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PRESENTATION HELD BEFORE THE SCIENCE COMMITTEE
OF THE
KANSAS STATE BOARD OF EDUCATION

TRANSCRIPT
OF
MORNING
PROCEEDINGS

Held on the 6th day of May, 2005,
beginning at 8:30 a.m., at Memorial Hall, 120
West 10th Street, in the City of Topeka, County
of Shawnee, State of Kansas, before Dr. Steve
Abrams, Chairman of the Kansas State Board of
Education; Ms. Connie Morris, member; and Ms.
Kathy Martin, member.

APPEARANCES

The Minority appeared by and through its
counsel, Lathrop & Gage, 2345 Grand Boulevard,
Suite 2800, Kansas City, Missouri 64108, by Mr.
John H. Calvert, and by Arnold & Porter, 555
Twelfth Street, NW, Washington, DC 20004, by
Mr. Edward Sisson.

The Majority appeared by and through its
counsel, Irigonegaray & Associates, 1535
Southwest 29th Street, Topeka, Kansas 66611, by
Mr. Pedro L. Irigonegaray.

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1 CHAIRMAN ABRAMS: On behalf of the
2 Board of Education, I would like to welcome you
3 to these hearings. My name is Steve Abrams.
4 And my apologies, this is basically the same
5 thing I said yesterday morning, but several of
6 you are new. I'm Chair of the State Board Of
7 Education and also Chair of the Science
8 Subcommittee. My fellow board members on the
9 committee include Mrs. Connie Morris and
10 there's Kathy Martin.

11 The purpose of the hearings that will be
12 held over the next couple of days is to assist
13 us as state board members in understanding the
14 complex and oftentimes confusing issues
15 regarding science education. A brief history
16 of how we arrived at these hearings may be of
17 use.

18 In June of last year, a statewide
19 committee appointed by the Commissioner of
20 Education and comprised of 26 public and
21 private educators spanning elementary, primary,
22 secondary and post-secondary levels, retired
23 educators, curriculum coordinators and a
24 private practice physician began the process of
25 reviewing and revising the state science

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1 standards. The writing committee met several
2 times between June and November and sent a
3 draft of the standards to the state board in
4 December of 2004.

5 At the same time, eight members of the
6 writing committee submitted what is now
7 referred to as the minority report, asking the
8 state board to consider some changes to the
9 draft. Through much discussion at the state
10 board and subcommittee, the three of us was
11 formed to further examine the issues contained
12 in the minority report. Also after much
13 discussion, it was decided the best forum to
14 address the issues was via hearings such as
15 those we'll have over the next couple of days.

16 In order to conduct the hearings in a
17 reasonable time frame and in a civil manner,
18 there are a few house rules and procedures that
19 you, the audience, and indeed all of us need be
20 aware of. First, we're on a tight schedule, we
21 have a lot of witnesses before the
22 subcommittee, and it is critical that we stay
23 on schedule. In order to do this, I've
24 requested that no comments come from the
25 audience.

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1 The expert witnesses have come, many of
2 them, from quite a distance to present their
3 information and we should allow them every

4 courtesy. We ask that you do not display signs
5 of support or opposition by yelling or applause
6 and so forth. We also would ask that you--
7 that each of you turn off your cell phones.

8 Each expert's testimony has been given an
9 allotted amount of time as determined by the
10 presenters. Following the experts'
11 presentation, the legal counsel for the
12 opposing viewpoint will be given half that
13 amount of time to ask questions. Following
14 that, we, the subcommittee members, will be
15 given half that time to ask questions. For
16 example, if an expert testifies for 20 minutes,
17 the opposing counsel will be given ten minutes
18 for questioning and the subcommittee members
19 will be given five minutes for questioning.

20 The time for questions will be adhered
21 to. Therefore, the questions should be
22 succinct and not sound like a speech. We'll
23 take one 15-minute break this morning, break
24 for lunch at 12 o'clock, resume at 12:55, with
25 another 15-minute break this afternoon and then

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1 hopefully we'll be able to adjourn by-- for the
2 day by 5:30.

3 Additionally, please note that the house
4 rules on this building are that Memorial Hall
5 does not allow food or drink in the auditorium.
6 We would greatly appreciate it if you would
7 abide by this policy.

8 Also, I would like to make some
9 introductions. Mr. Pedro Irigonegaray is for
10 the majority, and Mr. John Calvert is lead
11 counsel for the minority. Additionally, a
12 court reporter is recording all of the
13 proceedings and a transcript will be made
14 available to the public at a later date. Thus,
15 I would ask that when speaking, enunciate
16 clearly and try not to talk over on top of one
17 another. I thank you for your interest in
18 Kansas education. Mr. Calvert.

19 MR. CALVERT: Thank you, Doctor
20 Abrams. Members of the committee, I would like
21 to introduce you to Doctor Edward Peltzer.
22 Does anybody have a knife or anything that we
23 could cut an apple with?

24 DOCTOR PELTZER: Do you want to do
25 the honors? Just in half. We'll-- we'll get

0007

1 to this later.

2 EDWARD PELTZER, Ph.D.,
3 called as a witness on behalf of the Minority,
4 testified as follows:

5 DIRECT-EXAMINATION

6 BY MR. CALVERT:

7 Q. Ed, maybe you could introduce yourself, explain
8 a bit about your background and why you're here
9 and so forth.

10 A. My name is Edward Peltzer. I have a Ph.D. in
11 oceanography from Scripps Institute of
12 Oceanography. Should I start over? Here we
13 go. My name is Edward Peltzer. I have a Ph.D.
14 in oceanography from Scripps Institution of

Oceanography at the University of California, San Diego. Before that I got a bachelor of science degree in chemistry from Bucknell University, Pennsylvania. After I got my Ph.D., I worked for 20 years at Woods Hole Oceanographic Institution on Cape Cod, Massachusetts. And for the past eight years I've been working through Monterey Bay Aquarium Research Institute in Monterey, California-- or Moss Landing, California. I'm testifying as a private citizen. The opinions I'm giving today

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are not necessarily those of the schools or the institutions that I'm-- I'm--

Q. Doctor Peltzer, why-- what is in your background that qualifies you particularly to talk about origin of life?

A. As a graduate student, I did some work on the Murchison meteorite and worked with Jeff Bada and Stanley Miller.

Q. And did you study chemistry under Doctor Miller?

A. Doctor Jeffrey Bada was my thesis advisor. Stanley Miller was on my thesis committee.

Q. And what was your thesis about?

A. My thesis was about the geochemistry of alpha-hydroxy acids-- (reporter interruption). My thesis was about the geochemistry of alpha-hydroxy and dicarboxylic acids.

Q. How did you get interested in studying chemical evolution and origin of life?

A. As a first year graduate student, I was taking a class from Doctor Bada. And one day in class, he presented what he thought would be a good idea for a thesis topic, he was talking about the fact that in 1969 the Murchison meteorite fell on Australia and a few years

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Later some scientists from NASA had reported the discovery of amino acids in this meteorite. I was-- I was taking his class in 1973, so it was-- it was right after this information had been released. And Stanley Miller and Jeff Bada talked about this. And the mechanism for the production of amino acids in the Miller electric discharge experiment was the-- Strecker's finding of a hydrogen pathway. Could we have the first slide?

Q. Oh, sure. Okay.

A. It's not up. Okay. It's the next slide.

Q. Okay.

A. That's the one. Oop, too far. This-- this pathway forks. And in the presence of large amounts of ammonia, it produces amino acids. In the absence of ammonia, it produces only hydroxy acids. But if you have some intermediate concentration, you get both amino and hydroxy acids. And what Stanley Miller and Jeff Bada were thinking is, if we could analyze the meteorite and find the hydroxy acids, then from this ratio of those compounds to their amino analogs, one would be able to tell the ammonia concentration on the meteorite parent

0010

- 1 body.
 2 Jeff pretty much put this out there as--
 3 as a baited hook for one of the graduate
 4 students taking the class to bite on, and I bit
 5 hard.
 6 Q. As we go through your talk, are you going to
 7 explain later on the relevance of that or--
 8 A. Yes.
 9 Q. Can you explain to us generally the difference
 10 between chemical evolution and biological
 11 evolution? And you're here to talk about
 12 chemical evolution?
 13 A. Yes.
 14 Q. Okay.
 15 A. Chemical evolution is-- is what happens-- it's
 16 the natural chemistry that happens on the earth
 17 before life begins. Biological evolution is
 18 what happens after life begins. Biological
 19 evolution is subject to-- to natural selection.
 20 Chemical evolution because the-- the compounds
 21 are not living are-- are not subject to natural
 22 selection.
 23 Q. So you don't have a population that replicates,
 24 and that's critical to biological evolution; is
 25 that correct?

0011

- 1 A. That's correct.
 2 Q. So the chemical evolution is necessary for
 3 biological evolution to occur?
 4 A. I'm sorry?
 5 Q. Chemical evolution is necessary for biological
 6 evolution to occur?
 7 A. Well, you-- you have to have a-- some way you
 8 have to have life begin.
 9 Q. Okay. Can you-- before you get into your
 10 analysis and so forth, could you explain a bit
 11 about the work you've done in the area?
 12 A. Yes, the next slide. So-- so after Jeff sort
 13 of hooked me on this project, I-- I spent the
 14 next three years of my life working to develop
 15 the analytical method for analyzing hydroxy
 16 acids in meteorites. When I thought I was
 17 ready, I ran in to see Jeff in his office and
 18 he said, well, let's call Stanley and see what
 19 he thinks. And we talked it over with Stanley
 20 Miller, and Miller thought that because the
 21 meteorite samples were so precious that we
 22 should begin with an analysis of some of the
 23 product of one of his electric discharge
 24 experiments. So I went up to see him and-- and
 25 got some of that material, and that's what I

0012

- 1 began with.
 2 Once that was successfully done, we
 3 proceeded with the analysis with the Murchinson
 4 meteorite and found hydroxy acids present and
 5 were able to compare this to the pattern of the
 6 hydroxy acids in the electric discharge
 7 experiment. They were identical. If you
 8 didn't know which sample was-- was which, it
 9 would be hard to tell what you were looking at.
 10 The hydroxy acid turned out to be racemic,

11 which means that they were produced by chemical
12 processes and were not the product of biology.
13 And finally, we were able to use the ratio of
14 the hydroxy acids to the amino acids to
15 calculate the ammonia concentration on the
16 meteorite.

17 This-- this was work that I did for my
18 Ph.D. dissertation. Unlike the discovery of
19 amino acids in the Murchinson meteorite, there
20 wasn't much public fanfare. So after I wrote
21 up my thesis and published a few papers, I
22 wanted to pursue my career as an oceanographer.

23 Q. What-- what is the relevance of the ratio of
24 hydroxy acids and amino acids in your meteorite
25 and the fact that they indicate that the parent

0013 1 body had an ammonia attached to it?

2 A. Well, the relevance fits in with a lot of
3 theories about the early evolution of the-- of
4 the solar system and the formation of planets
5 and the conditions that were-- were present on
6 it. It tells us a lot about the presence of a
7 possible reducing atmosphere. It-- it fits in
8 well with many of the current theories leading
9 to the origin of life.

10 Q. So if you find amino acids on a meteorite, what
11 does that tell us, though, about the origin of
12 life?

13 A. Well, we-- we now have a-- a entirely chemical
14 process. Before Miller did his experiments,
15 amino acids were thought only to be the product
16 of living organisms. What his showed is it's
17 possible to produce them by simply natural
18 chemical reactions. So you-- you can't infer
19 that there's any life just because you find
20 amino acids in a meteorite.

21 Q. I notice you brought an apple with you. What
22 is--

23 A. We'll-- we'll get to that--

24 Q. Okay.

25 A. -- until a little bit.

0014 1 Q. Okay.

2 A. That-- that has to do more with some of the
3 problems in the--

4 Q. What-- what are some of the various theories
5 that have been postulated of the origin of
6 life?

7 A. Okay. Could I-- next slide, please. There's
8 actually quite a few theories about the origin
9 of life. The first one was proposed by the
10 Greek. I think it's been traced back to
11 Ambidogalese (phonetic) in about the Fourth or
12 Fifth Century, B.C. He proposed that life
13 arised just through spontaneous generation. He
14 was looking for a purely natural explanation
15 for what our life came from. He didn't-- he
16 didn't accept the idea that-- that God had
17 created life or if there were gods, they
18 weren't very effective in doing anything. So
19 he-- he assumed that things had to happen
20 naturally and just argued for this spontaneous
21 generation.

This was the prevailing explanation for where life came from until the middle 1800s. Pasteur in some of his early experiments, and also Tyndale, disproved this area of

spontaneous generation and their work led to the germ theory of disease.

The next area that came along for where life came from is basically called Abiogenesis. It's been traced back to a letter that Darwin wrote to his friend, Joseph Hooker, where he-- he imagined a warm little pond that had all the right ingredients for life to form. And if you had just the right conditions, life would begin.

He based this on the idea that the cell was a very simple structure that was just a-- a membrane with a-- a loose assemblage of chemicals inside. This-- this theory has been greatly modified and expanded upon. It's the most popular one today. And the-- I'll-- I'll explain it a bit more with the next slide.

The other competing theories are the-- the RNA, the ribonucleic acid world, or the peptide nucleic acid world. These are two variants of the Abiogenesis theory that tried to work on some of the problems.

And lastly, there's the idea of panspermia or directed panspermia. This is the idea that life came to earth from outer space

either accidentally or intentionally. So could I have the next slide?

Q. How would it be accidental?

A. That's a good question. The theory of Abiogenesis is also known as molecules to microbes. You begin with a simple atmosphere of reducing gases, things like water, hydrogen, methane, carbon monoxide, carbon dioxide, ammonium nitrogen. And these with various energy sources will produce fatty acids, amino acids, sugars, purines and pyrimidines. This is the basic-- basically what Stanley Miller demonstrated in his-- in his famous electric discharge experiment.

Then-- then the theory goes on to imagine the fatty acids polymerize and make lipids. Amino acids polymerize and make peptides. The sugar is polymerizing to make carbohydrates. And purines and pyrimidines are polymerizing to make polynucleotides and RNA and DNA.

When you first look at this, it seems like a very logical thing, because this is exactly the way biochemists would do it if they were asked to design a pathway. But having said that, that's probably the worst thing I

can say about it because it-- it-- it implies it's something that a designer could do.

When you take a second look at it, you-- you realize that while this step has been well demonstrated, none of these steps have ever been shown to-- to happen by natural processes.

Could I have the next slide. And, in fact, you begin to realize this slide looks more like this-- this cartoon by Steve Harris. Next slide.

So none of the-- these pathways are known. They're all attributed to unknown natural reactions that-- that hopefully someday we'll discover. When, in fact, there's reason to believe that the things go the-- the other way. No, we-- we stop here. Back. Back. Back. No, you need to-- right there.

Q. Right there?

A. Yeah. Do you want to go to the next question?

Q. Hm?

A. The question. Do you want to go to the next question?

Q. Oh, okay. What is the current state of our scientific understanding of chemical evolution?

A. Well, there's-- there's lots of problems with 08: 49AM

the current state of understanding. As-- as I showed you, the-- the various reaction pathways are unknown. We have problems with boundary problems. We don't know what the conditions really were on the early earth. An experiment works fine if you start with a reducing atmosphere. But if we start with a neutral atmosphere, the yields of the molecules are exceptionally low. If we start with an oxidizing atmosphere, we don't produce as many compounds. 08: 49AM

We have a synthesis problem. We don't know how to make the biopolymers except by using a biochemist. We have an information problem. We don't know how they came into kind of the right order that you find in living organisms. We also have an assembly problem. Even if you can make all the-- the compounds by natural reactions in the, say, nearest ocean, you've got to get them all together in one place. And that's a very tiny place, into a-- into a cell. We also have a time problem. Recent evidence suggests that we have less than 500 million years for this synthesis. And this is just not an argument from ignorance, there 08: 49AM

are-- there are competing natural reactions. Do we have the next slide?

In 1912 a Frenchman, Louis-Camille Maillard discovered-- or actually described the Maillard reaction. People have known about this for a long time, they just hadn't described it scientifically. 08: 50AM

This is a reaction where amino acids interact with reducing sugars, things like glucose and lactose, to produce colors, aromas and flavors characteristic of cooked food. Temperature-- temperature accelerates this process, that's why we cook food. It produces the-- the nice brown color you see in bread crusts and the melted cheese for pizzas. And it also produces by-products to give the aroma of baked bread and-- and-- and pizza cooking. 08: 51AM

18 And that-- that's why we-- we cut the apple
 19 here just a few moments ago.
 20 Could I ask you to cut it-- could I ask 08: 51AM
 21 you to cut the apple one more time, just-- just
 22 one of the halves. This-- this may be a little
 23 bit hard to see, but it's an experiment you can
 24 easily do at home. And I'll pass a portion
 25 over to the committee. 08: 51AM
 0020
 1 MS. MARTIN: Thank you.
 2 A. If-- if we look at the freshly-cut surface,
 3 it's-- it's a-- a nice white color. But in the
 4 process of cutting the apple, we broke cells
 5 and released the inner cellular fluids and 08: 52AM
 6 allowed them to react naturally without the--
 7 the control of the biological reaction. And as
 8 you can see on the surface that's been cut now
 9 for about 20 minutes, we've-- we've got a nice
 10 brown color. These are-- this is the-- the 08: 52AM
 11 products of the Maillard reaction producing
 12 melanoïds.
 13 Q. (BY MR. CALVERT) Next slide?
 14 A. The next slide. This is-- this is the-- the
 15 chemical pathway that's going on. The 08: 52AM
 16 important things are you have reducing sugars,
 17 you have amino acids, they have this very
 18 complex reaction pathway, but it produces these
 19 colored compounds called melanoïds. As you can
 20 see, it's a very fast reaction. It proceeds in 08: 52AM
 21 a few minutes at room temperature.
 22 During this time, if we had a solution of
 23 amino acids, we would not form any peptide
 24 bonds, we wouldn't form any polymers. So we
 25 have-- we know that there's this reaction that 08: 53AM
 0021
 1 under natural conditions will outcompete any
 2 polymerization reaction and essentially blocks
 3 the-- the production of biopolymers that are
 4 needed in the Abiogenesis theory.
 5 So next slide. Okay, I said all that. 08: 53AM
 6 You can go to the next one.
 7 Q. Next slide?
 8 A. Yes. We also know that in nature when-- when
 9 an organism dies, it begins to decompose and
 10 the biopolymers are released. And these are 08: 53AM
 11 degrading and produce a solution that is very
 12 similar to what Maillard produced. We have
 13 sugars, we have straight acids, we have amino
 14 acids, all naturally in a solution. And these
 15 react through the Maillard reaction to produce 08: 53AM
 16 a complex mixture of-- of folic acids and humic
 17 acids and melanoïd compounds.
 18 This happens every day on the earth.
 19 This is a-- this is a known reaction. It would
 20 most definitely be happening in the prebiotic 08: 54AM
 21 soup, blocking the production of the
 22 biopolymers and leading to the formulation of
 23 life.
 24 Next slide. So when we look at
 25 Abiogenesis, we know this first step happens, 08: 54AM
 0022
 1 it's been well demonstrated by Maillard, but we
 2 also know that these compounds, they're not

3 going to polymerize in a homogenous sense,
 4 they're going to polymerize in a heterogeneous
 5 sense and produce melanoids and kerogen. And, 08: 54AM
 6 in fact, one of the-- the-- the least discussed
 7 products in the Maillard reaction is that the
 8 main reaction of-- of that process was a red
 9 oily goo that formed on the surface of his
 10 apparatus. The amino acids that he found were 08: 54AM
 11 just a minor by-product and the major product
 12 were these melanoids and kerogen.

