah Blum: Does *Darwin's Cathedral* bridge the gap?

Michael Ruse: Yes, can I speak to this? Because, in fact, this is a topic which is first raised by David Hume, actually, in the 17th century, 18th century rather, in his *Natural History of Religion*. And Hume lays out sort of a natural course of how he thinks religion develops, which incidentally, was very influential on Darwin in *The Descent of Man*; he'd read Hume and studied him carefully. And Hume, and Darwin following him, says, "Of course, the fact that I give a naturalistic explanation of something doesn't tell you absolutely in any way whether it's true or not. You've got to have independent arguments for this." And I think that this is very true. I mean, the fact, for instance, that if I see a truck bearing down on me and I hop out of the

way and you say, "Oh, well, you don't [know] that the truck really was there because, you know, you've got it through your evolutionarily acquired characteristics, your eye and these sorts of things." I say, "Yes, but it doesn't mean to say that the truck didn't exist." And I think that you could use exactly the same argument with respect to religion. Now, some people, and we've mentioned Dennett earlier, some people have a rather different twist on this, because Dennett starts with the belief that religion is not true and then what he wants to do is give an evolutionary explanation, which is to show how we could be such fools to be deceived by religion so much. And of course, this is why he gets into his parasite and likens religion to being like the liver fluke and something like that. But Dennett of course is doing a rather different argument; he's not disproving religion through evolution. He's already, if you like, assuming or disproving religion and then going in that way. And I think it's a very dangerous argument to go the other way [and] just simply say, "Ah well, because I've given a naturalistic explanation of something, therefore, this shows that it's false." I mean, I think Ed Wilson makes this mistake in *On Human Nature*, and as I say, Hume two centuries before was right, but I'm not surprised because Hume tends to be right on all the important issues.

[laughter]

Tom Clorick: But I didn't get the sense that either one of those authors were at all approaching religion from a scientific viewpoint, had any thoughts that they were somehow weakening religion or disproving it or anything of the like.

Deborah Blum: I'm going to ask Professor Haught if he'd also address this issue.

John Haught: Well, let's take the question: Why are we religious or why do we have a tendency as a species to be religious? I think it's important to listen to what the evolutionists say on this, and I have no trouble answering a question as long as we allow for a plurality of levels of explanation. At one level, yes, I think we are religious because religion has proven to be adaptive from a Darwinian point of view. Or if you're a neo-Darwinian you might say that, "What's going on in religion, is that genes are getting into the next generation." As long as you don't say that's all that's happening. I mean, you can maintain all this

and still, at the end, say, “I’m also religious because I’m being addressed by a great mystery to surrender myself to something of ultimate truth, goodness and beauty.” So it’s possible, we should never have to say, “It’s Darwinian selection *rather* than some (explanation) addressed by the divine.” But that’s what happens, on both sides of the issue. And my definition of reductionism is the suppression of explanatory pluralism. And religious people can be just as reductionist as scientists here, whenever they say, “No, it’s God, rather than natural processes, that are involved in our being religious.” Let’s allow room for all levels of understanding, and I think we’ll have a richer understanding of our world.

Deborah Blum: Folks, we’re out of time. I realize that there are a fair number of you up here that yet have questions, and perhaps if you want to come down and ask the panelists directly, they’d be happy to answer them.

[*laughter*]

Deborah Blum: But ...

[*applause*]

Deborah Blum: Thank you for a terrific panel; it was a pleasure to be here.

[*applause*]

[*crowd noise*]