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1 IN THE UNITED STATES DISTRICT COURT
2 FOR THE MIDDLE DISTRICT OF PENNSYLVANIA
3
4 TAMMY J. KITZMILLER; BRYAN)
5 REHM; DEBORAH F. FENTIMORE;) CIVIL ACTION
6 JOEL A. LIEB; STEVEN STOUGH;) No. 4:04-CV-2688
7 BETH A. EVELAND; CYNTHIA)
8 SNEATH; JULIE SMITH; ARALENE)
9 D. CALLAHAN ("BARRIE");)
10 FREDERICK B. CALLAHAN,)
11)
12) Plaintiffs,
13)
14 vs.)
15)
16 DOVER AREA SCHOOL DISTRICT;)
17 DOVER AREA SCHOOL DISTRICT)
18 BOARD OF DIRECTORS,)
19)
20) Defendants.
21 _____)
22)
23)
24)
25)

DEPOSITION OF SCOTT MINNICH, Ph.D.

TAKEN ON BEHALF OF THE PLAINTIFFS

AT MOSCOW, IDAHO

MAY 26, 2005, AT 8:45 A.M.

REPORTED BY:
NEIL COOLEY, C.S.R.
Notary Public

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A P P E A R A N C E S

MR. ALEX J. LUCHENITSER, Attorney at Law, Senior
Litigation Counsel, Americans United for Separation
of Church and State, 518 C Street, NE, Washington,
D.C. 20002, appearing for and on behalf of the
Plaintiffs.

MR. EDWARD L. WHITE, III, Attorney at Law, of the
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P.O. Box 393, Ann Arbor, Michigan 48106, appearing
for and on behalf of the Defendants.

ALSO ATTENDING:
Nicholas J. Matske, Public Information Project
Specialist

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1 THE DEPOSITION OF SCOTT MINNICH, Ph.D.,
2 was taken on behalf of the Plaintiffs on this, the
3 26th day of May 2005, at University of Idaho, Life
4 Sciences Building, Room 144, Moscow, Idaho, before
5 M & M Court Reporting Service, Inc., by Neil Cooley,
6 Court Reporter and Notary Public within and for the
7 State of Idaho, to be used in an action pending in
8 the United States District Court for the Middle
9 District of Pennsylvania, said cause being Civil
10 Action No. 4:04-CV-2688 in said court.

11 THEREUPON, the following proceedings were
12 adduced, to wit:

13 SCOTT MINNICH, Ph.D.,
14 a witness having been first duly sworn to tell the
15 truth, the whole truth, and nothing but the truth,
16 relating to said cause, deposes and says:

17 EXAMINATION

18 QUESTIONS BY MR. LUCHENITSER:

19 Q. Dr. Minnich, could you please state your
20 name for the record?

21 A. Scott Arthur Minnich.

22 Q. And have you had your deposition taken
23 before?

24 A. Never.

25 Q. I'm just going to give you some standard

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1 instructions. Please answer all the questions
2 orally. Please don't nod your head or say uh-huh or
3 huh-uh, because then the court reporter won't be
4 able to take down your answer accurately.

5 If you do not hear a question or don't
6 understand a question, please tell me. Please wait
7 until I have finished asking my question before you
8 begin your answer. And if you realize that an
9 earlier answer you gave was inaccurate or
10 incomplete, please say that you would like to
11 correct a former answer and I will give an
12 opportunity to do so.

13 And if your attorney objects to one of my
14 questions, you are still required to answer the
15 question unless your attorney instructs you not to
16 answer.

17 And do you understand the instructions I
18 have given you?

19 A. I do.

20 Q. And do you understand that you under oath
21 and are required to tell the truth?

22 Q. I do.

23 Q. Is it correct that you are serving as an
24 expert for the defendants in this case?

25 A. Yes.

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1 Q. Let me pull out your expert report, and
2 we are going to mark that as Exhibit 1.

3 (Deposition Exhibit No. 1 marked for
4 identification.)

5 BY MR. LUCHENITSER:

6 Q. We have marked as Exhibit 1 the expert
7 report of Scott Minnich. And if you could flip to
8 Exhibit A to Exhibit 1, which is the biographical
9 sketch in the back, please, does that Exhibit A
10 correctly reflect your educational and employment
11 history?

12 A. It does.

13 Q. And is everything in there still correct
14 or current or has something changed since you
15 submitted it?

16 A. No, it is still current.

17 Q. What were you asked to give an opinion
18 about by the defendants in this case?

19 A. The theory of intelligent design and how
20 it fits into this case in Dover, Pennsylvania.

21 (Off the record.)

22 MR. LUCHENITSER: Back on the record.

23 BY MR. LUCHENITSER:

24 Q. Were you asked to give an opinion about
25 anything else?

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1 A. No.

2 Q. And can you tell me what the principal
3 opinions you have in this case are?

4 A. That intelligent design is a viable
5 scientific theory.

6 Q. Anything else?

7 A. No, I mean in terms of my expertise in
8 this case, you know, it is whether or not
9 intelligent design is a competing theory in part to
10 the current consensus in biology.

11 Q. When you say intelligent design is a
12 viable scientific theory, can you explain what you
13 mean by viable?

14 A. In other words, it is looking at the
15 public evidence and interpreting that evidence in
16 the sense that the design we see in nature is real
17 design, not just apparent design, which most of my
18 colleagues hold the latter view.

19 Q. Uh-huh, so when you use the word viable,
20 do you mean it is real?

21 A. It's real, it's real, okay? It is
22 science, it is not a religious position. It has
23 metaphysical implications, like evolution does, but
24 that is incidental, secondary to its explanatory
25 power when we look at the facts and experiences that

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1 we see in the natural world.

2 Q. What are the metaphysical implications
3 that intelligent design has?

4 A. That there is design behind it, that
5 there is an intelligence in part responsible for
6 what we see.

7 Q. And let me ask you, why do you use the
8 word metaphysical?

9 A. Well, it is philosophical, metaphysical.
10 I mean, in that realm it doesn't require a religious
11 position, you know? It can be more of -- a person
12 can hold the view of intelligent design as being
13 real and believe in the God of Espinoza or Einstein,
14 the God of the philosophers, not of a traditional
15 God that we think of in the context of traditional
16 religions.

17 Q. Does your report identify all the subject
18 matter that you are going to testify about at trial?

19 MR. WHITE: I have to object because I
20 couldn't hear you.

21 BY MR. LUCHENITSER:

22 Q. I'm sorry, does your expert report
23 identify all the subject matter that you will
24 testify about at trial?

25 A. That's an absolute statement, and being a

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1 scientist I always hesitate. But this is -- in
2 terms of my own research and training, it is
3 reflected in this report.

4 Q. Do you intend to express any opinions in
5 this case that have not been included in your
6 report?

7 A. If I am asked a question that is not
8 directly applicable to this report, I may choose to
9 respond or not if I have knowledge in the area. No,
10 this isn't a complete tome of all the knowledge that
11 I have.

12 Q. Do you have any plans to supplement your
13 report in any way?

14 A. No, not at present.

15 Q. Do you consider yourself an expert on any
16 issues relevant to this case?

17 A. As they bring to bear on examples that
18 are being disputed by both camps, you know, the area
19 of irreducible complexity of the bacterial
20 flagellum, molecular machines, genetics,
21 microbiology.

22 Q. What is -- do you have an area of
23 specialty within the discipline of biology?

24 A. I do, I am a microbial geneticist focused
25 on an area we refer to as microbial pathogenesis,

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1 organisms that cause disease.

2 Q. Has that area been the focus of your
3 professional research?

4 A. Yes.

5 MR. WHITE: Object as far as what time
6 frame you are talking about for his professional
7 research.

8 THE WITNESS: Yes, currently. I have had
9 other experiences, too. I have been in diagnostics,
10 I have been in developmental biology, and -- I'm
11 trying to think in terms of just how you quoted
12 this, basic molecular biology, molecular genetics.

13 As an example, the controversy about
14 genetically engineered foods and BT toxins. I don't
15 know whether you are familiar with this at all,
16 bacillus thuringiensis toxin. This has been
17 incorporated into agricultural plants and has been
18 controversial because of the ethical concerns about
19 introducing or modifying plant genomes.

20 But that bacillus toxin gene I cloned as
21 a post-doc, and we gave it to Monsanto 20 years ago.

22 So occasionally I am called to -- in
23 fact, four or five years ago I had my research
24 notebooks subpoenaed because of a patent lawsuit
25 involved in who owned the rights to that. That was

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1 between Monsanto and some other company in terms of
2 who had the right to that gene.

3 Q. Would you consider yourself an expert in
4 evolutionary biology?

5 A. That's a difficult question and I want to
6 qualify it, because I was challenged here at the
7 University of Idaho several years ago when Robert
8 Pennock came and gave a seminar. And he knew my
9 position and he challenged me in the audience with
10 respect to, "How can you, as a practicing
11 contributing scientist, hold the position that is
12 contrary to the very foundation of your discipline?"
13 Okay? This is in front of all of my colleagues and
14 students in a formal departmental seminar.

15 And I responded that, "That's an
16 interesting question, and now that you have raised
17 it, I'm sure a lot of people are interested in my
18 response."

19 What I find interesting in my own
20 experience, and that of colleagues in this
21 department -- and we are the most highly funded and
22 I think the most successful in getting extramural
23 funding, publication in peer-reviewed journals, we
24 have several new faculty so I don't want to make an
25 absolute statement, but, you know, the past couple

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1 of years -- but at that time nobody in this
2 department, as a student or post-doc, had taken,
3 except for one person, a formal course in evolution.
4 None of them, except for one person, had read
5 Darwin's book.

6 So when you say an expert on evolution,
7 you know, we are all biologists and we are all
8 contributing biologists, but in our training we have
9 not been required to study formally evolution as a
10 subject.

11 So I would say I am not, per se, an
12 expert. I know a lot about it. I think I
13 understand it clearly. But in terms of, you know,
14 looking at my transcripts through graduate school,
15 undergraduate school, post-doctoral training at
16 Purdue and Princeton, you will find no evidence that
17 I took a course in evolution.

18 In fact, when I wanted to as a graduate
19 student my mentor dissuaded me from doing it. He
20 said pretty derogatory things about it.

21 Q. So you have never actually taken a course
22 in evolution?

23 A. And that's the common experience for most
24 of my colleagues throughout my career.

25 Q. Right, and that's your experience. I was

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1 just trying to make a point that that's your
2 experience.

3 A. Right. Right.

4 Q. So you would not hold yourself out as an
5 expert on evolution?

6 A. I think I can hold my own, I think I can
7 hold my own in terms of this debate. I have done a
8 lot of reading on my own, but how do you measure who
9 is an expert?

10 If you look at publications,
11 contributions that are formal in that discipline,
12 no, you are not going to find them on my resume.

13 Q. So have you had any training in
14 evolution, other than just reading stuff on your
15 own?

16 A. I think in the informal discussions and
17 debates at meetings when these topics come up, I am
18 very interested in the subject and will participate.

19 Q. What have you read about evolution?

20 A. Well, I mean, I have read Darwin, you
21 know? I have read Dennett, I have read Dawkins, I
22 have read a number of books, perused the journals,
23 any journals that touch on evolution, infectious
24 disease, I pay attention to them.

25 Q. Have you ever taught any courses in

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1 evolution?

2 A. No.

3 Q. And is it correct -- you might have said
4 this already, is it correct that your department at
5 the University of Idaho does not offer a course in
6 evolution?

7 A. Our department does not. Biology does,
8 and this is another thing that I found interesting,
9 is that -- to clarify the statement, in talking
10 about Pennock, that our department does not require
11 nor does it offer evolution even as an elective.
12 And at the time period when Pennock was here,
13 biology offered a course in evolution, but it was a
14 400 level course.

15 Now they have since changed that, I think
16 in part to my criticism. But if it is so necessary
17 to have a firm understanding of evolution to do
18 biology, why do you offer it as a 400 level course?
19 So now that has been brought down into the 100
20 level.

21 Q. Just to clarify the record, is it
22 correct, Doctor, I want my understanding to be
23 correct, you have not had formal training in
24 evolution and your of knowledge of evolution is
25 based just on reading articles and discussions with

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1 colleagues, is that accurate?

2 MR. WHITE: Objection as to what you mean
3 by formal training.

4 THE WITNESS: I haven't had a formal
5 designated course in evolutionary biology. Now, it
6 has been a component of courses that I took as an
7 undergraduate, general biology. There would be a
8 section on evolution that dealt with mutation and
9 natural selection, Haeckel's embryos, peppered moss,
10 the standard fare back in the 70s, but it was pretty
11 shallow.

12 Q. That was as an undergraduate?

13 A. Right.

14 Q. Have you done any research in the field
15 of evolutionary biology?

16 A. I have dabbled in it in terms of
17 antibiotic resistance, which is in my expert report,
18 it's an interesting one.

19 Q. Can you explain what you mean by dabbled
20 in it?

21 A. In other words, we have done a series of
22 experiments, we haven't published them yet just
23 because at the time we were doing them, there were
24 other groups that were doing it as well, and they
25 published much of the same information that we had.

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1 And it wasn't a focused -- the primary focus of my
2 own work, so, you know, I just kind of let it slide,
3 although I think we have got some interesting
4 contributions to make. When I get time I will go
5 back.

6 Q. What was the purpose of the research you
7 were doing on the antibiotic resistances?

8 A. I was interested in the general
9 ramifications, because if you look at the
10 conversations in this area in terms of evidence for
11 evolution, antibiotic resistance is a very common
12 component to those arguments, whether you see it in
13 National Geographic last November, you know? I
14 mean, this is part of the overwhelming evidence.

15 And I was interested in terms of what the
16 fitness costs are associated with antibiotic
17 resistance and does it really fall into the series
18 of observations where you have mutations that are
19 contributing to the long term what I call
20 complexifying mutations that are driving evolution
21 from simple to complex systems.

22 Q. Have you published any articles in the
23 field of evolutionary biology?

24 A. No, I have -- I think some of my work has
25 implications in terms of evolution. But not

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1 formally, that's not my area of interest or, you
2 know, primary research.