13 So the current state is, if we look in
 14 the-- in the natural world for evidence of-- of
 15 any of these processes happening, we find that 08: 55AM
 16 this evidence is missing. This is a quotation
 17 from an anonymous editorial in Nature in 1967.
 18 And-- and their appraisal of the situation was
 19 that, "Those who work on the origin of life
 20 must necessarily make bricks without very much 08: 55AM
 21 straw, which goes a long way to explain why
 22 this field of study is so often regarded with
 23 deep suspicion. Speculation is bound to be
 24 rife and also so frequently wild." Basically
 25 what they're saying is there's no evidence, all 08: 55AM

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1 of these theories are just speculation.
 2 Next slide. And this just further
 3 expands upon the same idea. "Some attempts to
 4 account for the origin of life, however
 5 ingenious, have shared much with imaginative 08: 56AM
 6 literature and-- and little with theoretical
 7 inference of the kind that you can confront
 8 with observational evidence of some kind or
 9 another."

10 Next slide. Well, in fact, there are big 08: 56AM
 11 problems with a scientific theory of an origin
 12 of life. Lynn Margulis, she says that to go
 13 from a bacterium to people - this is the
 14 biological evolution - is less of a step than
 15 to go from a mixture of amino acids to a 08: 56AM
 16 bacterium. So the big problem is making life.

17 Next slide. And the problem there is it
 18 has the least amount of time available.
 19 Heinrich Holland has stated that the most
 20 reasonable interpretation of data is surely 08: 56AM
 21 that life existed on earth more than 3,850
 22 million years ago. The significance of this
 23 number is that it's-- it's thought that at four
 24 billion years ago was-- was about the first
 25 time that-- that the earth became habitable for 08: 56AM

0024

1 any life. So you have a time period of 150
 2 million years for life to form. Or at most, if
 3 you go back to the formation of the earth,
 4 maybe 500 million years.

5 Next slide. So in summary, there's no 08: 57AM
 6 remnant or trace evidence of a prebiotic soup
 7 anywhere. If it-- if it ever existed, it is
 8 entirely conjectural. Although its emergence
 9 from non-living matter is hard to conceive,
 10 life appears almost immediately. There was 08: 57AM
 11 almost no time for life to evolve into the
 12 simplest bacterial cells. And in spite of the
 13 idea of RNA or PNA worlds, there's no consensus

14 on the model for pre-cellular life.
15 So the situation is so bleak that 08: 57AM
16 scientists once again seriously considered the
17 idea of directed panspermia. This is the idea
18 that some other civilization somewhere else in
19 the universe sent out capsules to seed life
20 throughout the universe. The problem with this 08: 57AM
21 as a scientific idea is that it puts the
22 problem of how life began out of reach and out
23 of touch. And that's why it was dismissed the
24 first time. The only reason it's being brought
25 back the second time is they're having so much 08: 58AM
0025
1 trouble trying to figure out how life began on
2 the conditions of the early earth.
3 Q. Ed, you've mentioned that the meteorite that
4 you studied had substances on it very similar
5 to what you found in the flask in Miller-Urey's 08: 58AM
6 experiment. And I believe the flask had all of
7 this red goo on it and you found the same kind
8 of red goo in the meteorite.
9 A. Well, the meteorite actually had a slightly
10 more advanced-- more condensed form. It was a 08: 58AM
11 black tar. But if you take the red goo and
12 just let it continue to polymerize, it will
13 produce this-- this black tar. That's-- that's
14 the big difference between the two is the-- the
15 Miller electric discharge experiment is 08: 58AM
16 something a graduate student can do in a week.
17 The meteorite is something that's supposed to
18 be billions of years old, probably represents
19 millions of years of processes. So you would
20 expect there to be some difference. The 08: 59AM
21 surprise is why the amino acids and the hydroxy
22 acids are so similar.
23 Q. Is-- is the point of-- of this discussion that
24 although you may be able to form amino acids
25 under the special conditions, before they have 08: 59AM
0026
1 a chance to organize they turn into red goo?
2 A. Yes.
3 Q. Okay.
4 A. You-- you have-- you have two competing
5 reactions, one that we don't know how it goes, 08: 59AM
6 the other that we know it goes quite quickly.
7 I think it's pretty clear what-- what is
8 happening if you follow the facts.
9 Q. And we'll-- we'll get to the textbooks in a
10 minute, but I believe we asked you to look at 08: 59AM
11 proposed change to the Kansas Science Standards
12 in Indicator 7, Benchmark 3, Standard 3 of the
13 high school science standards. And it suggests
14 that students should understand or be able to
15 explain proposed scientific explanations of 09: 00AM
16 origin of life as well as scientific criticisms
17 of those explanations. And then there are a
18 number of additional paragraphs with the
19 additional specificity. Have you reviewed
20 that? 09: 00AM
21 A. Yes, I have.
22 Q. And do you think that the indicator states an
23 appropriate goal for education at this level?
24 A. Absolutely. If you could talk about theories

25 on the evolution of life, it-- it pretty much 09: 00AM
0027
1 begs the question of-- of how life began. So
2 if you don't include that, you've-- you've got
3 a big hole. People are going to want to know
4 what-- what the explanation is.
5 The other reason for it is if you look at 09: 00AM
6 most biology textbooks, and all the ones I've
7 examined but I haven't looked at all of them,
8 all the ones I've looked at do include theories
9 on the origin of life. So the genie is already
10 out of the bottle. What we need to do is-- is 09: 01AM
11 set some standards on how to do each one of
12 them appropriately.
13 Q. The books that you've reviewed, have they
14 discussed the points you're making today about
15 the Maillard reaction, the red goo? 09: 01AM
16 A. No, they-- they tend to ignore that. It's a--
17 it's a problem they don't have an answer for.
18 Q. Would it be fair to say that those descriptions
19 are pretty much one-sided?
20 A. Yes. 09: 01AM
21 Q. Maybe could you explain a bit further about
22 that. What-- in addition to the Maillard
23 reaction and so forth, what other things
24 perhaps you find omitted.
25 A. Well, one of the-- the big problems is the-- is 09: 01AM
0028
1 the boundary problem. It's generally not
2 covered in biology because it gets into a lot
3 of earth science, but we really don't know what
4 the conditions were on the early earth.
5 There's good arguments both ways. Some people 09: 01AM
6 say that it clearly had to be a reducing
7 atmosphere. Other people argue that it could
8 have been a neutral or an oxidizing atmosphere.
9 And it-- it would take a long time to cover all
10 the scientific evidence, but there's-- there 09: 02AM
11 are-- there are good arguments on both sides.
12 TIMEKEEPER: If I may interrupt.
13 There's two minutes remaining.
14 A. It-- it remains one of the big-- big
15 controversies. 09: 02AM
16 Q. (BY MR. CALVERT) Do you think the indicator is
17 an appropriate way to introduce students to the
18 discussion?
19 A. Yes, I do.
20 Q. Do you have any comments generally on the-- I 09: 02AM
21 believe you've also reviewed the other proposed
22 changes in standards?
23 A. I-- I've looked at-- at some of them, yes.
24 Q. What's your general reaction? And is there
25 any-- any additional change that you might want 09: 02AM
0029
1 to comment on within your remaining two
2 minutes?
3 A. I-- I found most of the comments to be very
4 reasonable. They-- they-- they tend to balance
5 the-- the standards. Without these comments, 09: 03AM
6 there is an underlying and an implicit reliance
7 on naturalism, the idea that the physical world
8 is entirely self-contained. And that is sort
9 of an unspoken assumption that runs through a

10 lot of the theories on the origin of life, that 09: 03AM
 11 we only have natural reactions to deal with.
 12 And it-- it sort of permeates the-- the
 13 standards.
 14 Many of the changes that have been
 15 proposed provide a-- a more balanced approach, 09: 03AM
 16 one that-- that doesn't have this underlying
 17 philosophy of naturalism. And if-- if we're
 18 going to teach science in the public schools,
 19 we-- we need to teach it fairly and-- and
 20 without philosophical or religious bias. One 09: 03AM
 21 of the problems is, is that religion is easy to
 22 spot. The philosophy of naturalism has been so
 23 ingrained in the science recently that it's
 24 hard to see. That doesn't mean it's not there.
 25 And to-- to treat it fairly and appropriately 09: 04AM
 0030
 1 and-- and to-- to honor the-- the intelligence
 2 of the students, we need to be honest about it
 3 and identify it where it-- where it crops up.
 4 Q. Thank you very much. And I believe you have 09: 04AM
 5 written testimony that will cover some of the
 6 additional questions that we might have. And
 7 we'll provide that to the committee and to Mr.
 8 Irigonegaray and the reporter. Thank you so
 9 much for coming, Doctor Peltzer.
 10 CHAIRMAN ABRAMS: Mr. Irigonegaray, 09: 04AM
 11 you have 15 minutes.
 12 MR. IRI GONEGARAY: Thank you, Mr.
 13 Abrams.
 14 CROSS-EXAMINATION
 15 BY MR. IRI GONEGARAY: 09: 04AM
 16 Q. Sir, I have a few questions for you, and some
 17 of these are just for the record that is being
 18 created by our court reporter. I said I have a
 19 few questions for you, sir, that I would like
 20 to have for the record that is being generated 09: 05AM
 21 by the court reporter.
 22 A. Certainly.
 23 Q. First of all, I would like to have your opinion
 24 as to what the age of the world is.
 25 A. The-- the best scientific evidence for this is 09: 05AM
 0031
 1 based on the age of meteorites. This-- this
 2 was determined by Clair Patterson.
 3 Q. Sir, I-- I'm just asking you what the age is,
 4 I'm not interested in the process right now. 09: 05AM
 5 What is your opinion as to what the age of the
 6 world is.
 7 A. I'm-- I'm getting to that.
 8 Q. Just if-- please, I'm asking you, just tell me
 9 what you think the age is. I'm not interested
 10 in an explanation, I'm just interested in what 09: 05AM
 11 you believe the age of the world is.
 12 A. I'm-- I'm trying to do that, if you would--
 13 MR. IRI GONEGARAY: Mr. Abrams, the
 14 question, as we agreed, is a direct question. 09: 06AM
 15 It calls for simply an age.
 16 Q. (BY MR. IRI GONEGARAY) If you know it, say so.
 17 If you don't, say you don't.
 18 A. Very well. 4.596 billion years.
 19 Q. Do you accept the general principle of common
 20 descent, that all life is biologically related 09: 06AM

21 to the beginning of life? Yes or no.
22 A. No.
23 Q. Do you accept that human beings are related by
24 common descent to prehomnid ancestors? Yes or
25 no. 09: 06AM
0032
1 A. No.
2 Q. What is the alternative explanation for how the
3 human species came into existence if you do not
4 accept common descent?
5 A. Are you going to allow me to do an explanation? 09: 06AM
6 Q. I'm asking you just to answer the question,
7 please. Would you like for me to repeat it?
8 A. Yes.
9 Q. If you do not accept common descent as an
10 explanation for the human species, how did we 09: 07AM
11 come into existence?
12 A. That is the question that science is trying to
13 answer--
14 Q. No, sir--
15 A. -- I don't know. 09: 07AM
16 Q. -- my question is, how do you explain it?
17 A. I don't know. That is the question. There are
18 serious problems with common descent. There
19 are serious problems. It hasn't been
20 demonstrated. There are serious questions 09: 07AM
21 there.
22 Q. I'm not asking you, sir-- I'm only asking you
23 if you do not accept common descent, do you
24 have an explanation for it? Yes or no.
25 A. As a chemist, I do not. I do not study this. 09: 07AM
0033
1 Q. The minority report says that, "In science we
2 must compare competing hypotheses." Is there a
3 competing hypothesis to common descent that
4 you're aware of?
5 A. Yes, there is. 09: 08AM
6 Q. And what is that?
7 A. That would be intelligent design.
8 Q. Do you subscribe to that theory or that belief
9 or that opinion?
10 A. I think it has a lot of interesting ideas that 09: 08AM
11 need to be considered. I think that it answers
12 a lot of problems that have cropped up with
13 common descent.
14 Q. My question is, sir, do you support the opinion
15 of intelligent design as the answer to human 09: 08AM
16 species?
17 A. Yes, I think it's the one that's quite probably
18 shown to be correct.
19 Q. You believe it's the one that's probably
20 correct; is that what you said? 09: 08AM
21 A. Yes. Would you like me to expand on that?
22 Q. No, sir.
23 A. Would you--
24 Q. I'm-- I'm asking the questions, sir. Please
25 just hang on. 09: 09AM
0034
1 A. So you won't allow me to expand on that?
2 Q. I said no already. Would you agree, sir-- let
3 me ask you the question this way, I would like
4 to hear your comments on this sentence, "There
5 are many issues which involve morals, ethics, 09: 09AM

6 values, or spiritual beliefs that go beyond
7 that which science can explain but for which
8 solid scientific literacy is useful." Would
9 you agree with that statement or that sentence?
10 A. Could you repeat it again? 09: 10AM
11 Q. I would be happy to. "There are many issues
12 which involve morals, ethics, values, or
13 spiritual beliefs that go beyond what science
14 can explain but for which solid scientific
15 literacy is useful." Do you agree with that 09: 10AM
16 statement?
17 A. Yes.
18 Q. Do you know who wrote that sentence?
19 A. I have no idea.
20 Q. Does this sentence seem to reflect naturalism 09: 10AM
21 to you, the philosophy that matter and energy
22 is all there is, or does it seem to reflect a
23 philosophy that there's more in the world than
24 what science can investigate?
25 A. Could you repeat the question? 09: 10AM
0035
1 Q. I would be happy to. Does the sentence that I
2 have just read to you seem to reflect
3 naturalism or, rather, the philosophy that
4 matter and energy are all there is, or does it
5 reflect a philosophy that there's more in the 09: 11AM
6 world than what science can investigate?
7 A. Given the complexity of the sentence, I think
8 you could find all of that in there.
9 Q. You were not aware of the fact that that is, in
10 fact, a sentence taken from Draft 2 of the 09: 11AM
11 standards written by the majority, did you?
12 A. It was familiar to me, but I don't remember who
13 wrote it.
14 Q. And that sentence makes it perfectly clear,
15 does it not, that the majority of the committee 09: 11AM
16 understands that there is more to human
17 knowledge than what science can provide, and
18 that Draft 2 does not imply, endorse or support
19 naturalism over any other theological view.
20 You would have to agree with that, would you 09: 12AM
21 not, sir?
22 A. No, I would not, because what you're doing is
23 you're trying to make all of Draft 2 in one
24 sentence, and clearly Draft 2 is much larger
25 than that sentence. You've picked one little 09: 12AM
0036
1 point and you've tried to generalize it for
2 all.
3 Q. All right, sir.
4 A. I think you're being deceptive in your
5 questions. 09: 12AM
6 Q. Then let's do it this way. Please go to Draft
7 2 and let me know where in Draft 2 you find the
8 majority endorsing naturalism.
9 A. There was the original definition of science.
10 Give me a second and I'll find it here. This 09: 12AM
11 is Page 4 of Draft 2. Do you have that, John?
12 Under the nature of science, you'll
13 notice there's a sentence that has been struck
14 out. "Science is the human activity of seeking
15 natural explanation for what we observe in the 09: 13AM
16 world around us." This sentence is based,

17 rooted and-- and firmly endorses the concept of
 18 naturalism because it assumes that science can
 19 only find natural explanations. This has, in
 20 fact, been shown to be false and that 09: 13AM
 21 naturalism is incomplete and does not-- does
 22 not work.
 23 Q. Is naturalism a philosophy or a scientific
 24 process?
 25 A. Naturalism is a philosophy. 09: 13AM
 0037
 1 Q. And is it your opinion that the Kansas
 2 standards endorse a philosophy of naturalism by
 3 the definition of science?
 4 A. If-- if you do not strike out this sentence,
 5 you are endorsing naturalism as the foundation 09: 14AM
 6 of science. The problem with that is it causes
 7 serious errors. I can cite two. The first is
 8 based on--
 9 Q. Sir, that's not-- sir, that's not my question.
 10 My question to you was very simple. 09: 14AM
 11 A. Okay. In that sentence it does implicitly
 12 endorse naturalism.
 13 Q. Implicitly.
 14 A. And that's why it was-- why it was struck out.
 15 Q. It is your interpretation of that sentence that 09: 14AM
 16 naturalism is included in the standards?
 17 A. As originally written by the majority.
 18 Q. But you would agree with me that the word
 19 "naturalism" is found nowhere in the standards?
 20 A. I have not read the whole standards, sir, I 09: 14AM
 21 cannot agree--
 22 Q. You've come here to testify and you have not
 23 read the entire standards?
 24 A. Of course not. I was asked to testify on areas
 25 of my own expertise. 09: 14AM
 0038
 1 Q. Well, don't--
 2 A. Not on things that I don't have any expertise
 3 in. That would be silly, wouldn't it?
 4 Q. I don't want to comment about what is silly in
 5 this process. But you would agree with me, 09: 15AM
 6 would you not, that the word-- that the word
 7 "naturalism" does not apply-- or strike that.
 8 That the word "naturalism" is nowhere in the
 9 definition that you have read?
 10 A. In that sentence, it does not appear. 09: 15AM
 11 Q. And you further--
 12 A. And it is-- I--
 13 Q. Sir, I just asked you if it's there. And
 14 further, you would agree with me, would you
 15 not, that there are thousands, thousands of 09: 15AM
 16 individuals who are scientists who are able to
 17 do their scientific research and work,
 18 understand evolution for what it is and not
 19 have their religious views threatened. You
 20 would agree with that, would you not? 09: 15AM
 21 A. No, I would not. Naturalism is a religious
 22 view and people that are basing their
 23 interpretation of science and they're doing
 24 their science on it are, in fact, practicing
 25 their religion. Those thousands of scientists 09: 16AM
 0039
 1 are trying to impose naturalism on the rest of

2 the public.
3 Q. Is it your opinion in these hearings that to
4 proceed with the understanding of the natural
5 world, as science is supposed to do, makes them 09: 16AM
6 atheists?
7 A. I'm sorry. Would you repeat your question?
8 Q. I would be happy to. Is it your opinion that
9 for scientists to follow the natural process
10 makes them atheists, in your opinion? 09: 16AM
11 A. No, it does not.
12 Q. Then how do you support the theory that the
13 study of science through nature and the
14 understanding of nature is somehow a
15 philosophical view as opposed to a scientific 09: 16AM
16 enterprise?
17 A. Well, when we look at this definition, we see
18 that it is rooted in a philosophical view.
19 Nobody comes to science without preconceived
20 notions. And when people bring their 09: 16AM
21 naturalistic views, that's all they look for,
22 that's all they're going to find. If you want
23 to fairly teach science, you have to remove the
24 philosophical biases, both religious and
25 naturalistic. 09: 17AM
0040
1 Q. Is it your opinion then that the majority
2 opinion of scientists across this nation,
3 indeed the world, is biased?
4 A. Absolutely. There is--
5 Q. Is it your opinion-- 09: 17AM
6 A. -- a strong naturalistic bias in most of
7 science.
8 Q. Is it your opinion that the National Academy of
9 Science is a biased institution using only
10 naturalism as a way to explain the world? 09: 17AM
11 A. That's not just my opinion, they have produced
12 a pamphlet that demonstrates this.
13 Q. Is it your opinion then that they should be
14 discredited in what they're doing?
15 A. They have-- they're clearly revealing their 09: 17AM
16 biases--
17 TIMEKEEPER: Two minutes remaining.
18 A. Sorry. They have clearly reviewed-- revealed
19 their biases-- excuse me. Let me try that one
20 more time. They have clearly revealed their 09: 17AM
21 biases in this pamphlet, sir.
22 Q. (BY MR. IRIGONEGARAY) Do you have any personal
23 concerns about introducing a religious view
24 into science?
25 A. Absolutely. That's why I'm here. 09: 18AM
0041
1 Q. Is intelligent design based upon a supernatural
2 interpretation of observation?
3 A. No, it is not.
4 Q. Then--
5 A. That is-- 09: 18AM
6 Q. Then who is the designer?
7 A. Sorry?
8 Q. Who is the designer?
9 A. That hasn't been determined yet.
10 MR. IRIGONEGARAY: I have nothing 09: 18AM
11 further of you, sir.
12 MS. MARTIN: You go ahead.

BY CHAIRMAN ABRAMS:

- Q. Doctor Peltzer, you were talking about just recently the-- the theories of science and religion and philosophical claims. And I have been a strong proponent for quite a while of empirical science as defined by observable, measurable, testable, repeatable and falsifiable. My thought on that was that that is the best way to remove bias from-- in the-- what-- how scientists proceed.

How would you describe the ability of the majority draft and how would you describe the

ability of the minority draft to teach the student to distinguish between the data and testable theories of science from religious and philosophical claims that are made in the name of science?

- A. Could you-- just-- just the last question.
Q. How would you describe the ability of the majority draft and the ability of the minority draft to teach the science-- to teach the student to distinguish the data and testable theories of science from religious and philosophical claims that are made in the name of science?

- A. Okay. The parts of the majority draft that I read were-- were very well written. They were very good for a start, but they did have some areas where they could be improved. Looking at the minority draft, I find that their suggested changes greatly improve the teaching of science, help the students to-- to better identify these underlying assumptions, the relevant data. They-- they've learned to look at both the evidence supporting the theory and the evidence not supporting the theory. To properly understand the scientific theory, you

have to look at both. The changes that the minority report have-- have-- that have made do this better than the original.

- Q. What-- what philosophical claims or religious claims that you briefly talked about earlier - would you expand upon those - that might be inferred or construed or in the majority document?

- A. I'm sorry. Could you-- could you do that again? I'm just--

- Q. What philosophical claims or religious claims might be inferred or construed to be in the majority document?

- A. It-- in the majority document, there was a clear identification that natural explanations were the only explanations. This is rooted in the philosophy of naturalism. While neither a religious philosophy that people recognize, it is-- it's a world view that many people subscribe to that substitutes for religion. It-- it is, if you will, a non-theistic religion.

- Q. What philosophical claims or religious claims

24 made in science can be construed or inferred
25 from the minority report? 09: 22AM

0044

1 A. The minority report tries to better identify
2 the philosophical claims for the various
3 theories so the student can identify them.
4 If-- if naturalism isn't implied, it's
5 identified. If a religious viewpoint isn't 09: 22AM
6 implied, it's identified.

7 Q. Okay. On a different topic. Back on your
8 research, was the-- was all of the sugars that
9 were formed and the construction of amino
10 acids, were they just the L side or were they R 09: 22AM
11 side or what-- I mean, what handed were they?
12 I mean--

13 A. The-- in the meteorite you're asking?

14 Q. Yes.

15 A. They were racemic. They had equal mixtures of 09: 22AM
16 the D and L sugars. They had equal mixtures of
17 the D and L amino acids. They had equal
18 mixtures of the D and L hydroxy acids. This
19 was the-- the test that was used to make sure
20 we hadn't contaminated the samples during 09: 23AM
21 analysis.

22 Q. In order to form-- what types of-- of sugars
23 and amino acids are used in construction of--
24 of life?

25 A. Life only uses the L form of amino acids and 09: 23AM

0045

1 only the D form in the sugars.

2 Q. What's the likelihood of the amino acids and
3 sugars forming life out of that racemic
4 mixture?

5 A. It's much more difficult because instead of 09: 23AM
6 just having the 20 amino acids that you-- you
7 commonly find in life, you have 50 amino acids.
8 But most of those are positively active, so you
9 have two or more forms-- two or more isomers.

10 So you're-- instead of reaching into a bag and 09: 24AM
11 pull out of 1 of 20 amino acids, you're
12 reaching into a bag--

13 TIMEKEEPER: If I may interrupt. Two
14 minutes remaining.

15 A. -- and pulling out 1 of 100 amino acids. This 09: 24AM
16 happens in each step--

17 Q. (BY CHAIRMAN ABRAMS) All right.

18 A. -- in the proteins. So the odds go up
19 dramatically.

20 CHAIRMAN ABRAMS: All right. Thank 09: 24AM
21 you. Questions?

22 EXAMINATION

23 BY MS. MARTIN:

24 Q. Hi. Thank you so much for being here. I love 09: 24AM
25 the subject of oceanography and I wish we could

0046

1 have you talk about that. But my question is,
2 if you would, would you like to expand on the
3 answer to how old is the earth, because I've
4 had someone approach me with that question,
5 too. I would like to hear your explanation and 09: 24AM
6 your expansion.

7 A. Okay. The age of the earth was-- was
8 determined based on regiments of-- I'm sorry,

9 lead isotopes in meteorites. This work was
10 done by Clair Patterson. And I had the 09: 24AM
11 privilege early in my career to work with Clair
12 Patterson on a project. He is a scientist of
13 the utmost integrity, and he works tirelessly
14 to make sure that the work he does is correct.
15 His analysis of the meteorites stands as one of 09: 25AM
16 the-- the major achievements in the field of--
17 of early solar system development. The numbers
18 he came up with were just a few million years
19 shy of 4.6 billion years old.
20 He did this work in the 1950s. To give 09: 25AM
21 you an idea of how hard he worked and how well
22 he worked, nobody has done better in the 40
23 years since then, even though the technology
24 has-- has advanced by leaps and bounds.
25 Q. Do you want to expand on any of the other 09: 25AM
0047
1 questions that you didn't get a chance to?
2 A. Well, I-- I have some written testimony, it's
3 all pretty much in there. I'm also getting a
4 little dry.
5 MS. MARTIN: I appreciate very much 09: 26AM
6 for all that you've said today.
7 CHAIRMAN ABRAMS: Thank you, Doctor
8 Peltzer. Mr. Calvert.
9 MR. CALVERT: Our next witness is
10 Doctor Russell Carlson. Doctor Carlson. 09: 26AM
11 Doctor Carlson, members of the committee, Mr.
12 Irigonegaray, the public, I would like to
13 introduce you to Russell Carlson.
14
15 RUSSELL CARLSON, Ph.D.,
16 called as a witness on behalf of the Minority,
17 testified as follows:
18 DIRECT EXAMINATION
19 BY MR. CALVERT:
20 Q. Doctor Carlson, would you please briefly 09: 27AM
21 introduce yourself and talk about your
22 background and why that background qualifies
23 you to talk about the science standards today.
24 A. I am currently a professor of biochemistry and 09: 27AM
25 molecular biology at the University of Georgia.
0048
1 I'm also technical director of the complex
2 carbohydrate research center at the same
3 institution, and adjunct professor of
4 microbiology.
5 Although I'm in Kansas, I hope you won't 09: 27AM
6 hold it against me that I received my doctoral
7 work at the University of Colorado in Boulder,
8 since it's a rival state. And before that, I
9 received a bachelor of science-- a bachelor of
10 arts degree actually from North Park College in 09: 27AM
11 Chicago, Illinois, with a major in chemistry
12 and a minor in mathematics. I am currently--
13 that's my educational background. Do you want
14 me to explain more about--
15 Q. Yeah, go ahead. What are you doing now? 09: 28AM
16 A. Okay. My area of research is to understand on
17 a molecular basis of how bacteria infect animal
18 and plant cells and projects involving
19 molecules that are in-- compose the cell wall

20 of the bacteria. Not surprisingly since I'm at 09: 28AM
 21 the carbohydrate research center, they are--
 22 they have carbohydrates in nature and-- and
 23 these molecules are involved in determining
 24 whether a bacterium can be virulent or not.
 25 And so we work on quite a variety of projects 09: 28AM

0049

1 in collaboration with other investigators.
 2 These projects include pathogens such as
 3 Neisseria meningitidis, which is a causal agent
 4 of bacterial meningitis, Haemophilus
 5 influenzae-- (reporter interruption). The 09: 29AM
 6 pseudomonas aeruginosa, which is an
 7 opportunistic pathogen. We also have currently
 8 projects on Bacillus anthracis, which is the
 9 causal agent of anthrax, and have done some
 10 work on another bioterrorism pathogen called 09: 29AM
 11 Brucellus abortus, which is a causal agent of a
 12 disease called brucellosis. And so those are
 13 some of the projects we've been working on.

14 We want to understand the molecular basis
 15 for how these bacteria are virulent in order to 09: 29AM
 16 provide basic information that would hopefully
 17 lead to therapeutic treatments and diagnostics
 18 and vaccines. Carbohydrates are already used
 19 from bacterial pathogens as vaccines, so I'm
 20 sure some of your children have already been 09: 30AM
 21 vaccinated with carbohydrate-based vaccines.

22 Q. Doctor Carlson, you're-- are you also a
 23 professor at the University of Georgia?

24 A. Yes, that's--

25 Q. And-- and you're heading up a research lab 09: 30AM

0050

1 work?
 2 A. Yes.
 3 Q. And-- and I believe you just described some of
 4 the activities of that lab, is that not true?
 5 A. Yeah. Well, all of the activities are-- that 09: 30AM
 6 we have are involved in-- in all those
 7 different projects and currently have-- this,
 8 of course, requires a lot of people. So I have
 9 four post-doctoral associates working in the
 10 lab, three graduate students, two technicians, 09: 30AM
 11 several undergraduate students. And currently
 12 I have-- we're privileged to have a visiting
 13 professor from the University of Tübingen in
 14 Germany working with me on a couple of the
 15 projects.

16 Of course, this requires a lot of money
 17 to do all of this work and biochemical research
 18 is not cheap. It's quite an expensive do, it's
 19 an expensive process and so on. Over the years
 20 all of it has-- had obtained funding from the 09: 31AM
 21 National Science Foundation, National
 22 Institutes of Health, U. S. Department of
 23 Agriculture and the Department of Energy.

24 And because of-- all of my students have
 25 been very hard workers and very productive and 09: 31AM

0051

1 my post-doctoral research associates over the
 2 years have-- hopefully we've made some
 3 contributions to the peer review literature.
 4 I've published somewhere around 130 articles.

5 Q. Just in general, tell about-- what is the 09: 32AM
6 amount of-- of grants and funding that you've
7 received to promote your work?
8 A. Over the--
9 Q. Yeah, over the years.
10 A. Approximately \$7 million. 09: 32AM
11 Q. To what extent does the theory of evolution
12 impact the kind of work you're doing and-- in
13 the-- in the area of operational science?
14 A. Well, as I say, most-- mostly what we're 09: 32AM
15 working on is the, you know, bacteria that
16 exists today and-- and determining how those
17 molecules infect cells. And so we make
18 percavations (phonetic) in the organisms by
19 mutating specific genes and seeing what the
20 effect is on the carbohydrate structure and 09: 32AM
21 what the effect is on a virulence mechanism.
22 These are things that can be done in the
23 laboratories, we can verify in the laboratory
24 and what-- where the mutation is, what the
25 structural defect is. We can look with the 09: 33AM
0052
1 electron microscopy what the effect of the
2 virulence is. So these are all things that are
3 observable-- observable in present time. And
4 so in this sense, I don't think that the
5 evolutionary theory really enters into this 09: 33AM
6 type of day-to-day work.
7 Q. Do you need to have a deep understanding of
8 evolutionary biology to conduct that work?
9 A. No.
10 Q. There has been a claim made that-- and I 09: 33AM
11 believe you've reviewed the proposed changes to
12 the Kansas standards that are reflected in the
13 minority report; is that correct?
14 A. I've-- yes, I've reviewed the changes that were
15 proposed. 09: 33AM
16 Q. And the argument has been made that if Kansans
17 were to embrace those changes, it would drive
18 bioscience out of the state. Would you mind
19 commenting on that?
20 A. Well, I don't-- I don't think that that-- I 09: 34AM
21 don't see how that could be the-- the case.
22 But, you know, to me, that-- it just seemed
23 like more of a-- basically a fear-- fear
24 tactic. So I don't-- I don't know-- I don't
25 know if-- I mean, others will testify here to 09: 34AM
0053
1 other stories that are likely eligible.
2 Q. Would you-- would you agree that there is a
3 scientific controversy over the theory of
4 evolution, both chemical and biological?
5 A. Yeah, I do agree. I think-- I think that the-- 09: 34AM
6 the level of controversy or-- or consensus, if
7 you will, about evolution as we have seen in
8 the-- both all day yesterday and today, so it's
9 probably for you that are here redundant, but
10 there's a lot of consensus with regard to 09: 35AM
11 unnatural selection accounting for diversity of
12 life within certain boundaries, for example
13 within variation of the species of what has
14 been referred to here in testimony by others as
15 microevolution. There is less consensus with 09: 35AM

16 regard to natural selection accounting for a
17 broader diversity such as plants, fungi, and
18 animals that will be derived from some common
19 ancestor. And ultimately, all life's diversity
20 being derived from some ancestor of Procarya. 09: 35AM
21 The consensus perhaps continues to
22 decrease as you've seen from just the previous
23 testimony, and controversy increased
24 surrounding the idea that biological
25 information or the genetic code of net 09: 36AM
0054
1 molecules necessary for life could arise from
2 random collisions of molecules in some
3 primordial soup. So the extent of consensus or
4 controversy kind of depends on what aspect of
5 evolution that you're talking about. 09: 36AM
6 Q. Do you think the minority report identifies in
7 the evolution benchmark, perhaps not all, but
8 some of the key controversial issues that the
9 students should be aware of?
10 A. What-- I'm not sure what-- can you be more 09: 36AM
11 specific on?
12 Q. One is the controversy regarding whether
13 microevolution can be extrapolated to
14 macroevolution, for example.
15 A. Well, I think-- I think it would be really nice 09: 36AM
16 for the students just to know that-- that in--
17 in their understanding of evolution that
18 macroevolution is an extrapolation of
19 microevolution. That would be good for them to
20 know. I think that it's perhaps-- that's one 09: 37AM
21 thing that's not taught very clearly. And so
22 just to distinguish in between the two and
23 having the students understand that
24 macroevolution is a-- an inference as taught
25 is-- is something that is inferred from 09: 37AM
0055
1 microevolution and the changes would be an
2 important aspect.
3 Q. All right. I would like you to turn your
4 attention to a provision in the minority report
5 regarding the definition of science. The 09: 37AM
6 minority report proposed to substitute the--
7 the current definition, which is, "Science is
8 human activity seeing natural explanations for
9 what we observe in the world around us," to a
10 definition that, "Science is the systematic 09: 38AM
11 method of continuing investigation," and so
12 forth that's shown on the screen. Would you
13 care to comment on that?
14 A. Yeah, I-- I support the-- this proposed
15 revision to the definition of science. An 09: 38AM
16 essential principle of science is that every--
17 every defect has a cause and science is in
18 search for those causes. And that search
19 includes origin of life and diversity and
20 these-- this is a historical science question. 09: 38AM
21 These kind of questions are historical science
22 questions and involve searching for causes of
23 past events that are singular, just happened
24 one time, and cannot-- these kinds of things
25 cannot be investigated in the laboratory sense 09: 39AM
0056

1 of being able to reproduce these types of
2 events in the laboratory.

3 And-- but, also, science includes
4 searching for causes of the present effects,
5 which is like how bacterium is infective or 09: 39AM
6 virulent. And this can be investigated in the
7 laboratory. And this is a-- often referred to
8 as operational science. And in that-- in the
9 search science, which includes both of these
10 historical and operational aspects, should be 09: 39AM
11 driven by a-- by an objective observation of
12 the facts and seek the most accurate
13 explanation based on, I believe, the criteria
14 that was stated in the revision, which is
15 hypothesis testing, measurement, 09: 39AM
16 experimentation, logical argument and theory
17 building.

18 In this effort, and we-- in particular
19 with origin science, explanations of evidence
20 have-- have medical -- metaphysical 09: 40AM
21 implications. And it's really inappropriate to
22 restrict explanations to those that only
23 support one metaphysical position, which is
24 materialistic and naturalism. And that's the
25 position that nature is all there is. 09: 40AM

0057

1 Science should be in search of the truth
2 and scientists, teachers, and students should
3 be able to follow the evidence wherever it
4 leads. It's-- it's not, in my opinion,
5 appropriate to force all evidence into a 09: 40AM
6 150-year-old Darwinian box. We need both
7 teachers and students that are-- critically
8 evaluate evolutionary theory and think outside
9 the box.