3 Q. Would you hold yourself out as an expert
4 in paleontology?

5 A. No.

6 Q. Do you have any training in the field of
7 paleontology?

8 A. No.

9 Q. Would you hold yourself out as an expert
10 in the field of systematics or taxonomy?

11 A. I have experience in that.
12 Microbiologists are taxonomic. You know, the
13 systematic bible is Burgy's Manual of Determinative
14 Bacteriology. And I took a course in systematics as
15 a graduate student from the editor of Burgie's
16 Manual, so I am familiar with systematics.

17 Q. The course you took, or the training you
18 took in systematics, did it relate only to
19 systematics at the microbiology level --

20 A. Right.

21 Q. -- or did it relate to -- did it cover
22 systematics at the organismal level?

23 A. No, I mean it was a microbiology course.

24 Q. Do you have any training in systematics
25 or taxonomy at the organismal level?

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1 A. I mean, I have had experience as an
2 undergraduate and graduate student taking
3 systematics courses or having it as a component of
4 my training, how you go through a systematic key and
5 look at phenotypes, or now as we employ genotypes,
6 and look at associations in terms or relatedness.

7 Q. Is it correct you would not hold yourself
8 out as an expert in systematics or taxonomy?

9 A. No, that's not my field.

10 Q. Would you hold yourself out as an expert
11 in biology at the organismal level as opposed to the
12 molecular level?

13 A. Again, I am a prokaryotic molecular
14 biologist, so I deal with haploid organisms and
15 that's my focus. I'm not an expert in terms of
16 mammalian zoology or taxonomy, if that's what you
17 are asking.

18 Q. And have you had any training in biology
19 at the organismal level?

20 A. In terms of course work, yes, I have. I
21 mean, I have taken micrology courses that are a
22 pretty broad group of organisms. And I have taken
23 courses in zoology and vertebrate zoology, but that
24 was years ago and things have changed dramatically
25 in terms of that.

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1 Q. Was that also as an undergraduate?

2 A. Undergraduate or early graduate student.

3 Q. Do you have any training in the fields of
4 information theory or probability theory or
5 statistics?

6 A. General statistics I have had courses in,
7 but I am not a statistician.

8 Q. So you would not hold yourself out as an
9 expert in any of those areas?

10 A. No, if I need to use statistics, I make
11 sure that I hook up with a statistician and go over
12 our data and make sure our interpretations are not
13 -- you know, are valid.

14 Q. Do you have any expertise or training in
15 the field of gene sequence comparison?

16 A. Yes, I do that routinely.

17 Q. Do you have any expertise or training in
18 the field of genetic engineering?

19 A. Yes. Yes, I mean, I publish in this
20 area, I use it all the time in my own research.

21 Q. Have you actually engineered any life
22 forms?

23 A. Yes, like I said, as a post-doc we cloned
24 bacillus thuringiensis toxin and that was handed
25 over to Monsanto, and they incorporated that into

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1 soy beans and into corn and other plants. So in
2 terms of the forefront of genetic engineering, that
3 was one the first major applications.

4 I have modified organisms routinely. We
5 use site-directed mutagenesis, making fusion
6 proteins for analysis of gene regulation, deletions,
7 insertion of new information. That's our bread and
8 butter.

9 Q. Do you have any expertise or training in
10 the fields of astrophysics, astronomy?

11 A. No.

12 Q. Cosmology?

13 A. No.

14 Q. Astrobiology?

15 A. No.

16 Q. Would you consider yourself as an expert
17 in the field of intelligent design theory?

18 A. I am a contributor and I know the
19 literature pretty well and the people involved, so
20 it is a young, young field. But, yes, I mean in
21 part that's why I am here.

22 Q. What sort of training have you had in
23 this field?

24 A. I am a trained molecular biologist, so in
25 terms of scientific expertise, you know, I think a

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1 lot of us recognize that advances in science aren't
2 so much generating new data, new information, but it
3 is looking at old information in new ways. In part
4 this is the contribution of intelligent design.

5 Q. Have you ever taught any courses in
6 intelligent design theory?

7 A. No.

8 Q. What sort of research have you done in
9 the field of intelligent design theory?

10 A. Again, that's a -- to me that's a loaded
11 question. I look at -- much of what I have done and
12 published is having implications in design theory.
13 You know, dissecting the macromolecular machinery of
14 the bacterial flagellum and looking at its genetic
15 programing, I think that has great implication in
16 terms of design theory, intelligent design in terms
17 of how we look at these things.

18 But in terms of formal presentation? I
19 have one publication that was in a meeting where I
20 designed the nature --

21 Q. The 2004 article with Mr. Meyer?

22 A. Right.

23 Q. With respect to the research that you
24 were discussing that relates to intelligent design
25 theory, was the primary purpose of any of that

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1 research to somehow advance intelligent design
2 theory?

3 A. No, no, I think it is implicit in the
4 work. You know, this is one thing I would emphasize
5 in terms of how science works. Forty years ago, 30
6 years ago we didn't know about macromolecular
7 machines. We assumed, as I mentioned in my expert
8 report, the article by Bruce Alberts when he was a
9 graduate student in the sixties, they looked at the
10 cell as essentially a bag of enzymes which are
11 colliding on second-order kinetics, okay? A pretty
12 primitive view of the cell. Now we see it as a
13 consortium of macromolecular machines that weren't
14 anticipated.

15 And so when I look at bacterial
16 flagellum, it is -- Howard Berg, at Harvard, has
17 referred to it as the most efficient machine in the
18 universe. That's a pretty astounding statement in
19 terms of something that on one side we hold as a
20 product of, you know, unpurposeful, unintelligent
21 cause.

22 So I think it is imperative, now that we
23 have all this new understanding, to go back and ask
24 is natural law efficient to produce sophistication
25 of the systems that we are studying.

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1 Q. So is it correct that the research you
2 have done, with respect to all the research that you
3 have done as it touches on intelligent design
4 theory, the purpose of that research was something
5 else, it wasn't --

6 A. Yes, it's an understanding in terms of
7 basic biology, how does this system work? What are
8 the components? Who are the players in this game?
9 How are the genes regulated? How is it assembled,
10 how is it synthesized, the controlling elements?

11 So, yes, you have a pretty sophisticated
12 engine and it is the greatest fun in the world. It
13 is like being a 17-year-old kid in a garage with a
14 car and you can take it apart and put it back
15 together, modify it, see how it works. It is part
16 of the discovery process.

17 Q. Can you tell me what intelligent design
18 is?

19 A. Intelligent design, you know, in the
20 simplest sense, is asking the question: The design
21 that we see in natural systems that all biologists
22 agree is there, okay, from Dawkins to Francis Crick,
23 et cetera, you know, is the design real or is it
24 merely apparent? It's a simple question, there are
25 two answers to it. Both of them are valid questions

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1 that should be explored and both of them are going
2 to have extremely interesting ramifications, okay?

3 So intelligent design is looking at
4 nature and saying, is our current understanding of
5 mutation, natural selection, time and chance,
6 sufficient to produce the systems that we are
7 studying, or are there other interpretations? Is
8 there an intelligence behind it?

9 Q. And would you define intelligent design
10 theory in the same way or would you give intelligent
11 design theory a different definition?

12 A. No, it is all, you know, focused in the
13 same goals. I mean, in part it encompasses -- it's
14 a new area. How do you measure, how do you detect
15 design, how do you quantify it? And that would be
16 outside of my expertise, per se, but there are
17 people that are working on those questions.

18 If you look at something, you know, if
19 you are an anthropologist and you pick up a bunch of
20 rocks and one of them is a piece of flint and has
21 certain patterns that by experience we know is
22 because of intelligence, how do we know that? I
23 mean, we intuitively can look and say, "Okay, this
24 is an arrowhead," but how do we quantify that in
25 terms of real scientific methodology? This has been

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1 Bill Dembski's contribution, probability,
2 specificity, how that fits into real analysis.

3 Q. Is intelligent design theory only -- is
4 it anything more than a field of study that attempts
5 to determine whether design in nature is caused by
6 an intelligent actor, or does it actually -- is it
7 actually a theory that affirmatively claims that an
8 intelligent actor did in fact design living
9 beings?

10 MR. WHITE: Objection, it's a
confusing question.

11 THE WITNESS: Yes, go back and rephrase
12 it because I want to understand.

13 MR. WHITE: One thing, so I understand,
14 were you separating intelligent design from
15 intelligent design theory or is it the same when you
16 are asking these questions?

17 MR. LUCHENITSER: Well, it seems Dr.
18 Minnich is not separating the two, so --

19 MR. WHITE: I just want to know, when you
20 are asking the questions, so if you can rephrase
21 this question -- sorry.

22 MR. LUCHENITSER: Okay, let me try to
23 make the question less confusing.

24 BY MR. LUCHENITSER:

25 Q. There are two possible ways that someone

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1 can understand what intelligent design theory is.
2 The first way would be that it is just a field of
3 study that attempts to determine whether an
4 intelligent actor was responsible for the creation
5 of a living organism or development, or, two, that
6 it is in fact a scientific theory that actually in
7 fact claims that an intelligent actor was in fact
8 responsible for the design of living systems or
9 beings, which one is it?

10 MR. WHITE: Same objection.

11 BY MR. LUCHENITSER:

12 Q. Was that clear?

13 A. Not really. Are you asking me, is it a
14 theory or is it a law in the minds of the people
15 that are carrying out --

16 Q. I am just trying to ask you, is it
17 anything more than a field of study that hasn't
18 reached any conclusions as to whether an intelligent
19 actor is responsible for living systems or is it an
20 actual scientific theory that in fact claims that an
21 intelligent actor is responsible for the design of
22 living systems?

23 A. I'm still a little bit confused on the
24 distinction that you are trying to draw. I think it
25 is taking --

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1 MR. WHITE: Let me object if you are
2 confused. Can you break it into two questions?
3 Because it seems like you have a couple of questions
4 mixed in there.

5 BY MR. LUCHENITSER:

6 Q. Let me try to summarize it. Is it a
7 theory of detecting design in living systems or is
8 it a theory of what actually has happened as far as
9 whether systems were designed or not?

10 MR. WHITE: Object, compound.

11 BY MR. LUCHENITSER:

12 Q. I think you are probably getting it.

13 A. I think it encompasses both. I mean,
14 it's a theory involved in detecting design, what are
15 the hallmarks of design, there is a component of
16 complexity and specification, pattern formation that
17 outside of this data we can recognize things in our
18 own experience that have design, and if we find them
19 in nature, we infer that they are designed as well,
20 okay?

21 Does it claim there is a designer, is
22 that what you are asking?

23 Q. Yes.

24 A. It assumes that at this point. I mean,
25 that's an area that I think is difficult to

00029

1 pinpoint. Can I go to nature and say, you know,
2 this was directly designed and this has been
3 modified by natural laws of mutation and natural
4 selection? No, I don't know at what point design is
5 incorporated into the systems that we are looking
6 at.

7 It is a new theory. I want to put it in
8 that context. It is not meant to supplant our
9 current ideas of evolution, I think it is going to
10 compliment it. And this is often the case in the
11 history of science where you have two competing
12 ideas and over time you find that there are truths
13 or components in both, okay?

14 My opinion from my experience is that
15 natural selection, natural laws of chemistry and
16 physics, time, are insufficient to explain both the
17 complexity and the specification that we see in
18 biological systems.

19 Q. Okay, on page one of your report you
20 said, "Intelligent design theory is a scientific
21 theory and it holds that the deep complexity and
22 clearly evident design in organisms is the result of
23 an intelligent agent."

24 MR. WHITE: Where are you?

25 MR. LUCHENITSER: That's the first

00030

1 sentence on page one after the big bold-headed one.

2 THE WITNESS: Right. Right.

3 BY MR. LUCHENITSER:

4 Q. And is that your understanding of what
5 intelligent design theory is?

6 A. That's my statement in terms of my --

7 Q. So that's your personal opinion?

8 A. Yes.

9 MR. WHITE: Objection, when you say
10 personal opinion, you are talking about as a
11 scientist, as an expert?

12 BY MR. LUCHENITSER:

13 Q. Your personal scientific opinion?

14 A. Right.

15 Q. Is that definition of intelligent design
16 generally understood to be the correct definition
17 among scientists that are studying and advocating
18 for intelligent design?

19 A. In a broad sense, yes.

20 Q. And can you tell me why you said in a
21 broad sense? Is there some sense in it which it is
22 not agreed upon?

23 A. In terms of just asking, all right, in a
24 thumbnail sketch, what intelligent design is, the
25 theory is it is saying essentially this, that the

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1 deep complexity, that apparent design is real
2 design, is a product of an intelligent agent.

3 Q. Are there persons in the field of
4 intelligent design who have not reached the
5 conclusion that an intelligent designer is
6 responsible for the deep complexity and clearly
7 into, if you will, the deep complexity in organisms
8 and are not sure about that matter?

9 MR. WHITE: Objection, confusing
10 question. Did you understand the question?

11 THE WITNESS: Not -- I mean, what is the
12 alternative? I mean, if something is designed and
13 you hold that it is real design, then I think by
14 definition there is an intelligence behind it.

15 BY MR. LUCHENITSER:

16 Q. Let me try to re-ask the question. You
17 have concluded that there is a designer; is that
18 correct?

19 A. Correct.

20 Q. Are there persons in the field of
21 intelligent design who have not reached the
22 conclusion as to whether or not there is a designer
23 but are uncertain about that?

24 A. There are people that are to a degree, I
25 think, agnostic in terms of that. I mean, David

00032

1 Balinski has stated that he favors intelligent
2 design because -- I don't want to put words in his
3 mouth, but my understanding of his position, and I
4 could be clarified, he agrees that there is real
5 design but he is agnostic in terms of where that
6 design is coming from, okay? In other words, it's a
7 viable compliment to our current consensus position,
8 it appears to be something more than just natural
9 law at work.

10 Q. So is the conclusion that there is a
11 designer, is that an integral component of
12 intelligent design theory?

13 A. No, not necessarily, not necessarily.
14 You know, designer has a broad interpretation as
15 well.

16 Q. So is it the case that somebody can be a
17 scientist in the field of intelligent design but can
18 conclude there is no designer or that it is unclear
19 whether there is a designer?