10 With regard-- do you want me to-- you-- 09: 40AM
11 okay. That's with regard--

12 Q. The-- as you move down through the introduction
13 section, there's another provision that says,
14 "According to many scientists, the core claim
15 of evolutionary theory is that the apparent 09: 41AM
16 design of living systems is an illusion." Do
17 you agree with that, that a core claim of
18 evolutionary theory is that apparent design--
19 like apparent design of the eye, is not
20 objectively real, that that is just an 09: 41AM
21 illusion?

22 A. I wouldn't know what all evolutionary
23 scientists say about that, but that has been
24 claimed. That has been the claim of some very
25 prominent ones. 09: 41AM

0058

1 Q. Would you also agree that there's scientists
2 that disagree that design is not objective,
3 that there is no evidence that suggests to the
4 contrary?

5 A. Yes, other scientists disagree with that. 09: 41AM

6 Q. And essentially the other scientists are
7 scientists that are pursuing the theory of
8 intelligent design?

9 A. Yes. Actually I had an interesting-- we have
10 a-- we have a big kind of a discussion listed 09: 42AM
11 on this topic on-- on our-- at our university,

12 and I have some-- I-- as has been mentioned
 13 by-- I'm not sure how to pronounce your name.
 14 Q. Irigonegaray.
 15 A. There are-- there are scientists with many 09: 42AM
 16 different religious views that-- that can do
 17 science very well. And so I have some good
 18 colleagues that are what I would call theistic
 19 evolutionists. And so there's a big
 20 discussion, pros and cons of-- of this type of 09: 42AM
 21 aspect. And, well, finally their position was
 22 that-- that, well, natural selection occurs and
 23 is actually guided, but we just can't detect
 24 it. And so it-- I pointed out to them that it
 25 seems to me that their position was different 09: 43AM
 0059
 1 from the-- the-- these are-- these are people
 2 who have faith but are theistic evolutionists.
 3 So atheistic evolutionists, some of the modal
 4 ones, have said that we have to keep looking
 5 at-- when we look at nature, we have to keep 09: 43AM
 6 reminding ourselves that design is-- is an
 7 illusion. And the theistic evolutionists from
 8 what I was getting in the research apparently
 9 have to look at nature and-- and they see
 10 design, but they-- they see randomness that 09: 43AM
 11 they have to-- they have to believe that
 12 randomness is an illusion, but it's guided.
 13 So, you know, so there is these debates that
 14 are going on.
 15 Q. Well, the standards-- the minority report 09: 43AM
 16 suggests that the debate about design or no
 17 design not be included in the standards
 18 themselves, but that teachers should not be
 19 prohibited from teaching about scientific
 20 disagreement. Do you agree with that? 09: 44AM
 21 A. Yes.
 22 Q. Would you want to comment on that at all?
 23 A. Well, I think it's inappropriate for-- I think
 24 to consider if we want to search for-- we-- we
 25 want students to be-- be able to objectively 09: 44AM
 0060
 1 follow evidence where it leads and then even--
 2 even-- even by those who don't agree with
 3 design may see apparent design, the students
 4 should be able to-- and the teachers should be
 5 able to-- to discuss this possibilities-- 09: 44AM
 6 possibility, that it should not-- discussion of
 7 it should not be prohibited.
 8 Q. Page 7 of the minority report discusses the
 9 problem with a number of events with respect
 10 to-- that science does not have all the 09: 45AM
 11 answers. It says, "Although science proposes
 12 theories to explain changes, the actual cause
 13 of many changes are currently unknown. For
 14 example, the origin of the universe, the origin
 15 of fundamental laws, the origin of life and the 09: 45AM
 16 genetic code, the origin of major body plans
 17 during the Cambrian explosion." Is that, in
 18 your opinion, an accurate statement?
 19 A. I think-- yes, I think it's an accurate
 20 statement. I think that's been demonstrated by 09: 45AM
 21 the witnesses here before this committee.
 22 Q. This is just a part of the introduction and

23 it's directed primarily to teachers. Do you
24 think this is the appropriate device for
25 teachers to keep in mind? 09: 45AM

0061

1 A. Yes. I think it is and I think this is
2 something that students are interested in,
3 really describes some of the things that are--
4 are most essential-- essential questions that
5 science is seeking to answer, and they need to
6 be informed about-- about them. And I think
7 that, as I previously stated, answers to some
8 of these questions do have profound medical and
9 metaphysical implications, and they could be
10 encouraged to-- or at least permitted to think
11 about those implications. 09: 46AM

12 Q. On Page 12, there is a proposed change, an
13 additional specificity 4C, and the change
14 relates to a sentence that says that students
15 should be able to evaluate preconceptions--
16 personal preconceptions and biases with respect
17 to his or her conclusions. And the minority
18 has stricken the word "personal" because they
19 believe that that word essentially limited the
20 analysis of bias and preconception that might
21 affect explanation. Specifically they were
22 worried that that would not direct the student
23 to attempt to understand institutional biases,
24 biases that might appear in the institutions.
25 Do you think that's an appropriate change and 09: 47AM

0062

1 would you care to comment on it?
2 A. Yeah, I-- I think certainly personal
3 preconceptions should be-- should be
4 considered, but those aren't the only ones.
5 And so I think it's appropriate to cross out
6 the personal and-- in order to expand that. So
7 scientific reasoning always involves some point
8 of view of a preconception. And so a personal
9 bias should be one of those and institutional
10 bias should also be one. 09: 48AM

11 However, also preconceptions can be the
12 result of accepted dogmas that may not be
13 supported by-- by new facts. And so all of
14 these types of things should be considered.

15 Q. Do you believe peer-reviewed science journals
16 ever employ an institutional bias? 09: 48AM

17 A. I'll-- well, yeah. I mean, I peer review stuff
18 all the time, I'm part of the-- I'm-- I'm not
19 on the editorial board of a journal, so-- but,
20 you know, I'm involved anyway in this, in most
21 peer-reviewing things for NIH proposals. And I
22 will say that most of-- most of-- I think--
23 well, it depends on certain-- it depends on
24 what area of work, too. 09: 49AM

25 Q. Will a peer-reviewing journal, biology journal 09: 49AM

0063

1 or evolutionary biology journal accept a paper
2 that postulates the possibility of-- of design?
3 A. Yeah, I'm not involved too much in-- in, you
4 know, peer reviewing those types of-- those
5 types of research articles or proposals in that
6 area. 09: 49AM

7 TIMEKEEPER: If I may interrupt. Two

8 minutes remain.

9 A. So, you know, I'm not-- I'm not sure about, you
10 know, the ones that I do, but I just really 09: 49AM
11 don't-- the most recent ones I've heard in this
12 area is-- is the episode with Steve Myers'
13 article on biological information, which was
14 peer reviewed for I think it's the Washington
15 Society-- Biological Society, and by the normal 09: 50AM
16 peer review process and-- and discussed the
17 idea of design. And from that, there was a lot
18 of outcry and the editor of the journal was
19 attacked because of this and-- in his
20 position-- one of his positions at the 09: 50AM
21 Smithsonian Institute, I believe, was-- he was
22 forced to resign from that. I'm not sure of
23 all the details, so--
24 Q. (BY MR. CALVERT) Have-- have you read that
25 article? 09: 50AM

0064

1 A. I've read most of it, not all of it.
2 Q. What do you think? I mean, was the criticism
3 of it justified?
4 A. Well, the criticism-- no one really criticized
5 the content of the article, they were 09: 50AM
6 criticizing the fact that it was published in a
7 peer review journal. And so, you know, there's
8 a saying that-- by a famous evolutionary
9 biologist, Bojinski, that he quoted that
10 nothing in sense-- nothing in biology makes 09: 51AM
11 sense except in the-- in the light of
12 evolution. And when you use that as a filter
13 for science articles that are-- are reviewed,
14 then the peer review process becomes converted
15 into a peer pressure process. And this is-- 09: 51AM
16 this is unfortunate.
17 Q. Thank you so much. Maybe one last question.
18 In general, what is your assessment of the
19 minority report?
20 A. Well, my overall assessment is that the-- is 09: 51AM
21 that they improve the original document since
22 they encourage more objective presentation of
23 origin science. I believe that the scientists,
24 regardless of his or her view on origins, were
25 really able to-- to read the standards as 09: 52AM

0065

1 modified by the minority, without prior
2 knowledge of this current debate, that he or
3 she would have very little problem readily
4 endorsing.
5 MR. CALVERT: Thank you so much, 09: 52AM
6 Doctor Carlson. We have copies of his
7 testimony and that will-- has just arrived here
8 in the room. We'll pass those out, distribute
9 those shortly, along with copies of Doctor
10 Peltzer's testimony. 09: 52AM
11 CHAIRMAN ABRAMS: Mr. Iri gonegaray,
12 13 minutes, please.
13 MR. IRI GONEGARAY: All right, sir.
14 CROSS-EXAMINATION
15 BY MR. IRI GONEGARAY: 09: 52AM
16 Q. Sir, I-- I have a few questions that I need to
17 ask you for the record. First of all, I would
18 like to ask you, sir, what your opinion is as

19 to what the age of the earth is.
20 A. Well, I-- I agree with the previous witness 09: 53AM
21 here. I'm-- I'm not-- I don't work in that
22 area, but I don't have any problem with the
23 idea that it's 4.5 billion years old.
24 Q. Do you accept the general principle of common
25 descent, which is that all of life is 09: 53AM
0066
1 biologically related back to the beginning of
2 life?
3 A. I-- no. I believe that, as I said, with the
4 term evolution I think common descent is also
5 one where there's-- you know, there's no 09: 53AM
6 problem with-- in--
7 Q. Sir, my question was whether you agree--
8 A. My comments on--
9 Q. I'm just asking you whether you agree or not.
10 Do you-- let me repeat the question. I'm not 09: 54AM
11 interested in an explanation.
12 A. Well--
13 Q. Do you accept-- just please listen to me.
14 A. I would like--
15 Q. This is a yes or no question. 09: 54AM
16 A. Yeah.
17 Q. Do you accept the general principle of common
18 descent, that all of life is biologically
19 related back to the beginning of life? Yes or
20 no. 09: 54AM
21 A. No.
22 Q. Do you accept that human beings are related by
23 common descent to prehomimid ancestors? Yes or
24 no.
25 A. I don't accept that as a fact. 09: 54AM
0067
1 Q. I did not hear you.
2 A. I don't accept that as being a fact, a
3 scientifically-proven fact.
4 Q. If that is not acceptable to you, what
5 alternative explanation do you propose for how 09: 54AM
6 the human species came into existence?
7 A. That's-- I don't-- I don't have an alternative
8 position on that. That's not my area.
9 Q. So would it be fair to say that you do not
10 agree with evolutionary theory as far as the 09: 55AM
11 common descent principles for the human
12 species, but you do not have an answer as to
13 how it happened?
14 A. I do not-- I do not have a scientific answer as
15 to how it happened, no. 09: 55AM
16 Q. Is it your opinion that it happened as a result
17 of intelligent design?
18 A. I believe that design is a-- is-- is a
19 possible-- possible explanation and it should
20 be investigated, yeah. 09: 55AM
21 Q. But you are not suggesting that intelligent
22 design is the answer?
23 A. Well, scientifically I don't think that's been
24 determined yet, but I think it should be one
25 that's considered. 09: 56AM
0068
1 Q. Is there in Draft 2 any discussion about the
2 origin of life?
3 A. Well, I've just read the-- I haven't read the

4 entire draft.
5 Q. They brought you here to testify about the 09: 56AM
6 standards for science education for our
7 children and you did not read it; is that
8 correct?
9 A. I've-- I haven't read-- no, I haven't read the
10 whole thing. I've read the-- the portions I 09: 57AM
11 was asked to give testimony on.
12 Q. So you have-- they-- who told you selectively
13 what to read?
14 A. Nobody told me anything, it was sent to me.
15 Q. What-- who sent to you only selective pieces of 09: 57AM
16 Draft 2 and the minority-- strike that. Were
17 you sent the minority report in toto?
18 A. No.
19 Q. Were you sent--
20 A. Wait. The minority report? Let me see. I 09: 57AM
21 believe I do have the minority report.
22 Q. You were sent the minority report in toto, but
23 you were only sent selective pieces of the
24 majority report. Correct?
25 A. Well, let me-- actually, I don't have a copy of 09: 57AM
0069
1 what I actually received so I can't-- I can't
2 answer that question.
3 Q. But one way or the other, you were instructed
4 to be familiar with only a portion. Correct?
5 A. I was instructed-- they asked me for a-- expert 09: 58AM
6 testimony in the various aspects of the changes
7 that they were suggesting, to see whether these
8 are reasonable changes. And so that's what I'm
9 doing.
10 Q. Is there consensus in the scientific community 09: 58AM
11 about how life began?
12 A. No.
13 Q. You say that there are many theories of the
14 origins of life, would you be in agreement with
15 me that it would be more appropriate to say 09: 58AM
16 hypotheses of the origins of life exist since
17 there's no consensus?
18 A. That there are-- that there are--
19 Q. Hypotheses as to the origin of life.
20 A. A number of hypotheses as to origin? Yeah, I 09: 58AM
21 guess I would have no problem with that.
22 Q. Is there anything-- and I don't know if you can
23 testify to this since you have not read the
24 entire draft, but has anyone told you whether
25 or not there's anything in Draft 2 that would 09: 59AM
0070
1 prevent a teacher from discussing the issues
2 that you and others might bring up about the
3 origins of life?
4 A. Well, in the portions I've read, there's
5 nothing that-- that would prevent teachers from 09: 59AM
6 doing it. I think that the-- it needs to be
7 more than just not prevent teachers from
8 doing-- from discussing those issues. Teachers
9 should be actually encouraged to discuss
10 those-- 09: 59AM
11 Q. Is there-- I beg your pardon.
12 A. -- issues. There should be-- that there should
13 be something in the changes that allow teachers
14 to discuss that.

15 Q. Isn't it, in fact, the truth that the majority 09: 59AM
16 standards do encourage teachers to discuss
17 openly evolution and questions raised by
18 children?
19 A. Well, I would-- I would say not. If in the--
20 in the majority if-- if-- if science is seeking 10: 00AM
21 natural explanations only and also that
22 scientific knowledge is defined only in terms
23 of matter and energy and forces that-- that--
24 no, they would not.
25 Q. Do you have a problem with science attempting 10: 00AM
0071 to find natural answers to the world around us?
1 A. Absolutely not.
2 Q. Is it your suggestion that science should
3 include intelligent design as a quest for
4 truth? 10: 00AM
5
6 A. I think it should be considered.
7 Q. Is intelligent design a philosophy?
8 A. Is it a philosophy? What I think design is--
9 it's-- it's a hypothesis.
10 Q. A hypothesis that has someone as a designer. 10: 01AM
11 Correct?
12 A. Well, the hypothesis is-- is-- intelligent
13 design is-- is that there is design.
14 Q. And the design, by definition, requires a
15 designer. Correct? 10: 01AM
16 A. Yes.
17 Q. And who is that designer, in your opinion?
18 A. I-- scientifically, I don't know.
19 Q. And if you don't know who the designer is and
20 if, by definition, it is a philosophical 10: 01AM
21 approach, why would you suggest that it should
22 have any place in science?
23 A. Well, design is not a-- design is something
24 that can be detected and looked for.
25 Q. Design can be detected and looked for. We 10: 01AM
0072
1 would all agree that things may have a
2 functional design, they-- for example, how our
3 planetary system is set up. But it's different
4 from observation to suggest what the design is,
5 to have an opinion that it must be a 10: 02AM
6 supernatural design. Correct?
7 A. Well, I don't think anyone is positing an
8 identity of-- of the designer would be
9 supernatural or not supernatural being.
10 Q. Are you suggesting in intelligent design that 10: 02AM
11 the designer was a human being?
12 A. No, I'm just saying that we cannot
13 scientifically determine the identity of-- of
14 the-- of the designer.
15 Q. We may not be able to determine the identity. 10: 02AM
16 But in your opinion, that identity is that of
17 God. Correct?
18 A. It--
19 Q. In your opinion, the intelligent designer is
20 God. Correct? 10: 02AM
21 A. Well, yeah, in my view I suppose I would agree
22 with that.
23 Q. And would you not agree with me that for the
24 interest of science, science should remain
25 neutral as it relates to religion? 10: 02AM

0073

- 1 A. Oh, I agree, but I don't think--
 2 Q. And would you not agree with me that
 3 introducing intelligent design into the
 4 curriculum, by definition, places an issue of
 5 faith when we cannot come up with a natural
 6 answer? 10: 03AM
 7 A. No, I don't agree with that. Design is
 8 neutral.
 9 Q. How can design be neutral if you just told me
 10 the designer is God? 10: 03AM
 11 A. I-- I said that was my-- my-- I didn't say
 12 that-- that we should discuss with-- with
 13 children in the science class the identity of
 14 the designer or that my--
 15 Q. So what do we do? Do we tell them it's a
 16 designer, but we disguise from them the fact
 17 that those who are suggesting intelligent
 18 design to be taught believe it's God? Do we
 19 keep that in secret from them as a mystery?
 20 A. Well, right now with it-- what is encouraged is
 21 that when children ask a question-- 10: 03AM
 22 TIMEKEEPER: Two minutes remain.
 23 A. When children ask a question about-- about the
 24 naturalistic response, they're told to go talk
 25 to their mom and dad or their parents or-- or 10: 04AM

0074

- 1 whatever.
 2 Q. (BY MR. IRIGONEGARAY) Or their pastor?
 3 A. Or their pastor, right.
 4 Q. And you believe that is inappropriate?
 5 A. No, I-- I believe that-- I believe that-- that 10: 04AM
 6 the neutral position would be to allow-- to
 7 allow a discussion of the-- of the evidentiary
 8 basis for design.
 9 Q. And is there anything in the standards, to your
 10 knowledge-- then again, you have not read the 10: 04AM
 11 standards. Let me-- let me suggest this to
 12 you: Has anyone told you that the standards
 13 would deny a Kansas teacher who is asked a
 14 question about intelligent design by a student
 15 to be able to discuss it? 10: 04AM
 16 A. No. No, I-- I don't think so. But I think--
 17 on the contrary, I think design should be one
 18 of the explanations that are-- that are brought
 19 forth.
 20 Q. An explanation of what? 10: 04AM
 21 A. An explanation of-- of a possible explanation
 22 of things like biological information with
 23 which we cannot explain.
 24 Q. So you suggest that if we don't have the
 25 ability at this moment in time to understand a 10: 05AM