20 A. Are you asking are there scientists that
21 believe there is no designer?

22 Q. Scientists that are in the field of
23 intelligent design theory.

24 A. No.

25 Q. Are there any alternative definitions of

00033

1 intelligent design that are different from the
2 definition you gave in your report?

3 A. I think my written statement is
4 consistent with my colleagues in terms of -- you
5 know, I think there are philosophers of science in
6 the intelligence design arena that are more
7 articulate in terms of the philosophical
8 implications of this.

9 Q. How would you define creationism?

10 A. Creationism, which I think is very
11 different than intelligent design, uses biblical
12 reference by which you judge science. In the
13 traditional sense, scientific creationism held to a
14 literal interpretation of Genesis and thought that
15 that was an embodiment of truth and that science
16 should be filtered through that viewpoint.

17 I disagree with that stand. In fact, I
18 was never an active participant in scientific
19 creationism as it went through the Louisiana and
20 Arkansas debates, I thought it was out of balance.

21 Q. Is there a difference between creation
22 science and creationism?

23 A. Well, in terms of definitions, yes, I
24 think it is subtle. Creationism, again I think in
25 the traditional sense as it is used in the public

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1 arena, implies a literal interpretation of Genesis.
2 Scientific creationism then tries to look at the
3 body of scientific understanding and fit it
4 consistently with that viewpoint of biblical
5 interpretation.

6 Q. Is teaching of creationism or creation
7 science -- is the teaching of that, that forms of
8 life began abruptly -- begin abruptly in their basic
9 types, for example, fish with fins and scales, birds
10 with feathers and beaks and wings?

11 A. That's -- repeat the question because I
12 want to make sure I understand it.

13 Q. Does creationism or creation science
14 teach that forms of life began abruptly in their
15 basic types? For example, fish began with fins and
16 scales and birds began with feathers, beaks and
17 wings?

18 A. That is my understanding, yes.

19 Q. What is the difference between
20 intelligent design theory and creation science?

21 A. Intelligent design theory isn't dependent
22 upon any formal religious writing or revelation in
23 which you are trying to match the natural world to
24 show consistency. It is simply looking at the
25 science and asking the question: Is the design that

00035

1 we all agree is there real or apparent? Okay? It
2 is a valid question and I think we should be
3 addressing it at a scientific level in our
4 inquiries.

5 It is that simple, okay? It doesn't have
6 any basis of going further than looking or devising
7 theories or hypotheses to look at how you detect
8 design. Our record of life on this planet, does it
9 fit with an intelligent agent or, again, is natural
10 law, in terms of physics and chemistry, of what we
11 know of genetics, sufficient to produce the
12 diversity that we see in life?

13 And you end right there, yes or no. It
14 is an interesting question, it is a valid question,
15 and it should be addressed. I mean, and that's why
16 we are here, you know? That's what Ken Miller is
17 writing about. Robert Pennock, he is asking the
18 question, can natural law come up with de novo
19 information?

20 Q. Does intelligent design theory reach any
21 conclusions that are different from the conclusions
22 reached by creation science?

23 MR. WHITE: Objection as to vagueness,
24 ambiguity.

25 BY MR. LUCHENITSER:

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1 Q. You can go ahead and answer.

2 MR. WHITE: If you understand the
3 question.

4 THE WITNESS: Repeat it one more time, or
5 let me ask a question to make sure I understand it.

6 Does creation science and intelligent
7 design both come to the same conclusion, is that
8 what you are asking?

9 BY MR. LUCHENITSER:

10 Q. Let just ask the question, does
11 intelligent design theory reach any conclusions that
12 are different from the conclusions reached by
13 creation science?

14 A. Oh, for sure.

15 Q. What are the differences? What different
16 conclusions does -- what conclusions does
17 intelligent design theory reach that are --

18 A. Well, creation science, I think, is
19 really an area of apologetics, religious
20 apologetics. They want the science to validate the
21 scriptural content of Genesis, okay? And
22 intelligent design isn't going to go that far. You
23 can say that -- looking at the data, what we know in
24 terms of chemistry and physics, genetics and natural
25 selection, that there is a real design, and you stop

00037

1 there.

2 Q. Can you tell me what theistic evolution
3 is?

4 A. Theistic evolution is the position, as I
5 understand it, that there is a designer or creator
6 that designed the universe, started the clock going,
7 designed the laws of physics and chemistry, and that
8 life, through those laws, emerged and has evolved.
9 But it is more of an impersonal activity. In other
10 words, the machine was started and is removed from
11 that machine, so that organisms do evolve in terms
12 of our common consensus.

13 Q. Can someone who believes in theistic
14 evolution also believe that God in some way guides
15 the progress of evolution?

16 A. Sure, I mean I think you have the entire
17 spectrum of people that believe in a designer or
18 creator in terms of his participation in the world
19 as we know it.

20 Q. What is the difference between theistic
21 evolution and intelligent design theory?

22 A. Theistic evolutionists, I think, agree
23 that given, for instance, the planet earth in its
24 early stages of development had incorporated in it
25 all the necessary components for the emergence of

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1 life and its subsequent diversity, that there is no
2 input from the designer from that point, okay?

3 So it is really consistent with the
4 Darwinian viewpoint that you just started it by an
5 intelligent agent or God and then everything
6 unfolds.

7 Intelligent design sees a more active
8 part of a designer from the sense that from my own
9 perspective I look at the bacterial flagellum, it
10 has stators and rotors and propellers and u-joints,
11 it is battery powered, it looks like engines that
12 Mazda makes, in one sense, but it is much more
13 sophisticated because there is an algorithm or
14 program that directs its assembly from genetic
15 information and it regulates the timing of synthesis
16 and the position where it is assembled, that that is
17 a product of intelligence.

18 And from my position you don't get these
19 machines by totally natural process. I mean, they
20 can change and evolve, I don't know at what level or
21 to what extent, but the prototypic or aboriginal
22 machine has all the hallmarks of design based on our
23 experience of machines that we manufacture.

24 Q. Other than the ultimate claim that a
25 designer or designers were responsible for the

00039

1 development of life forms on the planet earth, does
2 intelligent design make any other scientific claims?

3 MR. WHITE: Objection, it is misleading.

4 THE WITNESS: I'm not quite sure what you
5 mean in terms of other scientific claims. Give me
6 an example. You know, is it going to tell me that
7 butter is better for me than margarine? I mean --
8 BY MR. LUCHENITSER:

9 Q. I guess let me try to see if I can
10 rephrase it.

11 What is the scientific content of an
12 intelligent designer, other than the ultimate
13 assertion that there is a designer or designers?

14 A. That's the main principle, okay?

15 Q. Is there anything else?

16 A. I would have to think about it in terms
17 of the question. So if we proceed, I will come back
18 to that.

19 Q. Do you have an opinion, a personal
20 opinion, as to who or what the intelligent designer
21 is?

22 MR. WHITE: Objection as to are you
23 asking for his personal opinion or his opinion as a
24 scientist?

25 BY MR. LUCHENITSER:

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1 Q. Do you have a scientific opinion as to
2 who the intelligent designer is?

3 A. No.

4 Q. Do you have a personal opinion?

5 A. Yes, I do.

6 Q. You do. What is your personal opinion?

7 MR. WHITE: Objection as to relevancy.
8 Go ahead.

9 THE WITNESS: I want to make sure that
10 this is -- I mean, I have a problem in terms of
11 giving my opinion, but my experience, when asked
12 these questions, is that they are somewhat loaded.
13 In other words, in my discussion with Robert Pennock
14 when he was here and we were discussing type III
15 secretory systems and the flagellum, claims of
16 intelligent design, he then turned on me in this
17 public audience and said, "Who is the creator?"

18 And I said, "Well, I have an opinion, but
19 we are talking science, why do you want to bring
20 religion into the question?"

21 No, "Who is the creator? Tell us who the
22 creator is?"

23 And in part I think there is an attempt
24 to marginalize people in this area as
25 fundamentalists, you know, Christians that want to

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1 get the bible back into the classroom, and that's
2 invalid. But I am a Christian, that's my personal
3 faith.

4 And I also would like to state for the
5 record that that is not my family's faith tradition.
6 I was an agnostic, probably an atheist, and when I
7 took a course in biology and was confronted with the
8 design in the bacteriophage Landa, it made me pause
9 and think, is this the product of chance and
10 necessity?

11 Okay, so I am a Christian because of the
12 data, not despite it.

13 Q. So this experience led you to become a
14 Christian?

15 MR. WHITE: Objection as of "this
16 experience."

17 BY MR. LUCHENITSER:

18 Q. The experience when you were studying
19 this life form?

20 A. No, I think it was a factor, you know, in
21 my own personal journey, but I had no reason to --
22 at the point until I started taking biology classes
23 -- in fact, I was an English history major that took
24 a general chemistry course that had a molecular
25 biology component and was so fascinated by the

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1 information that I changed my major, because I was
2 interested in the science, the beauty of the
3 science, and the more I studied, it had
4 implications.

5 Q. This is when you were an undergraduate,
6 did you say?

7 A. Right.

8 Q. So is it correct that your personal
9 opinion is that the intelligent designer is the God
10 of Christianity?

11 A. Yes.

12 Q. Is there a consensus within intelligent
13 design theory as to who the designer is or what it
14 is?

15 A. No.

16 Q. Does intelligent design theory make any
17 claims as to who or what the designer is?

18 A. No, in a formal sense it doesn't. It
19 says you can infer design and therefore designer,
20 but that's as far as the science goes.

21 Q. Does intelligent design theory rule out
22 any type of possible designers?

23 Q. Not necessarily.

24 Q. Does intelligent design theory rule out
25 all possible and natural actors as designers?

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1 A. Natural what? I didn't hear your --

2 Q. Natural actors.

3 A. Natural actors?

4 Q. Yes.

5 MR. WHITE: Objection, vague, ambiguous.

6 What do you mean by natural actors?

7 BY MR. LUCHENITSER:

8 Q. Under intelligent design theory, is it
9 possible that space aliens could be the designers?

10 MR. WHITE: I didn't hear what you said,
11 under what?

12 BY MR. LUCHENITSER:

13 Q. Under intelligent design theory, is it
14 possible that space aliens could be the designers?

15 A. Sure.

16 Q. Is it possible that time traveling humans
17 could be designers?

18 A. I don't know. I mean, that's
19 speculation. I don't know. I mean, that's asking
20 me to speculate on time travel, which is a
21 hypothetical situation, and so I don't think it is
22 really pertinent to my contribution or expertise.

23 Q. Has any work been done within intelligent
24 design theory relating to the issue of who the
25 designer is?

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1 A. Not to my knowledge.

2 Q. Does intelligent design theory hold that
3 there is only one designer or is it -- can it be
4 consistent with intelligent design theory that there
5 might be multiple designers?

6 A. No, I mean -- again, you can just infer
7 design from the public evidence and, you know -- I
8 mean, we have multiple engineers that work in
9 consortia to produce machines today, who is to say
10 it is not true in the biological world? I don't
11 know.

12 Q. And under intelligent design theory, is
13 it possible that the designers are -- that there
14 might be multiple competing designers?

15 A. I don't know. I don't know what you mean
16 by in terms of competing designers.

17 Q. As opposed to designers who are working
18 together with each other, designers who are trying
19 to come up with life forms that end up competing or
20 opposing each other?

21 MR. WHITE: Objection, calls for
22 speculation.

23 BY MR. LUCHENITSER:

24 Q. Is that possible under your theory?

25 A. Yes, I mean, that's speculative, and I

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1 think it would be too early to say, but I wouldn't
2 rule it out. I mean, again -- never mind, I will
3 leave it at that.

4 Q. Is intelligent design theory in any way
5 intended to eventually determine which of these
6 possibilities is the designer?

7 A. No, not formally. I think it will have
8 implications, but it is not -- no, no, I think --
9 you know, the book is open in terms of the
10 implications of who the designer is. That
11 translates into philosophy and religion and, you
12 know, there is plenty of writing and experts on
13 that.

14 Q. So do I understand you correctly that the
15 theory is not even going to try to determine who or
16 what the designers are or is?

17 A. I think there are people within the
18 design community that have opinions with respect to
19 that, but, you know, from my own perspective I don't
20 have an agenda.

21 Q. Are there any kind of experiments or
22 empirical studies that could be done in order to
23 attempt or help determine who or what the designer
24 or designers is or are?

25 MR. WHITE: Are you speaking currently?

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1 I didn't get the question, I guess.

2 THE WITNESS: Are there people that are
3 actively participating in the intelligent design
4 movement to identify who the designer is?

5 BY MR. LUCHENITSER:

6 Q. Well, actually I will ask another
7 question.

8 A. No, again, at this stage saying is a
9 design apparent or is it real?

10 Q. Are there any experiments or empirical
11 studies that can be done to try to shed some light
12 on what the nature of the designer is?

13 A. No, not to my knowledge.

14 Q. Do you have a scientific opinion as to
15 how often the designer intervenes in the development
16 of living systems or beings?

17 A. No, at this point it is too speculative.
18 I mean, it evolves around the question in terms of
19 what is the genetic capacity of any organism to
20 change? I don't know the answer to that question,
21 nor do any of my colleagues that are Darwinists or
22 evolutionists, that's an open-ended question.

23 Q. Do you have a personal opinion on that
24 question?

25 A. I think it is limited. From the

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1 experiments that have been done by Lenski at
2 Michigan State, you are running E. coli through --
3 or Saccharomyces cerevisiae through 20,000, 30,000
4 generations in a hemostat, and you end up with the
5 same organism. And there are minor variation,
6 depending upon what selection -- what selective
7 pressure you apply, but the change is surprisingly
8 little.

9 MR. WHITE: Alex, when you ask the
10 question, you are asking for which type of opinion,
11 personal or scientific?

12 MR. LUCHENITSER: That was a personal
13 opinion.

14 MR. WHITE: Just off the record.
15 (Off the record.)

16 MR. LUCHENITSER: Back on the record.
17 BY MR. LUCHENITSER:

18 Q. So let's go back to the question of how
19 often the intelligent designer intervenes. Is it
20 your belief that it is fairly often? Would you say
21 more than once every few million years?

22 A. That's speculation, I have no idea at
23 this point.

24 Q. Do you have a belief as to whether the
25 intelligent designer only intervened in the early

00048

1 history of life on the earth or whether the
2 intelligent designer kept intervening periodically
3 afterwards?

4 MR. WHITE: Objection, asked and
5 answered. Go ahead. It's the same question.

6 THE WITNESS: Again, I am not committed
7 at this point.

8 BY MR. LUCHENITSER:

9 Q. Do you have a personal belief on the
10 matter?

11 MR. WHITE: Objection as to relevance.

12 THE WITNESS: I mean, my own personal
13 belief, I have some speculations but I hold them as
14 speculations. Going back to the record, I am not a
15 paleontologist, although I have read some Stephen
16 Jay Gould. When you look at the fossil record, the
17 lesson of the fossil record is stasis, not
18 modification. So that a turtle nowadays looks like
19 a turtle 30 million years ago.

20 So we have got the Cambrian explosion
21 where we can look at the fossil record from the
22 evidence that we have now, and this may change, I
23 don't know, that there are very -- I mean, there are
24 organisms that are present below the Cambrian strata
25 and then suddenly you have this biological big bang,

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1 body forms in a fairly -- patterns that are
2 consistent with organisms we find today that appear
3 to have a sudden appearance.

4 Again, I'm not willing to speculate in
5 terms of where the designer interjected his design.
6 I know that there are aspects of Darwinism that are
7 going to hold true.

8 I mean, again the history of science is
9 where you have two competing ideas, theories, or you
10 are looking at new data and trying to incorporate it
11 into our existing interpretations, there will be
12 individuals that are on the extreme sides of each.
13 But in general, you you will find that there will be
14 a melding or a blending of these ideas as we get a
15 better handle and more data.

16 Q. So do I correctly understand that you
17 have no scientific opinion as to how often the
18 intelligent designer creates?

19 A. No.

20 Q. Would I also be correct in assuming that
21 your personal opinion with respect to the Cambrian
22 explosion, for example, would be that the
23 intelligent designer was responsible for the
24 Cambrian explosion?

25 A. It is consistent with the design

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1 hypothesis. It is a problem for the Darwinists and
2 they recognize it, and that is in the published
3 literature, that there are evolutionary biologists
4 that look at Cambrian explosion as a problem, from
5 Simon Conway Morris in the U.K. to people in this
6 country.

7 There are problems in our current
8 understanding of biological systems and how you can
9 get spontaneous generation or the arrival of the
10 first ancestral organisms from a Darwinian
11 perspective.

12 Q. Are you aware of any scientific
13 literature in the field of evolution that holds that
14 what we call the Cambrian explosion was not as
15 sudden an event as scientists might have thought 23
16 years ago, but was more of a gradual event?

17 A. We know from the geologic history the
18 time period that is involved. I'm not an expert on
19 that, but it is -- from geological time it is pretty
20 short. And yet again, it has got to be viewed from
21 a perspective. If it is 40 million years
22 geologically, yes, that's a breath. But at the same
23 time, you know, we have a hard time imagining that
24 from our own experience.

25 Q. Does intelligent design theory have any

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1 -- does intelligent design theory draw any
2 conclusions as to how often the intelligent designer
3 intervenes?

4 A. No. No. I want to go back and qualify
5 one statement before.

6 Until recently, you know, the consensus
7 opinion in Darwinian theory was -- I mean, if you
8 distill evolution down to a one-liner here, it is
9 decent with modification, and there is the
10 assumption that there is decent from common
11 ancestors.

12 One of the papers that I submitted in my
13 expert report is from Carl Woese, who is a prominent
14 evolutionist at the University of Illinois. Anybody
15 in this area knows who Carl Woese is. I mean, he
16 led a whole generation of biologists sequencing
17 ribosomal RNA for, you know, systematic purposes.

18 But he states that, you know, a lot of
19 our ideas in evolution, including common decent from
20 a primordial organism, were conjectures of 19th
21 century biologists, but they were embedded in stone
22 and became part of the theory.

23 Now our experience and his experience is
24 that that's not necessarily so. There could have
25 been multiple origins of organisms and we shouldn't

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1 limit ourself to a single common ancestor, a single
2 root to the tree of life, but it looks like it is
3 now spread out.

4 Now, that is consistent as well with the
5 intelligent design interpretation, but again, where
6 the designer is acting in this processes is too
7 premature.

8 Q. Are you aware of any proposed experiments
9 or empirical analysis or studies that would be
10 designed to determine how often the designer
11 intervenes?

12 MR. WHITE: Objection, over broad.

13 THE WITNESS: Yes, I mean, that's a broad
14 question. And not formally, no.

15 I think again it goes back to the
16 question of what is the limits of genetic change of
17 any organism which is an unknown quantity, can
18 Saccharomyces evolve into a basidiomyces from a
19 sasccharomyces, or something like this. Can a
20 prokaryote evolve into a eukaryote, were those
21 separate evolutionary events, you know?

22 But to directly ask the question: Where
23 has the designer directly intervened? No. But if
24 we know the question in terms of limits -- and part
25 of this will come out empirically through genomic

00053

1 analyses, so that's why I say it is premature. We
2 have 500 bacterial genomes now, a number of
3 eukaryotic organisms, but this is in the last --
4 since 1994, whatever.

5 It has been surprising in terms of the
6 implications of comparing genomes from different
7 groups of organisms that we thought were disparately
8 related and now we are finding that there is
9 commonality, and that those bacterial systems are in
10 the order of 20 to 30 percent unique DNA in
11 different groups.

12 So these are questions that will bear on
13 what you are asking, but not directly, it is going
14 to be indirect.

15 Q. You said that the limits are unknown, and
16 I understand you were referring to the limits to the
17 extent which one living system or life form can
18 evolve into another one?

19 A. Right.

20 Q. If the limits are unknown, how can
21 intelligent design theory come to the conclusion
22 that there an intelligent designer?

23 A. Well, how can on the other side you make
24 assertions that there is no limit and that you can,
25 as with Escherichia coli, evolve into an organism of

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1 trillions of cells that can contemplate their
2 existence in the universe, you know, supposedly
3 without purpose?

4 So I think it goes both ways. It's a
5 question, it's a broad question that impacts both
6 sides of this debate.

7 Q. But let me try to re-ask my question. If
8 the limits are unknown, how can intelligent design
9 theory come to the conclusion that there is an
10 intelligent designer? Don't you have to figure out
11 what the limits are first before you can even come
12 to that conclusion?

13 A. Well, that hasn't kept evolutionists from
14 saying -- looking at public data and arguing that we
15 are the product of natural law, chemistry, and
16 physics, you know, without knowing. So they are
17 extrapolating from the data saying that because we
18 have simple organisms and complex organisms and we
19 are going to accept a natural explanation in terms
20 of the explanation of this diversity, one has
21 evolved into the other through a series of gradual
22 steps. I mean, that's going beyond the data, in my
23 mind, in terms of the limits of understanding of the
24 plasticity of the genome.

25 Q. I'll let Ken Miller respond to that, I'm

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1 not going to try to -- I don't want to get into an
2 argument with you.

3 But let me try to see if you can
4 affirmatively answer the question. If the limits
5 are unknown, how can intelligent design theory come
6 to the conclusion that there is a designer?

7 A. Again, you go back to the question of
8 looking at nature and seeing aspects of design that
9 all biologists recognize is there. Okay? And by
10 our experience is that design real or apparent?

11 There are going to be limitations from
12 our present knowledge in terms of what contribution
13 evolution has made in that diversity and
14 modification of design, how much creativity is
15 present in natural selection to modify organisms,
16 and how much of it is fixed in the initial design of
17 the organism, okay?

18 But I think from -- again, the fact that
19 we are dealing with molecular machines that have all
20 the hallmarks of manmade intelligently designed
21 machines, we can infer there is a designer that has
22 been active in our natural world. That's the limit,
23 you know, in terms of where I am going to go. Where
24 he injected his design, how many times he has
25 participated in this, is conjecture.

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1 Q. Are any experiments possible with respect
2 to the question of how often the designer
3 intervened?

4 A. I think so. Ultimately, these are
5 questions that are being pondered in terms of how to
6 address them. What is the, you know, what we call
7 the sequence space in protein evolution? We look at
8 the genetic code, we look at proteins as a true
9 code. There are symbols involved in conferring
10 information.

11 Are there limits to how that code can be
12 used? Just like if you use the alphabet, we can
13 randomly mix it together and get nonsense, you can
14 also get words that convey information as well.

15 In the proteins, it may be the same
16 thing. Proteins -- there may be sequences that are
17 a subset of the possible combinations that will have
18 activity in organisms. And as we get a handle on
19 that, and there are people in the intelligent design
20 working on this, Doug Axe, would be an example, that
21 are looking at constraints of protein sequence in
22 terms of function and randomness versus actual
23 sequence function, okay?

24 Again, these are questions that are
25 incubating at this point in terms of how they are

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1 going to be addressed empirically.

2 Q. Does intelligent design theory have an
3 opinion on how living things come into being?

4 A. What do you mean by coming into being,
5 that they are created de novo or are modified from
6 existing designs?

7 Q. Yes.

8 A. It's speculation at this point. I mean,
9 people have opinions, but those are speculative.

10 Q. Is there consensus within the intelligent
11 design field on that issue?

12 A. No.

13 Q. Do you have a personal opinion on that?
14 First, let me ask, do you have a scientific opinion
15 on that?

16 A. Rephrase the question so I am --

17 Q. Do you have a scientific opinion on the
18 question of how living things come into being under
19 intelligent design theory?

20 A. I have a scientific opinion that at this
21 point is speculative, based on knowledge that from
22 my experience and knowledge of the literature,
23 organisms do have the capacity to change over time,
24 no one is arguing that. But my position is that
25 change is limited.

00058

1 Q. So is it your opinion that when a new
2 kind of organism first appears, the organism, on the
3 one hand, is it developed from a previously existing
4 organism or is it developed out of inanimate matter?

5 MR. WHITE: Objection, compound question.

6 THE WITNESS: I mean, ultimately whatever
7 side you agree on, there has got to be either an
8 intelligent molding of the elements of this earth
9 into a living organism or it occurs spontaneously.
10 Okay? So there is a spontaneous appearance of
11 organisms. How that comes about, again that is
12 speculative.

13 If you look at the fossil record, from my
14 understanding, and I'm not an expert paleontologist,
15 but from what I have read by experts in the area,
16 there is a lack of intermediates. There is sudden
17 appearance of organisms in the fossil record.

18 Does that mean they appeared de novo?
19 Not necessarily. I can say, well, maybe there was
20 some catastrophic environmental insult where the
21 major forms of life were destroyed or went extinct
22 and these other organisms that suddenly appear were
23 a very specific niche or in low concentration and we
24 don't have the record. I mean that's possible, I
25 don't know. Do you see what I am saying?

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1 In other words, as a microbiologist,
2 maybe you can appreciate this, if I take a tube of
3 *Escherichia coli* bacterium that is sensitive to an
4 antibiotic, I can, from experience, know that within
5 those billions of cells there are three or four that
6 are resistant to Streptomycin.

7 Can I find them by just sorting through
8 them? I don't have enough time in my life. If I
9 put a selective pressure on them, I can uncover
10 them. They were there in a minuscule quantity that
11 is below my power of detection, but they were there
12 nonetheless. And if I apply the right selection,
13 the right catastrophe, they are there the next
14 morning for me.

15 BY MR. LUCHENITSER:

16 Q. Can you give me some examples of a
17 species that appear to have appeared suddenly in the
18 fossil record?

19 A. Again, I think if you go back to the
20 Cambrian explosion, you have all the present body
21 plans, from my understanding, developmental patterns
22 that are suddenly present.

23 Q. Do you have an opinion as to the -- and
24 I'm asking about your personal opinion, the various
25 species that appeared at the beginning of the

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1 Cambrian explosion, were they developed by the
2 modification of other species or were they developed
3 out of inanimate matter or did they just suddenly
4 appear?

5 A. That's speculation.

6 MR. WHITE: Also objection, his personal
7 opinion has no relevancy here. You are asking him
8 -- he is here as an expert.

9 THE WITNESS: Yes, like I said, I am not
10 a paleontologist. But again, in my reading of the
11 literature, this is a question, it's a problem in
12 terms of sudden appearance of organisms in the
13 geologic record, the lack of transitional forms.

14 The record of biology on this planet is
15 one of extinction, that's the most common event in
16 terms of looking at the overall record, okay?

17 BY MR. LUCHENITSER:

18 Q. Do some adherents to intelligent design
19 theory believe that organisms appeared either out of
20 inanimate matter or out of just nothing?

21 MR. WHITE: Objection, calls for
22 speculation, no showing he has personal knowledge.

23 THE WITNESS: Yeah, I mean I haven't
24 talked to people specifically about that. I mean,
25 de novo appearance, out of nothing, you know, other

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1 than inorganic matter? Again, that's the problem on
2 both sides in terms of mechanism. But we know that
3 we are composed of the elements we find in the
4 earth, and that's consistent with evolutionary
5 perspective, if you believe in spontaneous
6 generation, or design, if you believe in a designer
7 or creator.

8 BY MR. LUCHENITSER:

9 Q. If children in the Dover School District
10 were taught that life forms appeared out of nothing,
11 do you think that that would be an incorrect
12 teaching?

13 MR. WHITE: Are you asking a
14 hypothetical?

15 BY MR. LUCHENITSER:

16 Q. Yes, hypothetical.

17 A. Hypothetical? From public evidence, no,
18 because ultimately that's the question in terms of
19 how life arose on this planet, and there are various
20 opinions.

21 Let me put it this way. I think one of
22 the major contributions to biology that made it
23 transcend the really descriptive discipline of
24 natural history into manipulative science,
25 experimental science, was Pasteur's disapproval of the

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1 theory of spontaneous generation. It had profound
2 implications in terms of how we conduct science in
3 the biology arena, okay?