0075

- 1 natural process, that we should tell our
 2 students it must, therefore, be supernatural?
 3 A. No, I'm saying we should-- we should open it up
 4 to allow students to discuss whether a design
 5 is real or illusionary. 10: 05AM
 6 Q. Isn't that a philosophical question, sir?
 7 Doesn't that get involved with faith and
 8 religion and did you not agree with me a moment
 9 ago that science should be neutral?
 10 A. Well, I think detecting design is neutral, I 10: 05AM

11 think there are objective criteria by which we
 12 can detect design.
 13 Q. We're not talking about detecting design--
 14 TIMEKEEPER: Time.
 15 Q. (BY MR. IRIGONEGARAY) -- we're talking about 10: 05AM
 16 an explanation for design.
 17 A. Well, I think--
 18 MR. IRIGONEGARAY: My time is up.
 19 CHAIRMAN ABRAMS: Your time-- thank
 20 you.
 21 EXAMINATION
 22 BY MS. MARTIN:
 23 Q. Doctor Carlson, I realize how busy you are and
 24 how your research is very important to you, and
 25 I thank you very much for being here with your 10: 06AM
 0076
 1 expert testimony. And I will confess to you
 2 that I'm on this committee and I'm very
 3 interested in science, but I have not read the
 4 second draft word for word, either. And since
 5 you don't have it, please don't feel bad that
 6 you haven't read it. And I do see some things
 7 in the introduction that I feel are very-- are
 8 explanatory, are good explanations. So please
 9 don't feel bad that you haven't gotten to read
 10 the whole thing because I've not read it word
 11 for word myself. 10: 06AM
 12 So what I do want to ask a little bit
 13 about is, how can design then be introduced
 14 into the classroom and not lead toward what Mr.
 15 Pedro was saying might lead to intelligent--
 16 you know, identifying an intelligent cause? 10: 06AM
 17 A. Well, I think there are two objective criteria
 18 for design, and those standards can be
 19 discussed in the-- in the classroom. You know,
 20 like I said, there's medical-- metaphysical
 21 implications for if you-- if you detect
 22 designers' metaphysical implications for that,
 23 which is what was brought out here, the
 24 identity of the designer who was-- who, what,
 25 how, where did it come from, all those kinds 10: 07AM
 0077
 1 of-- all those kinds of things. And I'm not--
 2 I'm not sure that that can be discussed in a
 3 science classroom. It's perhaps at that point
 4 where there should be a referral, in order to
 5 be neutral, to a pastor or a guardian or
 6 parents or a mullah or whatever. 10: 07AM
 7 Q. But just allowing for this means an exploration
 8 with-- about design--
 9 A. Yeah, because, I think, design-- I think being
 10 able to-- to apply the mathematical criteria 10: 07AM
 11 for what-- detecting design to a biological
 12 system is something that-- that can be done.
 13 And so that-- that is a neutral that can be--
 14 (pause).
 15 EXAMINATION
 16 BY CHAIRMAN ABRAMS:
 17 Q. Doctor Carlson. Doctor Carlson.
 18 A. Yes.
 19 Q. We heard yesterday that evolution is a slippery
 20 word. Would you agree with that statement? 10: 08AM
 21 A. Well, yes, particularly now.

22 Q. Repeat that, please.
 23 A. Particularly after the-- yes, it is, I agree
 24 with you.
 25 Q. You talked earlier about the different meanings 10: 08AM
 0078 that evolution have in science and their
 1 understanding and their agreement. Why does
 2 the word have such different meanings?
 3 A. Well, I think that it has different-- some of
 4 the reasons it had different meanings is 10: 08AM
 5 because of the-- is what we call-- what we
 6 discussed earlier is-- is pre-- preconceptions
 7 and bias. And I think the-- the other reason--
 8 reasons that is based on the evidence, you
 9 know, of-- the strong evidence for what we 10: 09AM
 10 refer to as microevolutionary changes. And the
 11 evidence is not-- not as strong to support
 12 macroevolutionary changes as Jonathan Wells
 13 presented to you yesterday.
 14 And then to-- also yesterday and today we 10: 09AM
 15 saw the idea of chemical evolution being
 16 seriously-- having serious problems. And so I
 17 think that the slippery slope-- the
 18 slipperiness of it comes-- when you just use
 19 the word evolution, for some people it means 10: 09AM
 20 all the way from chemicals, you know,
 21 primordial soup to human beings. For other
 22 people that means, you know, microevolutionary
 23 changes.
 24 So when you just use the term evolution 10: 09AM
 25
 0079 then without clear definition, if I'm talking
 1 to someone in the audience and saying, do you
 2 believe in evolution, we have to first each
 3 have an understanding of what evolution means
 4 to me, it means-- what evolution means to me, I 10: 10AM
 5 need to know what evolution means to him.
 6 Q. Why not try to clarify what is actually meant?
 7 TIMEKEEPER: Two minutes remain.
 8 Q. (BY CHAIRMAN ABRAMS) Let me rephrase. Why in
 9 science is the word-- do you believe in 10: 10AM
 10 evolution or those types of comments-- or you
 11 don't believe in evolution, why not be more
 12 specific saying, do you believe in mutations,
 13 do you believe in biological or Abiogenesis or
 14 chemical evolution, or be much more specific? 10: 10AM
 15 A. Well, I think that would solve some of the
 16 problem of the slipperiness of the word if we
 17 would be more precise, yes.
 18 Q. Earlier-- earlier you used the word dogma.
 19 Would you agree or disagree that evolution is 10: 10AM
 20 taught as a dogma in many classrooms?
 21 A. I would-- well, you know, I'm not a high school
 22 teacher, so-- but I-- I would tend to agree
 23 with that, but I don't have a lot of, you
 24 know--
 25
 0080 Q. How about in college?
 1 A. Yes.
 2 Q. And when-- when I said evolution, I-- to be
 3 specific, I was not talking about mutations, I
 4 was talking about biological evolution. Is 10: 11AM
 5 that what you would agree to?
 6

- 7 A. Yes. And even more than that, I would say it
8 would be the standard Darwinian-- Darwinian--
9 any Darwinian model, yes.

10 CHAIRMAN ABRAMS: Thank you very 10: 11AM
11 much. We will break and we will be back at
12 10: 25.

13 (THEREUPON, a short recess was had).

14 CHAIRMAN ABRAMS: We're going to go 10: 26AM
15 ahead and get started again. If we could have
16 order and take your seat, please. Mr. Calvert.

17 MR. IRIGONEGARAY: Just a moment,
18 please.

19 MR. CALVERT: Doctor Abrams, members 10: 27AM
20 of the committee, Mr. Irigonegaray, I would
21 like to introduce to you Doctor John Sanford.

22 JOHN SANFORD, Ph.D.,
23 called as a witness on behalf of the Minority,
24 and testified as follows:
25

0081

DIRECT EXAMINATION

1 BY MR. CALVERT:

- 2 Q. Doctor Sanford, can you tell us a bit about
3 your background and how that qualifies you to
4 testify today?

5 A. Okay. I'm glad to be here. My name is John
6 Sanford. Just to explain how I got to be here,
7 Doctor John Calvert asked me to testify for
8 you. And I'm not coming here as an advocate,
9 I'm not here really to write your guidelines 10: 27AM
10 for you. But if you have questions for me, I'm
11 happy to answer them. So I-- I have not-- I've
12 not studied all the drafts, but I have simply
13 researched for you, and I've taken three days
14 of my life to donate to this discussion. I 10: 27AM
15 hope I can answer your questions adequately.

16 My background is I have training in the
17 area of plant breeding and plant genetics. My
18 Ph.D. is from the University of Wisconsin.
19 I've been a Cornell professor for 25 years. 10: 28AM
20 Retired. When I was at Cornell, I did a very
21 diverse range of research. I published on many
22 different topics, had 70 publications in
23 scientific journals, over 25 patents.

24 My main claim to fame is I'm the primary 10: 28AM
25

0082

1 inventor of the GeneGun technology, which has
2 been used extensively in plant genetic
3 engineering. So when the GeneGun technology
4 was developed, I was able-- I was very blessed
5 and able to take a lot of revenue from that. 10: 29AM
6 It was a very financially-rewarding invention
7 which eventually let me leave Cornell. So
8 right now I'm a courtesy professor at Cornell
9 with an office there, but I'm not on a paid-- a
10 paid faculty. And I'm presently in the process 10: 29AM
11 of writing books. So that's my background.

12 I-- just one more comment in terms of my
13 qualifications to discuss this, is most of my
14 career I've been an atheistic evolutionist,
15 later in life I became a theistic evolutionist, 10: 29AM
16 and later I became a-- a Biblical Christian.
17 And so I'm sure-- as the prosecutor will be

18 asking me, I do have a Christian perspective.
19 Q. Doctor Sanford, when did you switch from
20 atheism to a Christian world view? 10: 29AM
21 A. About 20 years ago.
22 Q. And--
23 MR. IRIGONEGARAY: Excuse me, I'm
24 going to-- this is irrelevant to the standards.
25 And I-- I don't think it does any good to get 10: 30AM
0083 involved in this.
1 MR. CALVERT: The rules do not permit
2 this type of interruption.
3 MR. IRIGONEGARAY: Well, there's got
4 to be some relevancy. 10: 30AM
5 MR. CALVERT: Would you please
6 answer?
7 CHAIRMAN ABRAMS: He has the time to
8 allow-- to do as he wants to do.
9 Q. (BY MR. CALVERT) All right. You may answer 10: 30AM
10 the question.
11 A. Twenty years.
12 Q. Twenty years ago?
13 A. Yes.
14 Q. And so-- and I think you said that you were a 10: 30AM
15 theistic evolutionist for a period of time
16 after that. You know, why-- why was that?
17 A. I had been trained in evolution and everything
18 I had ever thought was in terms of evolution.
19 For me, it was a-- as clear as the world around 10: 30AM
20 us. It was just uncontestable. But in
21 retrospect, I had not critically assessed much
22 of what I believed. I believed it based upon
23 very little, without critical assessment.
24 Q. So would it be fair to say that while you were 10: 31AM
25 an atheist, you didn't find any personal
0084 reasons to critically analyze the theory or to
1 challenge it?
2 A. Yes. Well, as an atheist, there's no-- there's
3 no alternative hypothesis because if-- if no 10: 31AM
4 one-- and there's no designer or creator, then
5 you have to believe that the universe created
6 itself.
7 Q. So you-- 20 years ago you became a Christian
8 and then at some subsequent time and you-- let 10: 31AM
9 me ask you this; do you use evolutionary
10 biology in your operational science?
11 A. I don't use it. And when I was an
12 evolutionist, I would have argued that
13 evolutionary theory is critical to being a good 10: 32AM
14 scientist. I actually realized that it's-- my
15 best science has been done since that time.
16 I've also realized that historically all the
17 founding fathers of science were
18 non-evolutionists and many of them were 10: 32AM
19 anti-evolutionists. So I realized that good
20 science is not in any way conditioned upon
21 accepting the evolutionary theory.
22 Q. The-- is it fair to say then that-- well, you--
23 you switched from Christianity-- from atheism 10: 32AM
24 to Christianity 20 years ago and then there was
25 a period of time where you were a-- I think you
0085

3 described a theistic evolutionist; is that
4 correct?
5 A. Yes. 10: 32AM
6 Q. And then during that period of time, did you
7 have any cause or reason to or did you
8 challenge or critically analyze evolutionary
9 theories?
10 A. I-- I did not generally question the-- the 10: 32AM
11 documents that I had been taught. They were
12 like foundational beliefs and I did not
13 generally question them.
14 Q. And then at some point in time something caused
15 you to begin to question it? 10: 33AM
16 A. So I had--
17 Q. Is that correct?
18 A. Yes. I had friends who basically said, have
19 you looked at the other side? And I said, what
20 other side? I honestly had been at Cornell at 10: 33AM
21 that point 20 years and I really did not know
22 that there was a-- a legitimate position which
23 could contest evolutionary assumptions.
24 Q. And so then you began to look at it critically?
25 A. I began to look at it critically and for 10: 33AM
0086
1 several years I was intrigued by alternative
2 explanations for many different things. And so
3 this was a-- a time of great intellectual
4 excitement for me. So looking at alternatives
5 to evolution, I did not find mental-- mentally 10: 33AM
6 deadening but rather incredibly stimulating.
7 And I basically went back and reassessed
8 everything I had ever knew.
9 Q. What-- what is the GeneGun?
10 A. The GeneGun is a process, an apparatus for 10: 34AM
11 delivering DNA into cells and tissues, and it's
12 been used for genetic engineering of plants and
13 for experimentation in the medical science.
14 Q. I want you to-- I just lost my file. Doctor
15 Sanford, we have discussed in the proceedings 10: 34AM
16 today the definition of evolution as contained
17 in the proposed science standards. And I-- the
18 minority report would substitute the definition
19 of science as, "The human activity of seeking
20 natural explanations for what we observe in the 10: 35AM
21 world around us," for a more objective
22 definition. The substituted definition, does
23 it-- in your view, is that important to
24 methodological naturalism? And if so, would
25 you please explain your answer. 10: 35AM
0087
1 A. Okay. The definition of science is tricky
2 business and requires a lot of word-smithing,
3 and I can appreciate the difficulty of coming
4 up with a definition that's acceptable to
5 everyone. I personally believe that the 10: 35AM
6 minority report's definition is a slight
7 improvement over the other because it does
8 define science somewhat more broadly.
9 For example, the first definition talks
10 about only studying physical-- the physical or 10: 35AM
11 material world, but there are things that we
12 can study that are not material. For example,
13 information is a non-material entity. As a

14 geneticist, I'm very interested in information.
 15 And even though it is often carried through 10: 36AM
 16 material substances like a CD disk or a tape or
 17 a piece of paper, it, itself, is a non-material
 18 entity. And so I-- I have a slight preference
 19 for the minority's definition of science.
 20 Q. Okay. What-- 10: 36AM
 21 A. In terms-- yes.
 22 Q. I-- I cut you off.
 23 A. Okay. In terms of methodological naturalism,
 24 methodological materialism, I do believe that
 25 methodological implies science and naturalism 10: 36AM
 0088
 1 implies philosophy. So we-- one can, in fact,
 2 use the methodology of science to study things
 3 without a materialistic or a naturalistic
 4 philosophy behind it.
 5 Q. Do you believe that the definition in the 10: 36AM
 6 minority report, which limits explanation to
 7 just natural phenomena, describes the science
 8 too narrowly? And does that impact, in your
 9 view, the issue of religion?
 10 A. I think that in-- in the case that we're 10: 37AM
 11 discussing, which is the issue of origins, it
 12 isn't a reasonable pre-assumption that
 13 everything occurred strictly by natural law.
 14 In fact, that is the very question, is-- was--
 15 in the beginning did everything arise from 10: 37AM
 16 natural law or was there a designer. That's--
 17 that isn't-- shouldn't be a premise, it should
 18 be the question. In other words, we will use
 19 science to ask-- to examine evidence for or
 20 against a design versus a randomly-occurring 10: 38AM
 21 universe.
 22 Q. You've mentioned operational science and
 23 historical science in your testimony. And I
 24 want to direct your attention to one proposed
 25 change in the standards that relates to the 10: 38AM
 0089
 1 issue of historical science. In this
 2 particular indicator, the minority-- this is
 3 relating to earth and space science. And the
 4 proposed indicator would have students
 5 understand how to test an historical hypothesis 10: 38AM
 6 about the cause of a remote past event by
 7 formulating competing hypotheses and then
 8 describing the kind of data that would support
 9 one and refute the other.
 10 A. Uh-huh. 10: 39AM
 11 Q. I think we had a discussion a while back and
 12 you made the comment that you did not realize
 13 that there was a distinction about-- between
 14 historical and experimental science until a few
 15 years ago. And so I would like you to comment 10: 39AM
 16 upon that, as well as this indicator, and the
 17 importance for students to understand the
 18 distinction.
 19 A. Okay. I think that what's proposed is
 20 excellent because developing alternative 10: 39AM
 21 hypotheses and then defining experiments to
 22 discriminate between which hypotheses are
 23 stronger than others is critical to scientific
 24 method and critical to critical thinking. So I

25 think that's an excellent addition to the 10: 39AM
0090
1 curriculum. I entirely support it. And I also
2 support the idea of getting students to
3 recognize the distinction between operational
4 science and historical science.
5 And for myself, as you point out, I often 10: 40AM
6 fail to make that distinction even as a Cornell
7 scientist. And I know that many of my
8 colleagues have often failed to make that
9 distinction. If you pick up the General
10 Science and go through it, you'll see that 10: 40AM
11 there are some publications which are easily
12 verifiable by any laboratory in the world.
13 That's operational science.
14 There are other publications which are
15 speaking about non-reproducible events in the 10: 40AM
16 distant past which really is historical
17 science. And it is very important to
18 distinguish them for this reason: Operational
19 science must be reproducible. It's incredibly
20 important. It's not science if you can't-- if 10: 40AM
21 someone else on the other side of the world
22 can't reproduce your experiment. But
23 historical science is not reproducible.
24 Let me give you a quick illustration.
25 It's often said that Josephine poisoned 10: 41AM
0091
1 Bonaparte, Napoleon, okay? That's historical
2 science. And they say, look, we have
3 scientific proof that she did it because we
4 found arsenic in the bones of the person who's
5 buried in Napoleon's grave. 10: 41AM
6 But I would like to distinguish for you
7 what part of that is operational science and
8 what part is historical science. If we test
9 for arsenic in those bones, you can send it out
10 to twenty different laboratories around the 10: 41AM
11 world and they'll all give you roughly an
12 agreement about how much arsenic is in those
13 bones. That's operational science and it's
14 reproducible. Everybody can agree to it.
15 But there's also historical science. 10: 41AM
16 Given the importance and political intrigue
17 associated with Napoleon, was it Napoleon
18 buried in Napoleon's grave? That's an
19 inference. Was he exposed to arsenic by
20 accident or on purpose? That's an inference. 10: 41AM
21 If he was exposed to Napoleon (sic) on purpose,
22 was it his wife or someone else or himself? So
23 there's a great deal of inference.
24 So although it's a science to say we
25 found bones-- we found arsenic in the bones in 10: 42AM
0092
1 the grave of Napoleon, that's operational
2 science. Historical science was Napoleon--
3 (reporter interruption). I'm sorry.
4 Historical science says that Josephine poisoned
5 her husband. It's incredibly important to 10: 42AM
6 distinguish these two things.
7 I'm seeing a lot of novels being
8 published today by evolutionary scientists
9 where they take the next step. If you are a