4 Any biologist that you ask on one level,
5 you know, do you believe in spontaneous generation?
6 If I take inorganic material, all the components and
7 life systems: nitrogen, carbon, oxygen, hydrogen, et
8 cetera, and mix them together, am I going to get
9 organisms appearing spontaneously? They will say
10 no.

11 Yet at the same time, to be a consistent
12 Darwinist where you believe that the natural laws of
13 chemistry and physics, chance and necessity, can
14 produce life, you believe in spontaneous generation.

15 Q. Let me --

16 A. So going back to Dover, Pennsylvania, if
17 you make the statement, you know, can life arise
18 spontaneously? Yes, we know it happened, in terms
19 of there was a period in geological history of this
20 earth where there was no life and there was a period
21 where it appears. Now, how that happened? If you
22 are a materialist, then you are going to explain it
23 in terms of natural law, you know? But if there is
24 a design involved, then -- a designer involved, then
25 it is an intervention of those natural laws that

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1 allowed this to happen.

2 Q. Let me try to make what I am asking
3 clear. Let's forget about how microscopic life
4 forms originally arose and focus only on complex
5 animal species.

6 Is it a tenant of intelligent design that
7 it is possible that complex animal species might
8 have appeared abruptly as opposed to developing from
9 other animal species? For example, is it consistent
10 with intelligent design that it is possible that
11 dinosaurs might have just appeared abruptly instead
12 of developing from smaller reptiles, or whatever
13 evolution holds their predecessors would be?

14 MR. WHITE: You are asking him as an
15 intelligent design theory?

16 THE WITNESS: All I would say, what is
17 appropriate is that if we look at life on this
18 planet, if we look at the geological record, there
19 is the sudden appearance of different diverse life
20 forms. That's the record. How that happened, the
21 mechanism, was there an intelligent agent?
22 Hypothetically, yes. Can these things evolve one to
23 the other? Hypothetically, yes. And I would leave
24 it at that.

25 This an active area of research, it is

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1 legitimate to be asking these questions, it is
2 legitimate to present them to students, but not to
3 go beyond our current body of knowledge. And when
4 you get into speculation, recognize it as
5 speculative.

6 Q. So intelligent design doesn't make any
7 claims or assertions as to whether on the one hand,
8 A, the designer modified the code of existing living
9 species to produce new living species, or, two, on
10 the other hand, the designer just created new living
11 species out of either inanimate matter or --

12 A. I think at this stage both positions are
13 legitimate.

14 Q. Do you have a personal preference as to
15 which one is correct, a personal intuition or --

16 MR. WHITE: Objection as to relevancy as
17 to his personal views.

18 THE WITNESS: I have a personal opinion.
19 It is not -- I mean, it is evolving in and of
20 itself.

21 BY MR. LUCHENITSER:

22 Q. Can you tell me what that is?

23 A. It's going to be a combination of both.

24 MR. WHITE: Hold on, I just want to
25 understand. What are you asking him as an opinion,

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1 as a scientist or just as a guy on the street?

2 MR. LUCHENITSER: Either as a scientist
3 or a personal opinion.

4 BY MR. LUCHENITSER:

5 Q. Your personal opinion informed by your
6 scientific knowledge.

7 A. Okay, so my personal opinion informed by
8 my scientific background, is it -- it is going to
9 fall out there is a combination of both. There will
10 probably be organisms that appear that were designed
11 as aboriginal forms that have diversified and
12 evolved over time, okay?

13 Q. Are there any experiments or empirical
14 studies that intelligent design theorists can do on
15 the issue of how organisms appear, you know, how new
16 organisms appear and develop?

17 A. Those are experiments that are ongoing in
18 terms of the general scientific community. I mean,
19 you can take microorganisms and grow them in
20 continuous culture for months and years in
21 generation times of 20 minutes, that from
22 generational perspective can be the equivalent of
23 hundreds of thousands of years and ask how much
24 change do we see?

25 So those are experiments that are

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1 pertinent to these questions in terms of change over
2 time.

3 Q. So would those experiments be designed to
4 observe action by an intelligent designer?

5 A. No, they are designed to look at the
6 limits of genetic change under varying environmental
7 conditions to model evolutionary theory or to
8 provide data that can be interpreted from a design
9 perspective.

10 Q. Are there any experiments or empirical
11 studies that are possible on the question of how an
12 intelligent designer acts when producing a new
13 species?

14 MR. WHITE: Objection, asked and
15 answered, and confusing.

16 THE WITNESS: Are you asking me are there
17 experiments that will define where design is
18 implicit in the appearance of --

19 BY MR. LUCHENITSER:

20 Q. No, the experiments -- are there any
21 experiments that are possible on the question of
22 whether the designer acts either, one, by modifying
23 the genetic code of an existing life form or, two,
24 by just creating a new life form from scratch out of
25 inanimate matter or design out of nothing?

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1 A. No, I mean --

2 MR. WHITE: Objection, compound question.

3 THE WITNESS: Okay, I mean, putting it in
4 this perspective, I mean, evolutionary science and
5 intelligent design is a historical science in terms
6 of -- I think I quoted in my expert report Ernst
7 Mayer, who is one of the most prominent of all
8 evolutionists, who just died recently, stated that
9 "Laws and experiments are inappropriate for the
10 explication of such events and processes. Instead
11 one constructs a historical narrative consisting of
12 a tentative reconstruction of the particular
13 scenario that lead to the tentative events one is
14 trying to explain."

15 So it is difficult when you ask me what
16 experiments are going to go back and tell us what
17 happened historically. You know, from both sides
18 that's very difficult, and it is somewhat unique in
19 terms of experimental science to the question of
20 evolution. It is an historic inference looking at
21 the record that we have.

22 Q. You say intelligent design theory is also
23 a historical science?

24 A. In terms of looking at the past record of
25 life on this planet and interpreting it as to a

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1 model in terms of how life appeared and has
2 diversified over time, yes.

3 Q. Is intelligent design theory capable of
4 demonstrating how an organism was designed?

5 A. Is intelligent design capable of
6 determining how an organism was designed?

7 Q. Right.

8 A. Not at this point. Neither is it true
9 for any biologist at this point in time.

10 Q. Does intelligent design theory have any
11 conclusions or opinions on which organisms were
12 designed or what kinds of organisms were designed?

13 A. No, no.

14 Q. Do you have an opinion on that basis in
15 your own scientific experience or knowledge?

16 A. No.

17 Q. Is there any way to I-D that intelligent
18 design theory can distinguish between organisms that
19 were designed and organisms that evolved?

20 A. Not empirically, but can you affirm.
21 This is where genomic analysis is going to come in.
22 At my level, the fact that different types of
23 organisms, groups of organisms, the alpha
24 proteobacteria from the beta proteobacteria which
25 are within organisms within each group show

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1 relationship, but there are differences between 20
2 to 30 percent novel DNA in all these major groups of
3 bacteria. The question arises, where does that
4 novelty come in.

5 Q. So does intelligent design theory contain
6 any conclusions or assertions other than that
7 neo-Darwinian theory doesn't adequately explain the
8 development of life on earth and that an intelligent
9 designer is responsible for the development of the
10 life on earth?

11 A. Yes, I mean that's the basic principle,
12 is that -- you know, my professional opinion,
13 natural selection, time, laws of chemistry and
14 physics are inadequate to explain life as we know
15 it. It has all the hallmarks of design.

16 You look at the genetic code, it is the
17 most sophisticated information storage system in the
18 universe as digital readout. If it is truly an
19 arbitrary code, then there is no reason why triplets
20 for each amino acid have that specific designation,
21 yet recent computer analysis shows that it is the
22 optimum code of all potential theoretical codes that
23 would be formed by random chance to negate the
24 effect of point mutations, which I find astounding.

25 Of the millions of combinations of

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1 triplets, you know, for the entire 20 amino acids
2 that it is coding for, we find, by empirical
3 analysis, that the genetic code is optimized to
4 minimize the effects of base changes in that code.

5 Now, that causes me to pause and wonder.
6 It causes my colleagues to pause and wonder how is
7 nature so lucky on random chance? You know, that
8 this frozen accident, Francis Crick refers to it as
9 the genetic code, is mind boggling. So --

10 Q. Uh-huh. Let me just go back, though.

11 Do you have a scientific opinion on
12 whether anything above complex molecular systems
13 were designed? By that I mean, do you have a
14 scientific opinion as to whether any complex animal
15 species were designed as opposed to just the
16 microscopic complex biological systems?

17 A. No, no. Again, it goes back to this
18 question of where is the designer intervening in
19 this process? And, you know, I don't know. I mean,
20 that's speculation.

21 Q. Is there any kind of consensus in the
22 intelligent design on that issue?

23 A. You have people from the entire spectrum
24 from theistic evolutionists all the way up to
25 six-day creationists. It is a pretty broad tent in

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1 terms of people that ascribe to intelligent design.

2 Q. How old do you think the universe is?

3 A. Well, the current, you know, consensus
4 was 20 billion years, although the COBE satellite
5 experiment measurements have reduced that to about
6 12.5 billion years in terms of the age of universe.
7 The earth, according to multiple scientific
8 independent analyses, is somewhere around 4.5
9 billion years old.

10 Q. Do you accept those concepts?

11 A. Yes.

12 Q. Does intelligent design theory accept
13 those beliefs about the age of the universe and the
14 age of the earth?

15 A. There is not a set consensus, okay?
16 Although I think it is a prominent position. But
17 there are both. I mean, from the camp you have your
18 old earthers and young earthers and both ascribing
19 to a designer.

20 Q. So are there some scientists within the
21 fields of intelligent design theory who believe that
22 earth is less than 10,000 years old?

23 MR. WHITE: Objection, speculation, lack
24 of relevancy.

25 THE WITNESS: Oh, I'm sure there are, you

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1 know?

2 BY MR. LUCHENITSER:

3 Q. Again, I'll give another hypothetical.
4 If students in the Dover School District were taught
5 that the earth's history can compress into a
6 framework of several thousand years, would they be
7 misled about scientific knowledge?

8 A. It's inconsistent with the present body
9 interpretation, okay?

10 Q. What is your belief on about how long ago
11 life first appeared on earth?

12 A. Well, from the fossil record you have
13 fossil bacteria that appear at 3.8 billion years,
14 somewhere around that time period.

15 Q. And what is your opinion on how long ago
16 the first multi-cellular animals on earth appeared?

17 A. I'm not a paleontologist, I don't know
18 what the time frame is, but it's a significant
19 period afterwards from the first appearance of
20 prokaryotes.

21 Q. Do you have any opinion or knowledge as
22 to how long ago the first land dwelling animals
23 appeared on earth?

24 A. Again, that's changed, from my
25 experience, over time, so I don't -- I don't fix a

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1 specific time period. Again, it's not my area of
2 expertise.

3 Q. Do you know what the consensus is in the
4 field of paleontology on that?

5 A. I have read it, but I don't recall a
6 specific number, but I don't have any problem with
7 it.

8 Q. Would 450 million years ago sound right?

9 A. Sure.

10 Q. You don't have any reason to disagree
11 with that consensus?

12 A. No.

13 MR. WHITE: I'll object to this line of
14 questioning. He said this is all outside of his
15 area of expertise.

16 BY MR. LUCHENITSER:

17 Q. Does intelligent design theory accept the
18 general consensus among paleontologists as to the
19 time line of the development of major kinds of life
20 on earth?

21 A. I think you have a spectrum of people
22 that are looking at that information. Some of them
23 are constrained by their religious beliefs and, you
24 know, there are scientific creationists within the
25 intelligent design camp that wouldn't say that so

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1 they are looking at a young earth viewpoint. And
2 there are other people that accept an old earth
3 scenario, the sequential appearance of organisms in
4 the geologic record.

5 Q. I think before we talked a little bit
6 about the concept of a common ancestry or common
7 decent, and let me try to define common ancestry or
8 decent as not necessarily that life descended from
9 one cell that appeared three or four billion years
10 ago, but that all life today developed from one or a
11 few microorganisms that existed several billion
12 years ago. So let's put aside the question whether
13 it was one or several or a bunch of different
14 ones.

15 Defined broadly in that sense, do
16 you accept the concept of common ancestry or common
17 decent?

18 A. I think it is highly speculative for
19 anybody to make an assertion along those lines based
20 on our knowledge, okay? This is looking at
21 historically -- let me put it this way. The
22 empirical science of nutrition can't figure out if
23 butter or margarine is better for us, yet at the
24 same time we make definitive statements that life
25 arose from primitive ancestral organisms on this
planet.

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1 It goes back to the question that I have
2 covered before, what is the capacity to change for
3 any organism? That's an unknown at this point. How
4 did these first organisms appear? You know, what is
5 the mechanism whereby natural law can produce a
6 replicating organism? I mean, that again is an
7 unknown quantity.

8 We know that the smallest free-living
9 organisms on this planet, the micro plasma, have on
10 the order of 300 to 350 genes, okay? So you've got
11 to have at least that amount of information before
12 you can replicate life that we know it at present.
13 That's a lot of information required.

14 Now, is just natural phenomena sufficient
15 to produce that? I'm unwilling to say. From my
16 professional experience, no. Whether you have 10
17 organisms, a hundred organisms, primordial organisms
18 appearing de novo, or one, I mean, you know, it is
19 an event that is on the range of the miraculous,
20 regardless of whether you still believe it is by
21 natural process or a designer, okay?

22 So am I making myself clear?

23 Q. I'm not sure. It sounds like you are
24 saying -- at least it's your personal opinion, based
25 on the scientific understanding that you have, is

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1 that you would not accept the proposition of common
2 ancestry or common decent as I have broadly defined
3 it?

4 A. Okay, look at -- I am trying to think. I
5 want to quote a couple of things from my report
6 directly so it's in the record. From Carl Woese,
7 who is a leading --

8 MR. WHITE: Just for me to clarify, are
9 you talking Exhibit 1? You are quoting from page
10 six; correct?

11 THE WITNESS: Yes, at the top of the
12 page.

13 So this is in the peer-reviewed
14 literature, this is a prominent evolutionary
15 biologist, and looking at what you are talking about
16 in terms of the origin of life.