10 novelist and you wrote about the story of how 10: 42AM
 11 Josephine poisoned her husband, that's called
 12 historic fiction. The problem is historical
 13 science can easily blur into historical fiction
 14 because there's no accountability, it's largely
 15 speculation. 10: 42AM
 16 Q. Would you describe evolutionary biology as-- in
 17 large part an historical science?
 18 A. It is entirely a historical science. This is--
 19 this is why the distinction is so important. A
 20 lot of people say if you don't agree with the 10: 43AM
 21 current form of historical science in terms of
 22 evolution, you are a threat to science at
 23 large. But you're not. Operational science is
 24 not being challenged.
 25 The space shuttle, modern medicine, 10: 43AM
 0093
 1 modern agriculture, telecommunications, that's
 2 all operational science. It is not influenced
 3 by this discussion of human origins. It is--
 4 everyone is supportive of that type of science.
 5 Historical science becomes more and more 10: 43AM
 6 uncertain and increasingly subject to error the
 7 further back you go and the more inferences
 8 that are made. And so very quickly, when you
 9 talk about very remote or very ancient events,
 10 you're talking speculation instead of science. 10: 43AM
 11 Q. I'd like to turn to a more operational science
 12 discussion here, and this is with respect to
 13 the evolution benchmark. There's an indicator
 14 that is proposed by the minority, it's
 15 Indicator 2B of the evolution benchmark. And 10: 44AM
 16 it states, "Inheritable traits may result from
 17 new combinations of genes from random mutations
 18 or changes in the reproductive cells." And
 19 then there's this sentence, quote, "Except in
 20 very rare cases, mutations may be-- that may be 10: 44AM
 21 inherited are neutral, deleterious or fatal."
 22 Are those scientifically-valid statements, and
 23 particularly the second one, and is it
 24 something that students should be aware of to
 25 enhance their understanding of biological 10: 44AM
 0094
 1 evolution?
 2 A. I believe those statements are entirely
 3 accurate. And the second part of it relates
 4 directly to my own area of current research. 10: 45AM
 5 I'm looking at the question of whether mutation
 6 plus selection can create a genome-- or I mean
 7 sustain a genome. And I've been studying the
 8 nature of mutation a great deal. And
 9 geneticists are-- universally agree that-- that
 10 mutation is overwhelmingly deleterious. 10: 45AM
 11 The ratio of deleterious to beneficial
 12 mutations is generally put at about-- at a
 13 million to one. One-- for every one beneficial
 14 mutation, there's as many as a million
 15 deleterious. The most optimistic numbers 10: 45AM
 16 offered which have-- which I don't believe are
 17 well-founded are 1,000 to 1. In other words,
 18 there are at least a thousand deleterious
 19 mutations for every beneficial one.
 20 Q. I believe you have a-- a power point 10: 45AM

21 presentation that deals with this issue that--
 22 are you--
 23 A. I would be happy to share some of my current
 24 research with the committee, if they would
 25 like. 10: 46AM
 0095
 1 Q. Okay. And also, in the standards that are
 2 proposed by the minority, the minority suggests
 3 that intelligent design not be required to be
 4 in the standards itself so that the students
 5 would not be-- teachers would not be required 10: 46AM
 6 to teach intelligent design theory or to test
 7 the students on it, but that the state would
 8 encourage that it not be prohibited.
 9 A. Uh-huh.
 10 Q. And so as you comment on this issue regarding 10: 46AM
 11 the beneficial mutations, I believe that your
 12 comments also tie into your-- your idea that
 13 the data is showing actually evidence of
 14 design, is that correct, and would--
 15 A. I believe there's evidence of design in the 10: 47AM
 16 genome. The genome itself is evidence of
 17 design. I also believe that as we study the
 18 nature of mutation and the genome and what
 19 selection can do, that it is a powerful
 20 argument against one of the central tenets of 10: 47AM
 21 evolution, which is that mutation plus
 22 selection creates information. So that's--
 23 that's the technical side.
 24 The other side you raise is, should this
 25 be open to discussion in the classroom. And I 10: 47AM
 0096
 1 think I'll try to separate them and deal with
 2 them one at a time.
 3 Q. Okay. Now, we have just a few minutes left,
 4 so--
 5 A. Okay. Because-- for lack of time, let's skip 10: 47AM
 6 through. Keep going. Okay. Let's stop there
 7 for a second. This is the theme of my
 8 research. Most-- okay. I'd like to draw an
 9 analogy between biological complexity and the
 10 information that underlies it, okay? 10: 48AM
 11 Most biologists would agree that the
 12 human body is much more complex than any human
 13 technology that's ever been developed. The
 14 space shuttle is enormously simple, it's
 15 child's play compared to the design of the 10: 48AM
 16 human body. So seeking for a-- a technological
 17 analogy to life, I've had to go into fiction,
 18 fictional technology, the U.S.S. Enterprise.
 19 Okay. This spaceship with its warp-speed
 20 engines and holodeck is a closer analogy to the 10: 48AM
 21 human body than any other technology that we
 22 can think of. But most biologists focus on the
 23 biological complexity, which is above. But as
 24 a geneticist, I'm interested in what's beneath
 25 it, and that is the instruction manuals that 10: 48AM
 0097
 1 specify all that complexity. That is the
 2 genome.
 3 Okay. Please, quick. So when we talk
 4 about historical science from a genetic point
 5 of view, the most popular view is that the 10: 49AM

6 genome is-- is the book of life. That's a term
7 that's often used in genetics and that it is an
8 instruction manual. And the central axiom of
9 genetics from an evolutionary point of view is
10 that the author of the book of life had 10: 49AM
11 misspellings and selective screening or
12 natural-- what's called natural selection.
13 That is absolutely central to Darwin and it is
14 what's taught as the baseline truth for all
15 evolutionary science. 10: 49AM
16 Okay. So just to help you understand
17 what-- what the current paradigm is, if you
18 have a little red wagon and you have the
19 instruction manual that goes with that,
20 including manual-- instruction on how to make 10: 49AM
21 the metal, how to make the wheels, how to make
22 the rubber, how to make the paint and how to
23 put it all together, and if you start to
24 introduce typographical errors into that and
25 you select the purpose as superior performance 10: 50AM
0098
1 of the wagon, okay, that's-- that's mutation
2 and selection, it will eventually evolve into a
3 superior form of technology.
4 So over time you might imagine that
5 misspellings have-- have-- create a internal 10: 50AM
6 combustion engine and power brakes and all the
7 rest to create a modern automobile. So the
8 modern automobile is specified by a great deal
9 of information. And it's-- if you include the
10 robotic assembly lines and all the component 10: 50AM
11 parts, it's pretty mind-boggling how much
12 information goes into an automobile. Enormous
13 amount of specified complexity.
14 But if we imagine more misspellings in
15 the manuals and perhaps it will develop into a 10: 50AM
16 higher form of technology, if you invoke even
17 more mutation and selection, you might get to
18 the final step, which is the next one, which
19 brings us to the Starship Enterprise.
20 That is a very reasonable analogy for 10: 51AM
21 describing the primary axiom of evolutionary
22 theory today. And so misspellings plus-- plus
23 natural selection can explain that.
24 Now, I've always believed that. And
25 about five years ago someone challenged me and 10: 51AM
0099
1 said, are you sure that's true? And I started
2 to examine that, and I've spent the last five
3 years examining that. And I'm here to tell you
4 it's not true. I can-- and it's-- and it's
5 amazingly not true. It's, like, very exciting 10: 51AM
6 to look at what selection can and cannot do.
7 So let's-- I don't have-- this would be an hour
8 or two presentation for me to share it with you
9 what I've been doing, so I'm going to try to
10 consolidate it to 30 seconds. You know, so I'm 10: 51AM
11 sorry if I rushed through it.
12 But the actual genome, of course, looks a
13 little bit like this, a t c g, on and on. And
14 if you look at a screen like that every second,
15 so you're just scanning the genome, I would ask 10: 52AM
16 you the question, how long would it take for

17 you to look at your own genome, to read your
 18 own genome? Of course, you're not reading it,
 19 you're just scanning through it one page a
 20 second. The answer is, if we could just 10: 52AM
 21 imagine it clicking every few seconds, it would
 22 take you-- if you worked 40 hours a week for
 23 the rest of your life and then some, it would
 24 take you 381 years, and you would only-- will
 25 have read half of your genome. So there's a-- 10: 52AM

0100

1 a lot of information in the genome.
 2 The question is, can mutations, which are
 3 misspellings, create that information or
 4 maintain it. So if we could just click again,
 5 I'm going to skip over those, we don't have a 10: 52AM
 6 lot of time. If you picture misspellings in a
 7 text like an encyclopedia, any single
 8 misspelling is going to be incredibly trivial;
 9 isn't that true? It would be very hard to
 10 select. If you start to introduce misspellings 10: 52AM
 11 into many different encyclopedia sets, it would
 12 be very difficult to distinguish which
 13 encyclopedia set has been more corrupted, but
 14 they're all being corrupted; isn't that right?

15 Can you picture how many misspellings 10: 53AM
 16 would improve the content of an encyclopedia?
 17 That would be exceedingly rare, wouldn't it?
 18 That same factor is known for genetics.

19 So if-- if this graph shows a range of
 20 mutations, on the left minus one means it's a 10: 53AM
 21 lethal mutation, in the middle a mutation which
 22 has no effect, and on the right is a mutation
 23 which would double fix, dramatic improvement.
 24 If this was true, natural selection would
 25 always work, you would just select away the bad 10: 53AM

0101

1 ones and select for the good ones and you would
 2 always have a net gain of information. But all
 3 geneticists know it's not true. Click again.
 4 When geneticists show a distribution of
 5 mutations, they don't show the beneficials. 10: 53AM
 6 They're so rare that they're not even
 7 considered. But this is still too optimistic.
 8 If we could click again. Most mutations are
 9 what are-- is called nearly neutral. That
 10 means that they have such a small effect that 10: 54AM
 11 there's no visible effect on the level of the
 12 little red wagon. In other words, a typical
 13 misspelling in the assembly manual for a jet
 14 fighter will not have an impact on the jet
 15 fighter that you can measure and say this jet 10: 54AM
 16 fighter is better. Does that make sense?

17 So this is actually a graph produced by a
 18 very famous evolutionary population biologist
 19 showing the distribution of mutations. And
 20 he-- Kimura is famous for putting the box-- do 10: 54AM
 21 you see the blue box?

22 Q. The mutations on the right, from zero to .002,
 23 those are the positive mutations?

24 A. So--

25 Q. And they don't show up? 10: 54AM

0102

1 A. Right. They're-- Kimura does not show any

2 positive mutations in his graph. And then he--
3 he shows the blue box. The blue box is
4 mutations that are so subtle that they are
5 unselectable. They cause nearly neutral 10: 55AM
6 mutations because they just-- they have no
7 effect. They-- they evolve and are not
8 deleterious--

9 TIMEKEEPER: If I may interrupt. Two
10 minutes remain. 10: 55AM

11 A. Okay. Well, you can see the difficulty of
12 dealing with this in a short time. One more
13 click. Two more clicks.

14 If you look at this graph, I would
15 challenge any evolutionist to explain to me how 10: 55AM
16 evolution can occur. You can't select away the
17 bad ones within the box, you can't select for
18 the good ones in the box. The only thing you
19 can do is select away the ones on the far left
20 which are the most deleterious mutations. 10: 55AM

21 So I'm sorry I couldn't give you the
22 whole story, but it's very fascinating. The
23 bottom line is that the primary axiom is
24 categorically false, you can't create
25 information with misspellings, not even if you 10: 56AM

0103

1 use natural selection.

2 Q. (BY MR. CALVERT) Thank you very much. Well,
3 in the last 30 seconds, I believe you have
4 reviewed the minority report in general. Do
5 you have any general comments upon the 10: 56AM
6 propriety of those proposed changes?

7 A. The changes that were shown to me seem to be
8 minor improvements. I-- I'm not quite sure
9 what the big deal is, they're minimal-- minimal
10 changes, in my opinion. It's incredibly 10: 56AM
11 important that students be-- have freedom of
12 access to all the information. And because
13 there is a major controversy about the origin
14 of information, origin of life, whether the
15 primary axiom is true, students have a right to 10: 56AM
16 know that. And there's nothing more
17 stimulating for a student's mind than to be
18 challenged with multiple hypotheses and being
19 told, you research it and tell me what you
20 think. That's awesome for students. 10: 57AM

21 MR. CALVERT: Thank you. Thank you
22 very much. Your witness.

23 CHAIRMAN ABRAMS: Mr. Iri gonegaray,
24 sixteen minutes.

25 MR. IRI GONEGARAY: Thank you, sir. 10: 57AM

0104

1 CROSS-EXAMINATION

2 BY MR. IRI GONEGARAY:

3 Q. Sir, I have a few-- I have a few questions that
4 I would like to ask you for the record. 10: 57AM

5 A. Uh-huh.

6 Q. First of all, do you have a personal opinion as
7 to what the age of the world is?

8 A. I do have a personal opinion.

9 Q. And what is that personal opinion specifically
10 as to the age? And I'm interested only in the 10: 57AM
11 age, not an explanation.

12 A. I believe that I was wrong in my previous

13 belief that it's 4.5 billion years old and that
14 it's much younger.
15 Q. How old is the earth, in your opinion? 10: 58AM
16 A. I cannot intelligently say how old it is except
17 it's much younger than I think widely believed.
18 Q. Give me your best estimate.
19 A. Less than 100,000 years old.
20 Q. Less than 10,000? 10: 58AM
21 A. Conceivably.
22 Q. Conceivably less than 10,000?
23 A. Yes.
24 Q. Conceivably less than 5,000?
25 A. No. 10: 58AM
0105
1 Q. So it's somewhere between 5 and 10,000 years of
2 age?
3 A. Between 5 and 100,000. But I would like to--
4 Q. No, I'm asking the questions.
5 A. Okay. You ask the questions. 10: 58AM
6 Q. Do you accept the general principle of common
7 descent, that all of life is biologically
8 related back to the beginning of life? Yes or
9 no?
10 A. No. 10: 58AM
11 Q. Do you accept that human beings are related by
12 common descent to prehominiid ancestors? Yes or
13 no.
14 A. No.
15 Q. If the answer is no, as you have indicated-- 10: 58AM
16 A. Uh-huh.
17 Q. -- what is your explanation for how human-- the
18 human species came into existence?
19 A. My explanation, humbly offered, is that we were
20 created by a special creation, by God. 10: 59AM
21 Q. And when did that occur?
22 A. Relatively recent by-- by-- in terms of
23 conventional wisdom. Very-- very recently by
24 conventional wisdom.
25 Q. Well, according to your opinion, when did that 10: 59AM
0106
1 occur?
2 A. I'm not going to speculate on-- on--
3 Q. No, I'm not asking you to speculate.
4 A. Well, you're--
5 Q. Based-- please listen to my question. 10: 59AM
6 A. What is my--
7 Q. Based on your opinion, when did that occur?
8 A. It happened recently. And it's not just my
9 opinion, it's based upon--
10 Q. Sir-- 10: 59AM
11 A. -- analysis--
12 Q. I'm not asking about recently. Do you have a
13 date?
14 A. I do not have a date.
15 Q. Do you have an estimate of the date? 11: 00AM
16 A. I do not.
17 Q. Less than 5,000 years ago?
18 A. You know, I'm not going to-- you can play that
19 game.
20 Q. I'm not-- 11: 00AM
21 A. But I-- I'm saying I don't know exactly how old
22 it is.
23 Q. All right. That's fine.

24 A. But I do-- I'm willing to tell you that I think
 25 it's considerably younger than-- much younger 11: 00AM
 0107
 1 than people are generally told.
 2 Q. Have you read in toto the majority report to
 3 the Board of Education?
 4 A. I have not.
 5 Q. So you have been brought here to criticize the 11: 00AM
 6 majority report without having read it.
 7 Correct?
 8 A. That's incorrect.
 9 Q. It is true you have not read it?
 10 A. It is true I have not read it. I-- I didn't 11: 00AM
 11 come here to criticize anything.
 12 Q. Sir, just answer my question.
 13 A. I am answering your question.
 14 Q. The answer was no, you haven't read it. That's
 15 all I asked for. 11: 01AM
 16 A. Uh-huh.
 17 Q. Do you believe that science teachers in Kansas
 18 when teaching science and evolution as outlined
 19 in the current standards, and although you
 20 haven't read them, based upon what you've been 11: 01AM
 21 told--
 22 A. Uh-huh.
 23 Q. -- are leading students to this conclusion;
 24 that they are meaningless accidents with no
 25 intrinsic purpose? 11: 02AM
 0108
 1 A. I believe that's a very common teaching in many
 2 public schools.
 3 Q. I wasn't asking about many public schools.
 4 Based upon what you've been told, is that your
 5 opinion as to what's going on in Kansas? 11: 02AM
 6 A. You're asking me to assess things I can't
 7 assess. I-- I come here to offer my expert
 8 testimony in my area, and I'm sorry if I can't
 9 give you satisfactory answers to everything you
 10 would like to know. 11: 02AM
 11 Q. Do you agree with-- have you read the minority
 12 report in toto?
 13 A. Yes.
 14 Q. Were you-- strike that. Do you agree with the
 15 minority report that teaching science as it is
 16 currently practiced constitutes an
 17 indoctrination in the philosophy of naturalism,
 18 a philosophy key to known theistic belief
 19 systems? Yes or no.
 20 A. I believe that statement is correct. 11: 02AM
 21 Q. Does this mean to you that the current Draft 2
 22 religiously quotes-- discriminates against
 23 theistic beliefs such as Christians?
 24 A. No, I think that's too strong a statement. I--
 25 if you're-- you're asking me to-- 11: 03AM
 0109
 1 Q. I'm just asking you for a yes or no answer,
 2 sir.
 3 A. Okay. So the answer is neither.
 4 Q. Neither. You say you hold a Christian view.
 5 You understand that that is not very helpful, 11: 03AM
 6 as many Christians accept both the great age of
 7 the earth and common descent. Do you agree
 8 with that statement?

9 A. Many Christians have-- hold many different
10 positions. It's a very-- many positions are 11: 04AM
11 held by Christians. I offered that information
12 because your line of questioning clearly goes
13 there, and so I'm just telling you where I'm
14 coming from.