17 He says, "The creation of the enormous
18 amount of and degree of novelty needed to bring
19 forth modern cells is by no means a matter of waving
20 the usual wand of variation and selection. What was
21 there, what proteins were there to vary in the
22 beginning? Did all proteins evolve from one
23 aboriginal protein to begin with? If you
24 extrapolate that all organisms evolved from one
25 single organism to begin with? Hardly likely!

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1 Evolution's rule, to which there are fortunately a
2 few exceptions, is that you can't get there from
3 here."

4 So the transitions required to go from
5 simple organism complex, we know from experience you
6 can't get there from here from our present
7 understanding of these organisms.

8 "Our experience with variation and
9 selection in the modern context does not begin to
10 prepare us for understanding what happened when
11 cellular evolution was in its early rough-and-tumble
12 phases of spewing novelty."

13 So you are asking me an opinion on
14 something that the leading evolutionists are at this
15 point speculating on and agreeing that our present
16 understanding of natural selection and variation in
17 modern context doesn't prepare us for understanding
18 what happened in the historic context, or historic
19 events billions and billions of years ago.

20 If I can find it --

21 So to rephrase where we are, I mean, the
22 question is dealing with common decent, okay?

23 Q. I'm trying to get past what happened
24 several billion years ago. I'm trying to kind of
25 say it in layman's terms of once the development of

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1 the life got going, once you got past the really
2 simple microorganisms and once you start getting
3 into more complex organisms, do you accept the
4 proposition that all the complex organisms descended
5 from one or a few more simple organisms that might
6 have existed three billion years ago, or whenever?
7 Or do you not even accept that?

8 A. My thinking on this is changing. As a
9 graduate student, a post doc, I didn't really have a
10 problem with that based on our knowledge. But now,
11 again with genomics and what we are understanding in
12 terms of our new understanding of the cell,
13 genetics, the capacity to change, I am finding it
14 harder.

15 There is one rule in design that
16 biologists also ascribe to. The more complex an
17 organism or the more complex the machine, the more
18 difficult it is to change it, okay? You just don't
19 throw DNA into a system and expect it to integrate
20 with the program that is present. There are real
21 problems with that.

22 So mechanistically from our present
23 knowledge I have difficulty in terms of assuming
24 that there is this gradual evolution of organisms
25 from the simple to the complex.

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1 Q. And does intelligent design theory have
2 an opinion as to whether these concepts of common
3 decent or gradualism are valid?

4 A. Again, there are people on the spectrum.
5 Mike Behe, in my conversations with him, has no
6 problem with common decent from very primitive
7 organisms to the complex. I am probably more
8 distant from that position. I think that there is
9 -- again, my opinion is that there is probably
10 injection of design at various stages, but I don't
11 know what those stages are.

12 Just to add to this, I mean, in my
13 readings of Stephen Jay Gould, who is a
14 paleontologist, Simon Conway Morris, is that the
15 record, the fossil record of change, you know, is
16 one of stasis, there is a lack of intermediate
17 forms. We don't have, according to James Shapiro,
18 who is a microbiologist at the University of
19 Chicago, the phylogenetic history of any biochemical
20 pathway for subcellular organelle.

21 We can't trace the flagellum back through
22 its heritage phylogenetically. So you are asking me
23 to speculate on, you know, at the organismal level
24 is this possible based on our current understanding
25 when we don't have the data to look at even

00080

1 components of the cell and their historical
2 progression?

3 Q. Do you have an opinion as to whether
4 humans and apes descended from a common ancestor?

5 A. It is possible, you know. The fact that
6 you find 98 percent sequence identity is consistent
7 with that viewpoint. The fact that you find 98
8 percent sequence homology is consistent with a
9 common design.

10 Q. Do you have an opinion as to whether
11 humans were specially designed?

12 A. Not scientifically. My personal opinion
13 from a philosophical point of view, from a religious
14 point of view, is that, yes, we are rational
15 organisms that have the ability to think in an
16 abstract sense, and that differentiates us from the
17 rest of the biological forms on this planet, okay?

18 Now, whether we were the gradual
19 descendant of other simians or specially created, I
20 don't know. I do know that we are -- we have been
21 endowed with certain capabilities that differentiate
22 us from the rest of nature.

23 Q. Do you believe that natural selection can
24 explain some aspects of biology?

25 A. Oh, for sure, no doubt.

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1 Q. Are there people within the intelligent
2 design community who would disagree with that
3 conclusion?

4 A. Not that I'm aware of.

5 Q. What aspects of biology do you think
6 natural selection can explain it?

7 A. Oh, I mean, that's the routine tool that
8 we use in the laboratory in terms of genetics and
9 putting selective pressure on organisms and looking
10 for modifications.

11 Q. Do you think that natural selection can
12 explain micro evolution?

13 A. For sure, no problem.

14 Q. How would you -- or how do you
15 distinguish between aspects of biology that natural
16 selection can explain and those that it can't?

17 A. Again, it comes back to the question of
18 what are the limits of change of an organism.

19 Q. Do you have an opinion whether natural
20 selection and random mutation can produce new genes
21 with new functions?

22 A. They can take existing information that
23 can be modified to produce similar, and over time,
24 some different properties. In other words, you can
25 expose an organism to a man made compound that has

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1 carbon and nitrogen that has a potential use for
2 energy, okay, and cycling into other components of
3 the cell.

4 It may be recalcitrant, you know, so it
5 it has never appeared on earth before. There are
6 organisms that aren't specifically capable of
7 breaking down and utilizing that compound, but over
8 time, if you put stress on the organism, you can
9 develop, modify enzymatic pathways that will evolve
10 and use and break open, say, a chlorinated biphenyl,
11 or something like that. So I have no problem with
12 that.

13 Q. How would you define science?

14 A. Science is the discipline of accumulating
15 knowledge of the natural world.

16 Q. Are you familiar with the National
17 Academy of Science's definition of scientific
18 theory?

19 A. Yes.

20 Q. Would you know it off the top of your
21 head?

22 A. I could paraphrase it. It would be a
23 statement or a set of statements that explain a set
24 of facts or phenomena through, you know,
25 experimentation or observation.

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1 Q. That seems pretty close to what I have
2 down here, but I will just read you back what I have
3 here, which I believe is the actual definition. It
4 is a quote.

5 "A well substantiated explanation of some
6 aspect of the natural world that can incorporate
7 facts, laws, inferences, and tested hypotheses."

8 A. Sure.

9 Q. Do you accept that as a valid definition
10 of a valid scientific theory?

11 A. Yes, I do.

12 Q. And under that definition does
13 intelligent design qualify as a scientific theory?

14 A. Yes.

15 Q. I'm going to read you a definition from a
16 Ken Miller's Biology Book of Science.

17 "First, science deals only with the
18 natural world; second, scientists collect and
19 organize information in a careful, orderly way,
20 looking for patterns and connections between events;
21 third, scientists propose explanations that can be
22 tested by examining evidence."

23 Would you agree with that definition?

24 A. Sure, it's right out of his biology
25 textbook. And in fact, you know, I was asked to

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1 review a biology curriculum for a private Christian
2 school and they had a -- I don't know where their
3 curriculum was from, but it was creationist. I
4 said, "Use Ken Miller's book, augment it with Pandas
5 and People if you want a counter-argument. But I
6 have no problem.

7 If you read further in that paragraph he
8 says, "Theory are subject to change as new
9 information is gathered and compared to the model of
10 any theoretical explanation."

11 That's a history of science, is
12 revolutions in thought. You accumulate more
13 information or you look at it in light of new
14 circumstances and you go back and you modify
15 theories to be consistent with observed fact or
16 experiments.

17 Q. Can you tell me what the difference is
18 between a hypothesis and a scientific theory?

19 A. Well, they can be used interchangeably,
20 and they are all the time from a working
21 perspective.

22 I have a student that will come in and
23 say, "Hey, I have a theory that this gene is
24 participating in knocking out this function in a
25 white blood cell." Fine. You know, that's really a

00085

1 hypothesis.

2 A hypothesis is an idea that predicts
3 certain outcomes that are testable experimentally,
4 all right? Then once you carry out the experiment
5 or a set of experiments, is it consistent with your
6 original hypothesis? So it can be something as
7 simple as an idea or a conjecture. First, as a
8 theory, which is more formally, you know -- and
9 according to the National Academy is based on well
10 documented experimental evidence that has been
11 accumulated over time and subject to experimental
12 verification.

13 Q. And then it is your opinion that
14 intelligent design is a scientific theory; is that
15 correct?

16 A. Yes.

17 Q. And with reference to the National
18 Academy of Science's definition, can you explain how
19 intelligent design satisfies that definition? Maybe
20 we should go by the components of the definition.

21 The first component is a well
22 substantiated explanation. Can you explain how
23 intelligent design theory can be considered a well
24 substantiated explanation?

25 A. Looking at the public evidence, okay, in

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1 terms of the natural record, can you explain it
2 based on inference to an intelligent designer? It
3 is a new theory and it is going to be modified over
4 time, and this is the way science works.

5 Let me give you an example. Until the
6 1930s the consensus viewpoint in science was that we
7 had a static universe, okay? And then Einstein
8 comes up with his equations and relativity and is
9 bothered by the fact that when you run these
10 equations through, it looks like the universe had a
11 point in time and history where it began.

12 Now, this was contrary to the accepted
13 consensus view of all scientists at the time period
14 and he didn't like the implications, from my
15 understanding of historical science, because of the
16 metaphysics.

17 Then you have independent observations of
18 Hubble and other astrophysicists that show you have
19 red shifts, you have got galaxies that appear to be
20 moving away, and you have a real monumental change
21 in our understanding of the universe in terms of
22 what was accepted theoretically. And then as new
23 data came in, it took time, it took argument, it
24 took reformulating how we could do experiments to
25 address this inference based on a minimal set of

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1 data. But it changed our view of the universe,
2 okay?

3 And in the same way I think we are at the
4 stages where we are looking at the natural record
5 and saying, based on inference, well substantiated
6 records from paleontology, from molecular biology,
7 from biochemistry, from genetics, that there is a
8 limitation to our current theory of natural
9 selection; that we infer intelligence. And that's
10 going to contribute to biological systems.

11 It will have an impact. Just because
12 Einstein had a metaphysical problem with the
13 predictions of his equations, and he even modified
14 those equations to remove the fact that the universe
15 had a point in time beginning in history, I think
16 impeded thought, okay?

17 And this is a question that I have in
18 terms of our present state of biology. Intelligent
19 design has been characterized as a religious
20 position, a non-scientific position, because it goes
21 against the current consensus.

22 Now, I think as a scientist there are
23 legitimate claims, legitimate questions, legitimate
24 criticisms that we are bringing out on the table
25 and have to be addressed by our current

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1 understanding of neo-Darwinism. We are being
2 marginalized as a non-scientific approach just as
3 people had problems with Einstein's predictions or
4 Hubbell's predictions because of the metaphysical
5 implications of how we viewed the universe and our
6 position in it.

7 People object to my position because of
8 the same -- for the same reasons. Nonetheless, the
9 data will drive us in that direction, the science
10 will drive us in that direction. We may be wrong,
11 okay? We are going to have to stand the test of
12 criticism and the dialogue and, you know, we may be
13 wrong, that's a possibility. But I think our model
14 is consistent with the public evidence.

15 Another critical aspect to this debate is
16 that if the other side is wrong in part, and I'm not
17 saying that they are wrong in total, but in part, if
18 there are positions that neo-Darwinism draws or
19 inferences that it draws that are incorrect, that
20 could have an impeding effect on the advancement of
21 science, just like Einstein's reluctance to accept
22 that there was a point time start in the universe.

23 That opened up entire new vistas in terms
24 of looking at the universe if it proposed at that
25 point unforeseen experiments that could be done to

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1 verify it.

2 So are you getting my point? You are
3 asking me, is intelligent design based on the
4 National Academy of Science's definition of a
5 theory based on a well substantiated explanation.
6 We are at an infancy at this point. It is
7 controversial, it is heretical based on the common
8 consensus. But that's the history of science.
9 Whenever you have a new interpretation it is going
10 to be fought in the public arena.

11 Q. You say it's in its infancy, how do you
12 -- what is the basis for saying it has risen above
13 all of the hypotheses and up to the level of a
14 scientific theory?

15 A. Because we are looking at the natural
16 world and we are seeing information storage systems,
17 coded systems that in any other context we would
18 ascribe an intelligence behind it. You look at the
19 genetic code -- I mentioned Bill Gates is envious of
20 the ability, you know, the mechanism whereby that
21 information is stored. It's the most efficient
22 storage system in the universe. It has true
23 characters by which information is extracted from
24 it. It's not unlike an alphabet, it's not unlike a
25 musical scale, it's not unlike mathematical symbols,

00090

1 okay? It's a true code.

2 Our experience tells us whenever we find
3 a code there is a coder. In the same context, we
4 look at subcellular machines, a new view of our
5 understanding of the cell that is within the last 40
6 years. We didn't know about the bacterial flagellum
7 and how sophisticated it was, we didn't know about
8 DNA replication and their profound efficiency and
9 editing functions.

10 We have to look at this new data and say
11 is natural selection up to the task to produce this
12 level of complexity and specification?

13 Put it this way, on the Genome To Life
14 web site that was produced by the Department of
15 Energy several years ago, they make the statement in
16 the introduction that is to be read by the public
17 that, "The molecular machines we find in the
18 simplest of organisms produced by evolution dwarf
19 the engineering feats of the twentieth century."

20 Natural laws, undirected, unintelligent,
21 un-in-purpose, un-forward looking can produce
22 machines more sophisticated than the entire
23 community of intelligent design engineers.

24 (Off the record.)

25 MR. WHITE: He was going to finish his

00091

1 answer from before.

2 MR. LUCHENITSER: I'm comfortable with
3 the answer, I don't need anything more on that.

4 THE WITNESS: The last bit of the
5 sentence. So I'll continue with the statement, "The
6 molecular machines in even the simplest of organisms
7 produced by evolution dwarf the sophistication and
8 subtlety of machines produced by man, essentially.
9 I mean, that's a paraphrase.