15 Q. Is the answer to the question yes or no? 11: 04AM
16 A. Okay. Let's phrase the question-- your
17 question--

18 Q. Let me read my question to you again, sir.
19 A. Yes, please.

20 Q. You have indicated to us you hold a Christian 11: 04AM
21 view.
22 A. Uh-huh.

23 Q. And I suggest to you that is not very helpful.
24 A. That's okay. I--
25 Q. Please let me finish the question, sir. 11: 04AM

0110
1 A. Uh-huh.
2 Q. And please understand this is not-- this is not
3 in any way an attack on your religious views.
4 We respect those.

5 A. Uh-huh. 11: 04AM
6 Q. We respect those fully and we would defend your
7 right to whatever religious views you hold,
8 that's not the purpose of the question.

9 A. Uh-huh.
10 Q. Would you accept then the proposition that many 11: 04AM
11 Christians, as scientists and as lay people,
12 accept the great age of the earth as well as
13 common descent?
14 A. Yes.

15 Q. Do you agree with Mr. Philip Johnson's opinion 11: 05AM
16 as a strong proponent of the minority-- as a
17 strong proponent of intelligent design, that
18 the teaching of science as is currently
19 practiced is an indoctrination in naturalism?
20 A. Yes, I think that's generally true. 11: 05AM
21 Q. And you would define naturalism as a philosophy
22 that does not allow room for a religious
23 belief?

24 A. Well, naturalism is a religious belief, but it
25 doesn't leave room for God. 11: 06AM

0111
1 Q. And is it your opinion that the study of
2 science--
3 A. Uh-huh.
4 Q. -- in an effort to simply understand nature-- 11: 06AM
5 A. Uh-huh.
6 Q. -- and to provide natural answers to
7 observations--
8 A. Uh-huh.
9 Q. -- must, therefore, be naturalists?

10 A. No, I think that the study of science is the 11: 06AM
11 study of-- of-- pursuit of truth using a
12 methodological approach, which is reproducible
13 by others.

14 Q. And would you agree that that process must
15 remain neutral as it relates to religion? 11: 06AM
16 A. I believe that there's not a neutral scientist
17 on the planet. When I was an evolutionist, I
18 was not neutral and as a-- a person who
19 believes in design, I am not neutral.

20 Q. I'm not asking you, sir-- I'm not asking, sir, 11: 07AM
 21 about whether or not individual scientists may
 22 or may not have religious views. I'm asking
 23 you whether their work in science--
 24 A. Uh-huh.
 25 Q. -- the scientific process-- 11: 07AM
 0112
 1 A. Uh-huh.
 2 Q. -- must it, in order to be valid, remain free
 3 of a supernatural implication?
 4 A. I disagree with that.
 5 Q. Is it your opinion that the science and the 11: 07AM
 6 study of science in our school should include
 7 supernatural explanations to natural events?
 8 A. No. I believe the educational process should
 9 encourage students to examine the alternative
 10 hypotheses and all the evidence, pro and con, 11: 07AM
 11 so they can make intelligent decisions.
 12 Q. Would it surprise you to learn that that is
 13 precisely what the majority opinion states in
 14 this Draft 2, that students are encouraged--
 15 A. Uh-huh. 11: 07AM
 16 Q. -- and, in fact, are encouraged with their
 17 teachers to discuss a broad range of ideas
 18 about evolution? You were not aware of that,
 19 were you?
 20 A. I think that's great. 11: 08AM
 21 Q. You were not aware of that, were you, because
 22 you have not read the standards.
 23 A. Yes, I don't feel bad about not having read the
 24 standards. I came here as a courtesy to the
 25 committee to share my expert opinion. If you 11: 08AM
 0113
 1 don't like that, that's your problem.
 2 Q. Do you agree with Phillip Johnson in the
 3 following quote, "Liberal Christians, theistic
 4 evolutionists are worse than atheists because
 5 they hide their naturalism behind a veneer of 11: 08AM
 6 religion." Do you agree with that statement?
 7 A. No, I don't.
 8 Q. Would you comment on the following statement by
 9 William Dimski, the main theorist of
 10 intelligent design, who wrote, "Design 11: 09AM
 11 theorists are no friends of theistic evolution.
 12 As far as design theorists are concerned,
 13 theistic evolution is American evangelism,
 14 ill-conceived accommodations to Darwinism.
 15 What theistic evolution does is to take the-- 11: 09AM
 16 is to take the Darwinian--" I lost my page.
 17 "What theistic evolution does is to take the
 18 Darwinian theory and make it, in fact, almost a
 19 theistic view." Would you agree with that?
 20 A. No. I believe there's a very diverse group of 11: 09AM
 21 scientists who dissent from evolutionary
 22 perspective. They include theistic
 23 evolutionists, they include old earth
 24 creationists, young earth creationists and a
 25 lot of people who don't know, but they just 11: 09AM
 0114
 1 don't buy the evolutionary story.
 2 Q. Would you agree, sir, that there are
 3 observations for which we simply today do not
 4 have an answer using the scientific process?

5 A. Absolutely. 11: 10AM
6 Q. And would you further agree, sir, that those
7 particular limitations have handicapped science
8 since the beginning?
9 A. No, I wouldn't put it that way.
10 Q. Is it your opinion that science has always been 11: 10AM
11 able to come up with the answers?
12 A. Certainly not.
13 Q. So, therefore, you would agree that
14 historically science has not always been able
15 to come up with an answer to a natural 11: 10AM
16 observation at any point in time?
17 A. Yes.
18 Q. And would you then believe that it is
19 appropriate for scientists, when they cannot
20 find a natural answer to observations, to 11: 10AM
21 simply rely on a supernatural explanation for
22 that observation?
23 A. They should look for the best hypothesis to fit
24 the evidence.
25 Q. My question-- 11: 10AM
0115
1 A. Which can include a supernatural explanation
2 when you're talking about origins and
3 historical science.
4 Q. Did you-- did you not tell me a little bit
5 ago-- 11: 11AM
6 A. Uh-huh.
7 Q. -- that science should be neutral?
8 A. I did.
9 Q. And if science should be neutral, how could it
10 be a good idea to impose a supernatural 11: 11AM
11 explanation to something that we simply don't
12 understand?
13 A. You're trying to put your words into my mouth.
14 I'm sorry, I just--
15 Q. Is-- 11: 11AM
16 A. -- won't be guided in that way.
17 Q. Is science neutral --
18 TIMEKEEPER: Two minutes remain.
19 Q. (BY MR. IRIGONEGARAY) Is science supposed to
20 be neutral? 11: 11AM
21 A. Science ideally should be neutral. It seldom
22 has been.
23 Q. If science is ideally supposed to be neutral,
24 how can we justify - because we do not
25 understand a natural phenomenon - the 11: 11AM
0116
1 attachment to the answer of supernatural
2 explanations?
3 A. See, those are your words, not mine. What I
4 would advocate is when we don't know something,
5 we develop hypotheses and we test them. 11: 11AM
6 Q. Do you believe in intelligent design?
7 A. I do.
8 Q. Do you believe intelligent design answers
9 questions that we yet don't know in science?
10 A. No. I believe that it's not just a matter of 11: 11AM
11 arguing that we don't know enough, so it must
12 have been God. I believe there's powerful
13 evidence against the primary axiom and that in
14 the absence of adequate evolutionary
15 explanations, it is reasonable and rational to 11: 12AM

16 seek other explanations.
17 Q. Do you believe the National Academy of Science
18 and all other major scientific bodies in this
19 nation and indeed the world--
20 A. Uh-huh. 11: 12AM
21 Q. -- are simply biased against intelligent
22 design?
23 A. I wouldn't say simply, but I-- I do know that
24 when-- when surveys have been taken, whereas 40
25 percent of scientists believe in God, only 4 11: 12AM
0117
1 percent of the National Academy members do. So
2 I do believe it-- it represents a limited
3 cross-section of scientists, yes. And they're
4 self-selected. You have to be-- you're--
5 you're elected by existing members, so there is 11: 12AM
6 a tendency for that group to be homogeneous and
7 self-selecting.
8 Q. Homogeneous and what?
9 A. Self-selecting. To become a national member,
10 you have to be nominated and elected by the 11: 13AM
11 existing members.
12 Q. Do you think merit and knowledge, research,
13 peer articles--
14 A. Absolutely.
15 Q. -- may have anything to do with that? 11: 13AM
16 A. Yes. Yes. All the people on that committee
17 are extremely intelligent, very
18 highly-accomplished scientists.
19 MR. IRI GONEGARAY: I have nothing
20 further. 11: 13AM
21 CHAIRMAN ABRAMS: Thank you. We have
22 eight minutes.
23 EXAMINATION
24 BY MS. MORRIS:
25 Q. Doctor Sanford, thank you for coming. I wish 11: 13AM
0118
1 we could hear you speak for hours actually.
2 It's fascinating and thank you for your work.
3 Can you give me a number, a ratio of the
4 mutations that are lethal versus those that are
5 healthy? One to what number would I fill in 11: 13AM
6 the blank with?
7 A. Lethal to?
8 Q. To a healthy or a positive mutation.
9 A. Okay. Lethals are very rare, beneficials are
10 even more rare. I-- I would have to think 11: 14AM
11 about the number. I don't want to just throw a
12 number out.
13 Q. That's fine.
14 A. But lethals are extremely rare. They're not
15 the problem, it's the near neutrals ironically. 11: 14AM
16 It's-- it's-- it's like rust in a car, it's the
17 stuff you can't see, the deterioration you
18 can't see, that you can't stop.
19 Q. Okay. That's great. Thank you.
20 EXAMINATION
21 BY CHAIRMAN ABRAMS:
22 Q. Doctor Sanford, you stated that evolutionary
23 concepts were taught as foundational when you
24 were in school doing your graduate work and you
25 believed them. Were those-- after you went 11: 14AM
0119

1 through your Ph.D. program and post-doctoral
2 and started into your research that you're
3 currently involved in, were those concepts
4 central to your research, the near Darwinian
5 evolutionary concepts? 11: 14AM

6 A. Evolutionary theory was taught to me since I
7 was a little boy. I never-- I didn't even know
8 that people didn't agree with this, I
9 considered it as universally accepted. When I
10 was in college and graduate school and early in 11: 15AM
11 my career, it was more than a foundation, it
12 was actually my religion. I based my personal
13 ambitions and hopes and dreams upon it, helping
14 to continue the evolution of the human species.
15 And I had defined my own reality based upon 11: 15AM
16 what will advance evolution.

17 But evolution did not help me in my work.
18 My work was always directed from the point of
19 view of there must be a logical explanation.
20 In fact, the belief that we live in a 11: 15AM
21 rationally-designed world is the reason why
22 scientific exploration can be trusted to
23 produce results.

24 Q. I've been a proponent of empirical science,
25 you've probably heard that. 11: 15AM

0120

1 A. Uh-huh.
2 Q. Observable, measurable, testable, repeatable,
3 and falsifiable. Those are the tenets in which
4 I believe empirical science is-- with which
5 people do good in science. Does empirical 11: 15AM
6 science provide data of the type that would
7 support one hypothesis and refute another?

8 A. Yes.
9 Q. Is that something that would eliminate biases?
10 A. Generally you don't find in the operational 11: 16AM
11 sciences a lot of controversy because things
12 are verifiable. And if someone questions
13 whether the density of gold is-- is a certain
14 amount, people go out and test it and they put
15 the controversy to rest. And so there's a 11: 16AM
16 strong consensus within operational science.

17 Q. Would you like to discuss or comment on the
18 philosophical claims or the religious claims
19 that are made in the name of science?

20 A. I think that it's very important that when we 11: 16AM
21 as scientists talk about science, that we
22 separate historical science from operational
23 science because the-- the benefits that mankind
24 enjoys, like longer life and-- and more
25 creature comforts and the elimination of 11: 17AM

0121

1 hunger, these things come from operational
2 science. But historical science is more in the
3 realm of philosophy. As you develop your
4 theories of history, your theories are very
5 much colored by your real view, you tend to 11: 17AM
6 paint a past that fits your ideology.

7 Q. So how would you describe the ability of the--
8 of the majority draft and how would you
9 describe the ability of the minority draft to
10 teach the student to distinguish between the 11: 17AM
11 different types of data and testable theories

12 of science from religious and philosophical
13 claims that are made in the name of science?
14 A. I believe that the minority report where I've
15 seen word-for-word comparisons and changes that 11: 17AM
16 have been made seems to take a small step
17 toward greater objectivity and greater
18 intellectual freedom for the teachers and the
19 students, which I think is really good.
20 CHAIRMAN ABRAMS: Thank you very 11: 18AM
21 much.
22 DOCTOR SANFORD: Thank you.
23 CHAIRMAN ABRAMS: Mr. Calvert.
24 MR. CALVERT: As our next witness we
25 would like to call Doctor Robert Di Silvestro, 11: 20AM
0122
1 professor of nutrition at I believe it's Ohio
2 State University.
3
4 ROBERT DI SILVESTRO, PH. D.,
5 called as a witness on behalf of the Minority,
6 testified as follows:
7 DIRECT EXAMINATION
8 BY MR. CALVERT:
9 Q. Doctor Di Silvestro, would you please give us a
10 little bit about your background and your 11: 20AM
11 qualifications to testify with respect to
12 science standards.
13 A. Yes. I have a Ph. D. in biochemistry from Texas
14 A&M. I'm currently a professor of nutrition at
15 Ohio State University. My research has evolved 11: 20AM
16 over the years but with design. Starting from
17 very basic studies of proteins that contain
18 minerals to now looking at some very applied
19 human nutrition and other biomedical issues.
20 And one of the things I do now to a large 11: 21AM
21 extent is try to design pharmaceutical and
22 nutraceutical interventions that affect
23 biological processes for a desired purpose. So
24 I think I bring a little bit of a different
25 perspective to this whole issue because I'm 11: 21AM
0123
1 actually trying to change biological systems by
2 design, and I think that gives me a perspective
3 on how hard it is to get what you want without
4 getting a lot of side effects.
5 And I find it hard to believe that even 11: 21AM
6 with me knowing a little bit about life
7 processes and how hard it is for me to get what
8 I want without getting bad consequences, that
9 random processes could do a better job than all
10 us PhDs could do when we're trying to change 11: 21AM
11 processes for good.
12 I have almost 80 peer-reviewed scientific
13 research journal articles, plus I've written
14 various commentaries for both scientific
15 publications as well as the lay public. 11: 22AM
16 Q. Are you working or do you sponsor a research
17 lab?
18 A. Yes, I have a-- a lab. I currently have five
19 grad students, some undergrads, a couple of
20 technicians. 11: 22AM
21 Q. And what does that lab or that project
22 investigate?

23 A. Well, we-- as I said, we do a variety of
 24 things. I still do some real biochemistry, for
 25 example now I'm involved in a project looking 11: 22AM
 0124
 1 at multiple sclerosis. We're testing
 2 hypotheses that if we can increase the gene
 3 expression for a certain zinc-containing
 4 protein and do it at several different stages
 5 of the process of gene expression, if we can do 11: 22AM
 6 that, we might be able to minimize the symptoms
 7 of people that have multiple sclerosis. That's
 8 an example of a project I'm doing.
 9 Q. You mentioned that you were using design-type
 10 thinking in your current research. I would 11: 23AM
 11 like you to comment on one provision in the
 12 evolution benchmark. It's Indicator 6, and I
 13 need to put that up on the screen.
 14 Okay. The indicator says, "Biological
 15 evolution is used as a broad, unifying
 16 theoretical framework for biology." I would 11: 23AM
 17 like to ask you to first comment on that. To
 18 what extent do you use evolutionary theory in
 19 the-- in the work that you're doing right now?
 20 A. Well, there's a popular statement that nothing 11: 23AM
 21 in biology makes sense in light of evolution.
 22 I challenge anyone to tell me any single area
 23 of biomedical research that one couldn't do if
 24 they didn't accept Darwin's current ideas. I--
 25 I'm waiting to hear it. I can't think of a 11: 24AM
 0125
 1 single one. And that question has been asked
 2 to some people and they can't give me an
 3 answer, either.
 4 So in my work, what I work on could be
 5 interpreted in light of some evolutionary 11: 24AM
 6 theories, but it's not required that I hold a
 7 particular theory in order to do my work. I
 8 could believe in Darwin, I could believe in
 9 punctuated equilibrium, I could believe in
 10 spacemen, I could believe in intelligent 11: 24AM
 11 design. And I pretty much do the work in more
 12 or less the same way.
 13 I know people are saying, well, you can't
 14 bring religious prejudice to the table. Well,
 15 if I'm not mistaken, Newton is one of the 11: 24AM
 16 greatest scientists of all time, started with
 17 the premise that God designed the universe, so
 18 it was his job to figure out a little bit about
 19 what God did.
 20 Q. Moving on in that indicator on the additional -- 11: 25AM
 21 on the right-hand side of the column, it says,
 22 "Natural selection, genetic drift genomes and
 23 the mechanism of genetic change provide a
 24 context in which to ask research questions and
 25 help explain observed changes in population." 11: 25AM
 0126
 1 What kind of research questions are they
 2 talking about there?
 3 A. Well, I think that's a common idea in theory
 4 but not in practice. I've read hundreds of
 5 biomedical research papers, I've been to 11: 25AM
 6 hundreds of talks, and evolution is only
 7 brought up once in a great, great while. For

8 the most part, it's never even brought up,
9 which is something I wanted to comment on and
10 it's in my written statement, which hopefully
11 some of you got. 11: 25AM

12 When I was involved in the whole Ohio
13 debate over the science standard issues, one of
14 the counterpoints that was brought up was that
15 in a debate you need to keep things fair, so we
16 have two on one side and two on the other side. 11: 26AM
17 But if we were really debating all the
18 scientists that could line up on each side, we
19 would have thousands and thousands of
20 scientists over here, and we would only have a
21 handful of people on the other side. I think
22 that's an erroneous idea. 11: 26AM

23 In reality, there are a handful of people
24 that have really gone through the Darwinian
25 ideas, have come to the conclusion that they 11: 26AM

0127
1 make compelling sense. There are a few, like
2 myself, who questioned those ideas and have
3 come to the conclusion that they make
4 compelling nonsense. But the overwhelming
5 majority of scientists have never even thought
6 about the question. 11: 26AM

7 My own case, I was an undergrad in
8 biochemistry, I changed some of my spiritual
9 beliefs during college, but I thought the whole
10 idea of evolution was pretty irrelevant. My 11: 27AM
11 feeling was, well, let's get through that
12 pretty quickly so I can go on to the areas that
13 are really important that I'm going to use in
14 my job, and I really didn't care about the
15 issue.