10 BY MR. LUCHENITSER:

11 Q. Does the science only consider natural
12 causes?

13 A. Not necessarily, okay? You always look
14 for natural explanations first. I mean, that is
15 consistent. But I mean, there are sciences that
16 look for signs of intelligence, whether it is the
17 SETI project, if you are a forensic scientist, if
18 you are an archeologist, you know? You are looking
19 at natural products and asking is there an
20 intelligence involved in what you are seeing.

21 Q. Does science ever consider supernatural
22 causes?

23 A. Under our current definition of science,
24 natural methodological science excludes
25 supernatural, but that hasn't been the case

00092

1 historically.

2 Q. Is the idea that science doesn't consider
3 supernatural causes as methodological naturalism an
4 accurate term for that concept?

5 A. Right, if you are only going to -- if you
6 are going to define science as only accepting
7 natural cause and event to explain the phenomenon
8 you are studying, fine, if that's your definition of
9 science. It may not be the reality or the truth of
10 the situation.

11 Q. Do you disagree with the current
12 definition of science that does not -- that's too
13 many negatives.

14 I think you agree that the current
15 definition of science does not consider supernatural
16 causes. Do you disagree that that should be the
17 correct definition?

18 A. It's a qualified disagreement, especially
19 in this debate. If the science is pointing you to
20 an intelligent cause, then you have to go where the
21 data leads. If you are limiting your
22 interpretation, your interpretations, or what you
23 will accept as interpretations, it has consequences.

24 And I'm the first person to say we look
25 for natural causes, natural explanations first, all

00093

1 right? But I'm not opposed to looking at the data
2 any more than a forensic pathologist is and saying,
3 you know, is it a natural death or was this a
4 designed death, is this a murder?

5 Is natural law sufficient to describe
6 life forms on this planet or not? It's a valid
7 question. If it is insufficient, then that implies
8 that there may be an intelligence behind it, or in a
9 definitional term, a supernatural cause. But I'm
10 not saying supernatural in the way that you would
11 imply superstition or a specific god, et cetera. It
12 is just above the natural explanation.

13 Q. Would you agree with the proposition that
14 in order for intelligent design theory to be
15 considered valid science, science has to go beyond
16 the concept of methodological naturalism?

17 A. It would have to be modified. But again,
18 this is an artificial definition, in my mind. If
19 you are only going to accept natural explanations,
20 then that's all you are going to see, because by
21 definition you aren't even going to allow any other
22 explanation into the conversation.

23 Q. So in order for intelligent design theory
24 to be valid science, does the definition of science
25 have to be broad enough so that science can consider

00094

1 supernatural causes?

2 A. Right, I mean, isn't that what is going
3 on in NASA when you have all these radio telescopes
4 pointed out in the universe and asking the pattern
5 of pulsar magnetic radiation, different types of
6 radiation coming at us? Is it all just natural, or
7 is there somebody out there that has intelligence
8 that is trying to communicate with us?

9 I mean, that is going beyond, that is
10 looking at the natural data and saying, "Is there an
11 intelligence behind it?" That is legitimate. You
12 are looking for patterns, you are looking for
13 specificity, and it is being used now as part of our
14 scientific methodology.

15 Q. But there you are talking about looking
16 for extraterrestrial life, so it still seems that
17 you are looking at natural actors as opposed to the
18 supernatural actor. Now with respect to intelligent
19 design theory, doesn't --

20 A. Intelligent design theory doesn't rule
21 out the fact that those natural actors may have a
22 super intelligence that participated in development
23 of life on this planet, okay? And we don't know
24 that they exist so it is supernatural to our
25 experience. We don't know that there are aliens out

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1 there. We don't rule them out, we don't know they
2 haven't visited this planet. So that is, by
3 definition, supernatural, and there are a lot of
4 scientists that agree.

5 Francis Crick looked at the common
6 evidence in biology and said life could not arise on
7 this planet de novo, it was seeded by some
8 extraterrestrial source, in formulating his theory
9 of Pan Spermia, all right? Nobel laureate, looking
10 at the evidence, saying that there is some
11 supernatural event in terms of our understanding of
12 natural events on this planet, that solar winds blew
13 in some primitive organism or someone visited this
14 planet and seeded life. I mean, that's pretty far
15 out, but it is one of the hypotheses.

16 Q. Let me draw your attention to the top of
17 page 10 of your report, all the way to the top. You
18 say, "The real problem may not be determining the
19 best explanation of the origin of the flagellum.
20 Rather it may be amending the methodological
21 strictures that prevent consideration of the most
22 natural and rational conclusion."

23 Can you tell me what you meant by
24 amending the methodological strictures?

25 A. In other words, it is limiting our

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1 interpretation of natural phenomena. It has
2 consequences. If you are only going to accept the
3 laws of physics and chemistry, time and chance, as
4 an explanation of life on this planet, how it arose,
5 how it diversified, that could have -- that could be
6 a methodological stricture that has consequences in
7 terms of the progress of science.

8 Going back to Einstein's experience, he
9 came up with a radical new interpretation of the
10 universe that had philosophical, religious,
11 metaphysical implications. Whatever you want to
12 call it, he didn't like it, all right? And he
13 essentially fudged his equations to eliminate that
14 interpretation that impeded science.

15 All I'm saying is that I think in
16 biological systems we infer, in a consensus
17 viewpoint, that natural cause and effect is
18 sufficient to explain what we see, and I disagree
19 with that. It has the same types of implications
20 that were faced by the big bang theory, and that's a
21 legitimate area of exploration scientifically.

22 Q. On page one you say, kind of in the
23 middle of the last full paragraph on the page, you
24 refer to neo-Darwinism as the generally accepted
25 mechanism. So you would agree that evolution is a

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1 generally accepted theory in the scientific
2 community?

3 A. Sure.

4 Q. Would you agree that intelligent design
5 theory is not generally accepted by the scientific
6 community?

7 Q. Oh, I agree, I agree. Like I said, it is
8 a minority opinion; in some people's minds it is
9 heretical, okay? But again, you can look at the
10 history of science and that's how we progress, by
11 challenging the status quo and holding it up to, you
12 know, an explanatory filter that has got to be
13 consistent with the information as we see it.

14 I think it is legitimate debate. That's
15 why we are here. I respect Ken Miller and he is
16 serving a purpose in this debate, you know? He is
17 -- and I am all for it. I enjoy the interaction
18 that we have had in a limited sense.

19 That's how science works. You have areas
20 of contention that can be small, they can be large
21 with cosmological implications. But that's how we
22 progress, by keeping each other honest.

23 Q. In your report, again I've quoted -- and
24 this is before the beginning of the last paragraph
25 on page one, you state that, "Intelligent design

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1 theory holds that the deep complexity and clearly
2 evident design in organisms is the result of an
3 intelligent agent."

4 Do you consider that to be a testable
5 proposition?

6 A. It is as testable as evolutionary theory.
7 Again, it we are looking at -- you know, it is an
8 historical science in one aspect. We are going back
9 and looking at the records, we are looking at our
10 present knowledge and seeing if it is consistent
11 with the model that we currently have. This is as
12 much testable as evolution.

13 Let me give you an example. One of the
14 evidences for neo-Darwinism is molecular and
15 structural homology, okay? You look at the skeleton
16 in my hand, you look at the skeleton of a bat wing,
17 you look at the skeleton of a whale fin, there is
18 similarity: Same bones, different size structure.

19 I have a problem in the sense, though,
20 that it is a self-referential argument. I believe
21 in common decent and therefore organisms should have
22 homologies, and because I find homologies, it
23 therefore proves common decent.

24 It doesn't rule out common design, in my
25 mind. Common design is on the table and you would

00099

1 make the same predictions.

2 Q. Do those various kinds of examples you
3 just gave, do these homologist structures -- do they
4 have identical genetic codes?

5 A. Some of them do, some of them don't. And
6 that's another interesting point that Simon Conway
7 Morris brings up in his paper that is included in
8 mine. If you believe in common decent, you would
9 think that organisms that have the same body plan
10 would develop through the same genetic program.

11 So there are, to my understanding,
12 invertebrates, such as sea stars, that go through
13 intermediate larval stages that are vastly
14 different. In fact, they weren't even recognized as
15 similar organisms when they are looked at at the
16 larval stage, yet they end up with the same body
17 plan.

18 Morris says it looks like evolution is
19 somehow channeled, and that is a problem with an
20 evolutionary scientist in terms of genetics and the
21 phenotype. And if it is channeled, then teleology,
22 purpose, is back on the table.

23 That's the prominent -- one of the most
24 prominent evolutionary biologists stating and citing
25 an intelligent design by Denton saying that this is

00100

1 a legitimate explanation.

2 Q. Now, let's go to the -- I guess there are
3 bird wings and bat wings as kind of an example in a
4 homologous sense. What was the example you were
5 just using a second ago?

6 A. In terms of human skeletal structure for
7 a hand and a bat wing and a whale fin. I mean, they
8 have got similar structures, and therefore you infer
9 that they are related by decent because of
10 homologies at the structural level.

11 Q. Does a scientific theory have to be
12 testable?

13 A. Again, in terms of evolution, and Ernst
14 Mayer's definition, "Laws and experiments are
15 inappropriate for the explication of events and
16 processes when we are dealing with evolution."

17 We are looking at historical records.
18 There are certain aspect that can be testable, but
19 again, there is a lot of inferences and
20 extrapolations that are involved in our current
21 thinking.

22 Q. Is it generally accepted in the
23 scientific community that for something to be a
24 scientific theory it has to be testable?

25 A. It has to be consistent with a body of

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1 knowledge that explains the phenomenon or the facts
2 that you are addressing.

3 Q. Is it not the case that there has to be a
4 way to test this?

5 A. There are examples. I mean, Kurt Goedel
6 said that there statements that are true that are
7 unverifiable, you know? And that's a conundrum.

8 Q. What are some examples of statements that
9 are scientifically --

10 A. I'm not a mathematician and he is a
11 mathematician. But, you know, I would refer you to
12 -- go to Escher Bach, you know a popular treatise on
13 this phenomenon.

14 Q. Does scientific theory have to be
15 falsifiable to be a valid scientific theory?

16 A. It is a component that should be
17 incorporated, yes.

18 Q. Is there any way to falsify intelligent
19 design theory? Is there any way to falsify that?

20 A. You bet, you come up with a phylogenetic
21 history of some of these things that are up in
22 contention and, you know, where you can get genetic
23 information de novo, in a real experiment, not an
24 artificially simulated experiment, and we are going
25 to check.

00102

1 There is a potential that, hey, there is
2 -- the evidence could be overwhelming and we are
3 going to throw the towel in and go home. You bet.

4 The same has to be held on the other side
5 as well. And there are certain concepts of
6 evolutionary theory that I think are unfalsifiable
7 in terms of -- some people, even within the
8 scientific community, have the old adage that a
9 theory that explains everything, explains nothing,
10 okay?

11 If you look at the bacterial flagellum,
12 Mike Behe says that it is irreducibly complex, we
13 don't have intermediates. He says you need two
14 microorganisms. We don't have the intermediate
15 stages of the phylogenetic history of that.

16 Yet my colleagues, as evolutionists,
17 assume without fact that these are all present, the
18 intermediates, or some presence, is responsible for
19 the appearance of this structure, you know? By
20 definition, because they are only going to accept
21 the natural law, but is that falsifiable?

22 Q. Have you conducted any experiments to
23 demonstrate the validity of intelligent design
24 theory?

25 A. I think the body of my peer-reviewed

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1 publications are consistent with an intelligent
2 design interpretation. Again, this isn't -- it is
3 not the accepted interpretation, but I think they
4 are consistent.

5 Some of the experiments that I mentioned,
6 both done by other researchers and experiments we
7 have initiated looking at antibiotic resistance, are
8 consistent with some aspects of intelligent design
9 or consistent with what we refer to as the
10 limitations of evolutionary theory.

11 Q. These experiments you have conducted you
12 say are consistent, but they don't conclusively
13 prove that intelligent design theory is accurate --

14 A. They are scientific -- they are
15 scientific --

16 Q. -- or that --

17 A. -- sorry, I didn't mean to interrupt.

18 They are scientific conclusions based
19 upon the work that, through my interpretation, are
20 counter to, say, a neo-Darwinist. That's where Ken
21 Miller and I come in, we are both looking at the
22 flagellum, we are both asking, can natural selection
23 produce it? We are looking at type III secretory
24 systems. This is what I work on specifically in my
25 research, and whether or not these are true

00104

1 intermediate structures to bacterial flagellum.

2 I was willing to concede that they
3 weren't. In fact, when Mike Behe first published
4 his book, I called him up and said, "Whoa," you
5 know, "we are working on stuff that may be a problem
6 here when you are using this as an example."

7 Over time, as more work has been done by
8 my lab and other labs, I am unwilling to say that
9 the type III secretory system is an intermediate
10 structure for the bacterial flagellum. But the
11 point is, we are both scientists, we are both
12 looking at the common evidence, we are both drawing
13 conclusions based on that evidence. And my
14 conclusion is that this is a highly efficient
15 machine that has all the hallmarks of a design
16 product, and he says natural law is sufficient to
17 explain it, okay? That's a legitimate argument and
18 I don't see why there is a problem with it.

19 Q. If scientists were to demonstrate how
20 natural selection could have produced the flagellum,
21 would that, in your mind, falsify intelligent design
22 theory?

23 A. If you can show me the intermediate
24 structures in the phylogenetic history, yes, but in
25 a sense that to me is unfalsifiable because I don't

00105

1 think we have them. It is going to be inferred and
2 -- listen, we all have biases that we bring to the
3 table, you know? And how we are going to interpret
4 things. Mark Twain is quoted as saying, "Don't
5 believe your eyes when your imagination is out of
6 focus."

7 You know, we have got a set body of
8 evidence that has been filtered through an allowable
9 set of parameters and new ways of thinking about it
10 are a problem to get through that filter.