16 And it really wasn't until I was in grad
17 school when I saw that there was this double
18 standard, that my research and almost every
19 other research I knew of was subject to certain
20 kinds of scrutiny. And when it came to origins 11: 27AM
21 issues, origin of life, origin of species,
22 these researchers seemed to get a pass on the
23 kind of scrutiny that my research and pretty
24 much every other person's research was subject
25 to. So that was really what got me interested. 11: 27AM

0128
1 But I think the overwhelming majority of
2 scientists, of life scientists, have not really
3 considered the-- the area very critically.
4 Most of us are too busy trying to design drugs,
5 study agriculture, examine ecosystems, do 11: 27AM
6 whatever we do for our job, and we more or less
7 take the word of what we were taught, that
8 Darwin's ideas are very solid because that's
9 what we were told, and we're busy doing other
10 things now. 11: 28AM

11 That's not just my opinion, that opinion
12 has been reflected in a publication that goes
13 around to a very large group of scientists and
14 the-- the name of the publication is not very
15 clever, it's called Scientists. But there was 11: 28AM
16 an editorial in there where-- basically it was
17 called Curiosity Won't Kill the Science Class.
18 And someone was encouraging more consideration

19 of Darwin from a critical perspective. His
20 opinion was Darwin would come out pretty good 11: 28AM
21 if that was done.

22 And he got all kinds of letters to the
23 editor. And there was one letter written by
24 someone that is in favor of the Darwin ideas,
25 but he made this comment, "Many biologists, I 11: 28AM

0129
1 regret to say, don't really know and understand
2 the issue of evolution." And then it goes on,
3 it says, "And ask some biologists to define
4 evolution in a short paragraph, you will wait,
5 alas, in vain for a succinct and lucid 11: 28AM
6 explanation." I very much agree with that. I
7 think most scientists have just never
8 critically considered the issue.

9 Q. I had asked you to look at the very last
10 sentence in that section we're talking about. 11: 29AM
11 And the sentence says, "However, reverse
12 engineering and indirect thinking are used to
13 understand the function of biochemical -- or
14 biosystems and information." And I guess that
15 refers to bioinformation. But would you agree 11: 29AM
16 with that?

17 A. Yes. I -- information, as was mentioned by the
18 last speaker, is incredibly complex to life's
19 systems. And as I said, I try to deal with
20 things. It's much easier to get things to go 11: 29AM
21 wrong than to get things to go right. And I've
22 heard the comment that given enough time, the
23 unlikely becomes likely. Well, all I can say
24 is given enough time, there's much more of a
25 chance that things can go wrong and break down 11: 29AM

0130
1 than to lead to something that functionally
2 makes sense. It's much easier to mess
3 something up than to make something work
4 properly.

5 Now, along those lines I've heard, well, 11: 30AM
6 we have evidence for these microevolutionary
7 changes within species, couldn't they just add
8 up to changing the whole species.

9 Interestingly, a professor at Ohio State that
10 teaches an upper level course in evolution made 11: 30AM
11 the comment that that was one of the worst
12 arguments that could be made for

13 macroevolution. He said it's totally -- it's
14 comparing apples and oranges. The kind of
15 changes that take place that make these little 11: 30AM
16 microchanges in species could never add up to
17 make a new species because they're -- they're
18 just two different processes. That's what he
19 said. And he is someone that very firmly
20 believes in Darwin and teaches class on it. 11: 30AM

21 I might say, by analogy, one could look
22 at the record for high jump, it's gone up over
23 the last 100 years. But nobody is going to
24 say, well, given another thousand years,
25 people -- the elite high jumpers will start 11: 30AM

0131
1 jumping over five-story buildings. Nobody
2 would accept that because the kinds of changes
3 you would need for that to happen go way beyond

4 the kind of changes you need to make the record
5 go up by a few inches at a time. 11: 31AM
6 So I would say that the tremendous amount
7 of complexity in-- in biological systems and
8 the number of ways that things can go wrong
9 compared to the number of ways that things can
10 go right and the limits to changes that take 11: 31AM
11 place in microevolution make it untenable to me
12 to think you could make a whole new species or
13 create life that way from no life.
14 Q. In-- in the work you do at the biochemical
15 level, are you using methodological naturalism 11: 31AM
16 or some kind of methodological design to
17 understand the system?
18 A. Well, I usually initially just start out by
19 saying, how is the system currently working.
20 And I could come to that conclusion either from 11: 31AM
21 a design standpoint or from Darwin's
22 standpoint. I really look at what do we know.
23 A lot of times we don't know everything, but
24 what do we know and how can I best affect that
25 system. So I-- I would say I come at it 11: 32AM
0132
1 neutral initially.
2 Q. But do you ever look at the system as if it was
3 designed and try to-- and assuming it was
4 designed, trying to figure out how that design
5 or-- or allow that-- that perception to-- to 11: 32AM
6 aid your investigation?
7 A. Sometimes I-- I think that way in the sense of,
8 well, it was designed, what might happen. But
9 in a lot of concepts of intelligent design, the
10 initial design has changed. I mean, in a 11: 32AM
11 Christian concept, for example, of design the
12 Christian concept would be there was a designer
13 that designed everything good and humanity muck
14 it up. And-- and so there would be evidence of
15 the problems as well. 11: 32AM
16 So even if-- even if I do believe there
17 was a designer at the beginning, I also believe
18 there could be problems along the way, so I may
19 not-- may not always see the hand of design.
20 So that's why I say I look really at the system 11: 33AM
21 as is, which could reflect design, it could
22 also reflect problems that have developed.
23 Q. There is an indicator that this-- touches upon
24 the description of scientific knowledge that I
25 want you to look at. It's on the screen now. 11: 33AM
0133
1 "Scientific knowledge begins with empirical
2 observations." Oops. Here it is. "Scientific
3 knowledge describes and explains," and the
4 majority report would say, "explains the
5 physical world in terms of matter, energy, and 11: 33AM
6 the forces." And the minority report would
7 truncate that and simply say, "Scientific
8 knowledge describes and explains the natural
9 world." Would you comment on those?
10 A. I like that a little better because I'm not 11: 33AM
11 sure what forces are. And I think that's one
12 of the reasons I've been interested in-- in the
13 revisions. I think there's some areas where
14 the majority report is saying something that I

15 look at and I say, well, that could be exactly 11: 34AM
 16 what I think, too, but I'm not sure because a
 17 lot of people will interpret it a lot of
 18 different ways. So I think the-- one of the
 19 good accomplishments of the minority report is
 20 to just say something specifically where 11: 34AM
 21 there's room for more than one interpretation.
 22 So something like forces, I'm not sure
 23 what that means. And I like the minority
 24 report because it states things a little more
 25 specifically. 11: 34AM

0134
 1 Q. Going back to the evolution indicator. There
 2 is a-- I would like you to comment on this.
 3 This indicator talks about DNA, and there's a
 4 statement, "The sequence of nucleotide bases
 5 within genes is not dictated by a known 11: 35AM
 6 chemical or physical law." Is that a
 7 scientifically-valid statement?
 8 A. I would think so. Even in my son-- my son now,
 9 my son's classes at OSU, he's in honors
 10 biochemistry, and he says one of his professors 11: 35AM
 11 said, boy, isn't it-- isn't it clever how
 12 nature manages to do all of this. And, you
 13 know, that was-- he's not coming from a
 14 theistic perspective at all, but-- but he's
 15 just saying that, you know, we can't really 11: 35AM
 16 figure out how some of this arose.
 17 And-- and to me, this is one of the great
 18 arguments for the idea that there could be
 19 design in the origin of life. It's what's
 20 called order and complexity, that you have 11: 35AM
 21 order and complexity. I mean, you can have
 22 complexity, but it can be all gibberish. You
 23 can have order, like somebody saying, go Ohio
 24 State Buckeyes, but that's not really complex.
 25 But you can then have order and complexity 11: 35AM

0135
 1 where you have a Shakespeare play, for example.
 2 And the genetic codes have got amazing order
 3 and complexity.
 4 And-- and no, I've never seen anywhere
 5 where anyone said we know how this came about. 11: 36AM
 6 There are people that have ideas and
 7 hypotheses, but I've never even heard the most
 8 ardent of naturalists say we know how life
 9 started, we know the origin of the genetic
 10 code. 11: 36AM
 11 Q. They-- in the evolution indicator-- or
 12 Benchmark Indicator 1 explains generally the
 13 biological evolution concept. In-- in the
 14 additional specificity 1A, the minority report
 15 adds, "Biological evolution postulates an 11: 36AM
 16 unpredictable and unguided natural process that
 17 has no discernible direction or goal." Is that
 18 a scientifically-valid statement?
 19 A. Okay, that's really a philosophical statement,
 20 but I think it's important to state that 11: 37AM
 21 because that's what a lot of people mean when
 22 they say evolution. As was indicated earlier
 23 today, there's-- there are words that a lot of
 24 people mean different things when they say in
 25 this whole debate area. So I think that's good 11: 37AM

0136

1 to define that. That would be what a lot of
2 people would say, that's what I mean when I say
3 this word.

4 And in just the kind of-- to go a little
5 further with that, there's been this idea that, 11: 37AM

6 what about the implications? Well, that type
7 of a statement has profound theological
8 implications. There's certainly people that
9 hold certain beliefs, that even hold the
10 beliefs that are called Christian that would 11: 37AM
11 have no problem with that, they would just say,
12 you know, that's the way God planned it.

13 There's other people that have certain beliefs
14 where they would really have a hard time with
15 that statement and they would say that that 11: 37AM
16 really goes against their beliefs.

17 But my feeling about science, I've heard
18 a lot already about a science neutral. Science
19 should be neutral in the sense of looking at
20 the data and try as best you can to remove your 11: 38AM
21 prejudices in what it says. But science
22 doesn't have to be neutral in what it
23 concludes. We shouldn't say you can't teach
24 certain things because it would have
25 anti-religious implications. And that Darwin 11: 38AM

0137

1 does, to many people, have anti-religious
2 implications. But we shouldn't say, well, you
3 can't get evidence to support that because that
4 bothers someone's particular belief. By the
5 same token, we can't say-- 11: 38AM

6 TIMEKEEPER: If I may interrupt. Two
7 minutes remain.

8 A. We shouldn't say, well, you can't look at any
9 evidence that points to design because that has
10 religious implications. Your neutral in terms 11: 38AM
11 of scientists should be neutral in terms of
12 trying to examine the data objectively, but you
13 don't have to be neutral in what it applies
14 (sic).

15 And a good example has to do with 11: 38AM
16 astronomy of a big bang. At Ohio State
17 University there's a taught-- course taught in
18 cosmology where they teach the big bang, and
19 there's tremendous evidence of that, and the
20 physical universe sprang from the nonphysical. 11: 39AM
21 They then say in their class notes, "And that's
22 going to make you ask what caused that.
23 Astronomy doesn't answer that question."

24 So they don't seem to have any problem
25 with looking at science and looking at facts 11: 39AM

0138

1 neutrally, but then saying, well, there are
2 implications and science is supposed to say
3 here's the way it is and then the-- it's up to
4 the philosophy class, the religion class,
5 whatever, to deal with the implications. 11: 39AM

6 Q. (BY MR. CALVERT) In general, we have about a
7 minute left, could you comment generally on the
8 minority report and your view about the
9 propriety of the state adopting that?

10 A. Well, I think for the most part what the 11: 39AM

11 minority report at least did from my reading,
 12 maybe some other people read it differently,
 13 was it made some very specific comments in some
 14 areas. I think there are areas that if you
 15 read-- as I said earlier, if you read the 11: 39AM
 16 majority report, you might come away with the
 17 feeling of "I agree with that," and someone
 18 else might read it and see something completely
 19 different.
 20 So my feeling was what the minority 11: 40AM
 21 report did was made some statements that were
 22 very specific to clarify some language.
 23 Q. Okay.
 24 MR. CALVERT: Thank you very much,
 25 Doctor Di Silvestro. Pedro, your witness. 11: 40AM
 0139
 1 CHAIRMAN ABRAMS: Mr. Irigonegaray,
 2 you have ten minutes.
 3 CROSS-EXAMINATION
 4 BY MR. IRIGONEGARAY:
 5 Q. I have just a few questions for you, sir. And 11: 40AM
 6 for the record, I am interested first what is
 7 the age of the world, in your opinion?
 8 A. Well, since that's out of my area, I can't
 9 really give an expert opinion, but I haven't
 10 heard of any major arguments against the 11: 41AM
 11 four-and-a-half billion-year-old idea, so I
 12 don't challenge that idea.
 13 Q. Do you accept the general principle of common
 14 descent, that all of life is biologically
 15 related back to the beginning of life? 11: 41AM
 16 A. I'm unconvinced of that idea.
 17 Q. Do you accept that human beings are related by
 18 common descent to prehomimid ancestors?
 19 A. I'm unconvinced by that idea, also.
 20 Q. If you were unconvinced by that idea, do you 11: 41AM
 21 have an alternative explanation for how the
 22 human species came into existence?
 23 A. I think design is a reasonable alternative.
 24 Q. And the design you suggest is by a creator?
 25 A. I would put that in and I would say it's 11: 42AM
 0140
 1 reasonable, though there's other blind forces
 2 and other things that people might adapt.
 3 Q. Doesn't intelligent design mean that human
 4 beings and other species were specially created
 5 since they weren't born of parents? 11: 42AM
 6 A. I would say intelligent design says that.
 7 Q. And do you agree with that proposition?
 8 A. I would, but I wouldn't ask the state to
 9 agree-- or I would not ask the state to teach
 10 my opinion in that area. 11: 42AM
 11 Q. I would like for you to listen first to the
 12 sentence I'm about to read. "There are many
 13 issues which involve morals, ethics, values, or
 14 spiritual beliefs that go beyond what science
 15 can explain but for which solid scientific 11: 42AM
 16 literacy is useful." Would you agree with that
 17 sentence?
 18 A. Partly. I would agree that there's more to
 19 learn, but in science we have to make opinions
 20 based on data we have. And in terms of 11: 43AM
 21 origins, we actually have a lot of data that

22 goes against the Darwin ideas.
 23 Q. Sir, I just asked you if you agree or disagree,
 24 yes or no, with that sentence.
 25 A. I'm not on trial, I can't answer that yes or 11: 43AM
 0141 no.
 1 Q. You're not on trial. Sir, you're just simply
 2 being questioned, this is not a trial. Do you
 3 agree or disagree with that sentence?
 4 A. Partly. 11: 43AM
 5 Q. Were you aware that that sentence is in the
 6 Draft 2 of the standards?
 7 A. Yes, I am.
 8 Q. You took the time to read the standards?
 9 A. I read the parts that I considered 11: 43AM
 10 controversial. I skipped over some of the
 11 parts that I didn't think were relevant to what
 12 I was going to discuss.
 13 Q. Is it fair to say then that you have not read
 14 the totality of the standards? 11: 43AM
 15 A. That's fair to say.
 16 MR. IRIGONEGARAY: I have nothing
 17 further for you.
 18 CHAIRMAN ABRAMS: Thank you.
 19 EXAMINATION
 20 BY CHAIRMAN ABRAMS:
 21 Q. Doctor DiSilvestro.
 22 A. That's very good with my name, thank you.
 23 Q. You heard me say, I suspect, earlier that I'm a
 24 proponent of empirical science. Is that 11: 44AM
 25 something that you believe would support one
 0142 hypothesis over another and refute another?
 1 A. Yes, very much. I think-- that's, I guess, why
 2 I got into this whole thing is I felt that when
 3 it came to issues like origin of life and 11: 44AM
 4 origin of species that the same good science
 5 standards weren't always applied. I did give a
 6 written commentary out here, and it's--
 7 basically the title is, you know, What
 8 Constitutes Good Science, particularly in some 11: 44AM
 9 areas of statistics and probability.
 10 Having gone through biochemistry, I never
 11 had a stats course. But now that I'm doing
 12 work with pharmacology, with nutrition,
 13 physiology, I found that I have to use 11: 45AM
 14 tremendous amounts of statistical analysis, and
 15 papers wouldn't even-- the journals wouldn't
 16 even look at my papers if I don't have good
 17 stats. And I look at what I have to do to get
 18 a paper published, then I look at some of the 11: 45AM
 19 statements made like-- like the one I said
 20 earlier, given enough time the improbable
 21 becomes probable. Well, in any other area of
 22 science, the question that would be asked back
 23 is, okay, how much time do you have available, 11: 45AM
 24 how much time do you need before this becomes
 0143 probable. And that's not asked here, and I
 1 think that's inconsistent with the rest of the
 2 science.
 3 Q. Are there religious and philosophical claims 11: 45AM
 4 that are made in the name of science?
 5
 6

7 A. I think there are implications. And as I
8 mentioned earlier, maybe I've watched too many
9 episodes of Law and Order, but I think that was
10 kind of the-- the asked and answered thing, I
11 think I-- what I said earlier still applies,
12 that there could be implications of a science
13 finding, but science needs to go forward,
14 whether there's implications one way or
15 another. If there's implications against
16 certain spiritual or philosophical beliefs,
17 they should be pursued. But by the same token,
18 if there's some implications that help some
19 spiritual or philosophical beliefs, I don't
20 think we should say, well, we can't go forward
21 in that area of science.

11: 46AM

22 Q. Which leads to the second part of that. How
23 would you describe the ability of the majority
24 draft and minority draft to teach the students
25 to distinguish between those two?

11: 46AM

11: 46AM

11: 46AM

0144
1 A. I think there's a lot of good guidelines in the
2 majority report. I just think the minority
3 report defines a few areas a little more
4 precisely, and I think they would be good
5 additions.

11: 46AM

6 CHAIRMAN ABRAMS: Okay. I thank you.
7 It is now 11:45. We'll break for lunch and
8 we'll reconvene and start promptly at 1
9 o'clock.

0145
1 C E R T I F I C A T E

2 STATE OF KANSAS)
3) ss:
4 COUNTY OF SHAWNEE)

5 I, Kelli Stewart, a Certified Shorthand
6 Reporter in and for the State of Kansas, duly
7 commissioned as such by the Supreme Court of
8 the State of Kansas, do hereby certify that I
9 was present at and reported in shorthand the
10 foregoing proceedings had at the aforementioned
11 time and place; further that the foregoing 144
12 pages is a true and correct transcript of my
13 notes requested transcribed.

14 IN WITNESS WHEREOF, I have hereunto
15 affixed my Official Seal this _____ day of
16 _____, 2005.

sc hearing05062005am. txt

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Kelli Stewart
CERTIFIED SHORTHAND REPORTER

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