11 Q. Just a second ago you said in some sense
12 it is unfalsifiable, can you explain what you meant?
13 Did you mean there is no way to actually --

14 A. No, I think there is, but I am going to
15 be --

16 MR. WHITE: Just don't over-speak him,
17 because the court reporter can't get everything.

18 THE WITNESS: Okay, all right.

19 It is going to be -- it's going to be
20 difficult. I think, yes, there is -- my view is
21 falsifiable.

22 BY MR. LUCHENITSER:

23 Q. It is falsifiable?

24 A. Right, for sure. In other words, if you
25 can come up with a mechanism that can produce these

00106

1 macromolecular machines, you know, then okay.

2 Q. Would you be satisfied by just the
3 demonstration of how the flagellum is produced or
4 would you want a demonstration of how a bunch of
5 different macromolecular flagellum were produced by
6 natural selection?

7 MR. WHITE: Objection, a compound
8 question. The reason I say that, there are two
9 parts to it which advance both questions.

10 THE WITNESS: Right, is one body of
11 evidence sufficient or does it require multiple?

12 You know, it's a speculative hypothetical
13 question. I want to see the data before I make an
14 assessment.

15 But going back to your original question,
16 yes, I think it is falsifiable.

17 Q. A lot of what we talked about is kind of
18 the pace of development of major kinds of life on
19 earth, and I think it is correct that the general
20 consensus is that about four billion years ago first
21 life appeared and complex multi-cellular life might
22 have appeared about 600 million years ago, and then
23 multi-cellular land animals might have appeared 450
24 million years ago. Would you kind of agree with the
25 proposition that the pace of development of more and

00107

1 more complex life has accelerated throughout the
2 history of earth? Is that something you generally
3 see as correct based on the --

4 A. I don't know if I would say accelerated.
5 The appearance of organisms in the fossil record
6 have expanded in terms of their complexity over
7 time.

8 Q. Does that pace of development -- does
9 that support intelligent design theory or does
10 support the scientific theory of evolution?

11 A. It could be interpreted either way.

12 Q. Can you explain how it could support
13 intelligent design theory?

14 A. Well, you have an intelligent agent that
15 could be introducing new life forms at specific
16 points in history.

17 Q. Do you have any idea why it would take
18 the intelligent agent several billion years to go
19 from the simple microscopic life forms to a more
20 complex animal species?

21 A. That's a speculative question, it's like
22 asking why did Beethoven write the Ninth Symphony
23 last instead of first. It's a created object. If
24 intelligent design designed an object, it is a
25 creative process, and I'm not going to speculate on

00108

1 the motives of any designer.

2 Q. Does the intelligent design theory have
3 any answer to that question?

4 A. No.

5 Q. Do we have any evidence of any
6 extraterrestrial life in the universe?

7 A. Not at this point.

8 Q. Does the intelligent design theory have
9 any opinion as to whether the universe is finite or
10 infinite?

11 A. I think it subscribes to the current
12 cosmological understanding of the universe in terms
13 of it is expanding and there was a point in time
14 where it began. I mean, infinite --

15 Q. Is it infinite in size or finite? Is
16 there a consensus --

17 A. That's outside of my expertise.

18 Q. Now, one way to characterize -- or an
19 argument made by intelligent design proponents is
20 that there is an extremely low probability that the
21 living beings we see on earth could have arisen
22 through natural causes?

23 A. For sure, right.

24 Q. Now, do we have any evidence at all as to
25 how frequently life in the universe arises, what the

00109

1 actual frequency of living beings -- complex living
2 beings arise in the universe on any given planet?
3 A. Again, that's outside of my expertise. I
4 mean, I know the Drake equation predicts that there
5 are multiple planets that could support life. There
6 is a group at the University of Washington that has
7 published a book recently called Rare Earth, which
8 Gierrmo Gonzalez was part of that group who is an
9 intelligent design advocate who had an article on
10 the cover of Scientific American several years ago
11 expounding this view of rare earth hypothesis, that
12 the Drake equation may be wrong in terms of
13 predicting the number of potential planets that
14 could support life.

15 Q. We don't have any actual empirical
16 evidence on how frequently life actually arises in
17 the universe?

18 A. There are conjectures, from my
19 understanding, but that is outside of my expertise.

20 Q. Now, even if one were to accept the
21 proposition that the probability of life arising on
22 earth and developing to its present state through
23 natural causes is incredibly low without other
24 evidence of -- without empirical evidence of how
25 frequently life arises in the universe, how does the

00110

1 first proposition support intelligent design?

2 A. Rephrase the question so I understand
3 what you are asking. In other words, you are
4 talking about probability, low probability for life
5 arising spontaneously in terms of the -- what would
6 we say, the probabilistic resources in the universe,
7 is it consistent?

8 Q. Let me try to rephrase it.

9 Okay, you take a proposition that the
10 probability of life arising on earth is an extremely
11 small number. Without any evidence that life in the
12 universe, in fact on any given planet, arises more
13 often is a probability number, what is the -- how
14 can you conclude that the low probability indicates
15 that life in fact was intelligent design and didn't
16 just in fact originate through natural causes?

17 A. I mean, that's a complicated question. I
18 am going to reply and clarify in my response, if I
19 am addressing the question you are asking.

20 But does it --

21 MR. WHITE: If you don't understand the
22 question --

23 THE WITNESS: I think I understand it,
24 but I'm not sure. In other words, if there is an
25 assigned probability to any event, no matter how

00111

1 small it is, given the size of the universe and the
2 time involved, is that sufficient for that extremely
3 rare event to occur? In other words, are the
4 probabilistic resources available for events in the
5 order of 10 to the minus 128 to happen?

6 MR. WHITE: Is that you are asking, Alex?
7 BY MR. LUCHENITSER:

8 Q. You can go ahead and answer the question
9 the way you've understood it.

10 MR. WHITE: Object to the question that
11 it is complex and confusing.

12 THE WITNESS: I will put it this way. I
13 think it is recognized that life arising by natural
14 cause on this planet is an extremely rare event.
15 From our current knowledge, it is a singular event.
16 It doesn't rule out that it hasn't happened
17 somewhere else in the universe, but from our
18 understanding that is speculative, okay?

19 Because of that extreme low probability,
20 I think there are efforts in the scientific
21 community to expand the probabilistic resources.
22 The age of the universe is 20 billion years old,
23 maybe 12.5, somewhere in there. The age of the
24 earth is 4.5 billion years. The first life arose
25 at 3.8 billion years. So you have got a time window

00112

1 that has got to account for the generation of the
2 first organisms.

3 That's in terms of what we know and the
4 probabilities that have been assigned these vary
5 tremendously. A narrow window of time, regardless,
6 everybody agrees. To expand that probabilistic
7 resources available to us, there are people that are
8 proposing there is a fourth law of thermodynamics to
9 get around this problem that there is some
10 organizing principle that can account for generation
11 of information and formation of replicators, or
12 there are infinite universes so that even though it
13 is an extremely low probability in this universe, if
14 there are an infinite number of universes and there
15 is any probability for something to happen, it will
16 happen at some time. It happened here, deal with
17 it, okay?

18 But these are speculative. But I think
19 they in part are addressing the problem of this low
20 probability event of life arising.

21 BY MR. LUCHENITSER:

22 Q. So how do we get from the low probability
23 to the conclusion of intelligent design if these
24 alternative explanations which have not been refuted
25 or falsified are still available? In an infinite

00113

1 number of universes, then as far as we know this may
2 be the only planet in the numerous universes that
3 even has life, how do you get to intelligent
4 design? COURT REPORTER: You have to
5 speak up.

6 MR. LUCHENITSER: I'm sorry --

7 MR. WHITE: Will you repeat that? I
8 didn't hear most of it.

9 BY MR. LUCHENITSER:

10 Q. It was without having evidence of
11 extraterrestrial life, how do you get to intelligent
12 design? The only data point you have is the earth
13 and life on earth and you have no evidence of life
14 elsewhere and all you have is the low probability of
15 life on earth, how can you get to the conclusion of
16 intelligent design?

17 MR. WHITE: Object, it's an
18 unintelligible question.

19 THE WITNESS: I understand what you are
20 saying, but, you know, that's speculation. To me
21 it's outside of my expertise.

22 But what it could imply that would be
23 consistent with intelligent design is that the
24 universe is a created phenomenon; that the designer
25 could be outside of the universe and the author of

00114

1 these laws whereby the universe acts.

2 BY MR. LUCHENITSER:

3 Q. Let me switch gears here.

4 Before you spoke of your experience from
5 where you used to be an atheist or agnostic and then
6 you became a Christian. Can you tell me what
7 denomination you ascribe to?

8 A. I'm not a member of any church or
9 denomination.

10 Q. Do you attend any church?

11 A. I do.

12 Q. Is it an evangelical church?

13 A. I think it could probably be defined as
14 evangelical.

15 Q. And would you consider yourself an
16 evangelical Christian?

17 A. Evangelical in the sense that a Christian
18 is directed to account for their beliefs in the
19 public arena.

20 MR. WHITE: I will object to all these
21 questions as irrelevant.

22 BY MR. LUCHENITSER:

23 Q. Does neo-Darwinian evolutionary theory
24 conflict with your personal religious beliefs?

25 MR. WHITE: Object as to relevance.

00115

1 THE WITNESS: Parts of it, I think. Let
2 me give you an example.

3 I am very sensitive to the difference
4 between a lectern and a pulpit. I teach in a public
5 university, I respect my students. What I hold as
6 personal belief I don't present to students as part
7 of the scientific knowledge that I am imparting to
8 them.

9 Now, if they ask me personal opinions, I
10 will say, "I have an opinion, we can talk about it
11 outside of class," and it impacts on these
12 philosophical questions. But I don't look at it as
13 my responsibility to give my world view to anybody
14 unless I am asked.

15 Contrast to that, I can give you numerous
16 examples on this campus this year where my
17 colleagues have stood up in front of a class and
18 said, "No true scientist believes in a creator,"
19 making absolute statements that are loaded
20 metaphysically.

21 We had a situation where there was an
22 instructor hired by this department by an
23 evolutionist to teach her class because she was
24 buying her teaching requirement out with grant
25 money, and she hired a creationist.

00116

1 There were people that objected on this
2 campus that said, "Under no circumstances should a
3 creationist be allowed to teach a biology class in a
4 public institution." Okay? To me that's viewpoint
5 discrimination.

6 So I am very cognizant of where my
7 personal beliefs lie and the responsibility I have
8 to make them known if I am teaching a course to my
9 students. I don't find the same rules being applied
10 to my colleagues.

11 Q. Let me ask you, at the top of page 10 of
12 your report, I guess you are quoting your pre-year
13 2004 paper, you say, "Rather it may be amending the
14 methodological strictures that prevent consideration
15 of most natural and rational conclusion" --

16 MR. WHITE: Hold on a second, we've lost
17 the page.

18 THE WITNESS: Right here.

19 MR. WHITE: Are we talking about Exhibit
20 1 here? Page 10.

21 BY MR. LUCHENITSER:

22 Q. "The most natural and rational
23 conclusion, albeit one with discomfiting
24 philosophical implications." And what is the
25 conclusion you are referring to there?

00117

1 A. There is a designer.

2 Q. What are the discomfiting philosophical
3 implications?

4 A. You know, that that has metaphysical
5 implications in terms of how you conduct yourself.

6 Let me give you an example from my own
7 personal experience. Now I have colleagues that I
8 am very good friends with in my department and they
9 know where I stand on this and they disagree with
10 me, okay? And in our conversations I will ask them,
11 okay, "Do you agree that nature has the appearance
12 of design?"

13 They say, "Yes."

14 "Are you willing to consider that it may
15 be real design or do you just think it is apparent
16 design, as does Dawkins?"

17 "Well, it's apparent. We can explain it
18 by evolution and natural selection."

19 Okay. But they know the problems of
20 evolution because we are all molecular biologists
21 and we know the complexity and specification that we
22 are dealing with.

23 I will ask the question, "But don't you
24 think this is a legitimate question?"

25 And they say, "Yeah, okay."

00118

1 "Then why are you so against my position
2 of even considering that there is a designer?"

3 The almost unanimous response to that
4 question is generally two fold: "If there is a
5 designer, I don't want to know who he is because
6 there is so much evil in the universe," or, "if
7 there is a designer I don't want to know who they
8 are," because, you know, him or she or it is,
9 "because it has implications in how I lead my life."

10 And I can say to them, "Fine, I can
11 respect your opinion. But recognize that your
12 difference with me in addressing these questions is
13 not scientific, it is metaphysical, you have a
14 philosophical -- you have a religious problem with
15 the implications, the discomfiting philosophical
16 implications of my position and you dismiss them on
17 that basis, not totally on the scientific argument."

18 And they agree. They will stop and say,
19 "Okay, you are right."

20 Q. Let me ask you about the bacterium that
21 causes the bubonic plague, is that called the
22 Yersinia pestis bacterium?

23 A. Yes.

24 Q. And is it your opinion that this plague
25 bacterium was designed?

00119

1 A. That's a loaded question, in the sense
2 that if I am going to be consistent with ascribing
3 the flagellum to a designer with inference to
4 design, that it is a beautiful rotary engine, and I
5 find it to be an irreducibly complex machine, this
6 nano syringe, that is the most deadly molecular
7 machine that we know of. I mean all gram-negative
8 organisms have them. The *Yersinia pestis* alone has
9 killed over 200 million people, it is going to be
10 designed, too, okay?

11 So you have the problem of theodicy of
12 evil, is the designer the author of evil as well as
13 good design and bad design? That's a philosophical
14 problem.

15 What I find interesting, however, is that
16 there is a paper in the proceedings of the National
17 Academy of Sciences this past year that compared the
18 genomic sequence of *Yersinia pestis* with a closely
19 related organism *Yersinia Cita tuberculosis*. So
20 they are like 99 percent similar at the DNA level.
21 In fact, the differentiation into different species
22 is arbitrary, one is probably a sub species of the
23 other.

24 No, *Yersinia cito tuberculosis* is a mild
25 pathogen, it doesn't kill anybody, it will make you

00120

1 sick, it is food borne. It is like getting
2 salmonella or pathogenic *E. coli*, you know? It's a
3 double-bucket disease. You are going to be
4 uncomfortable for a few days, but it's not going to
5 kill you.

6 Compared to *Yersinia pestis*, that is in
7 the major leagues in terms of slate-wipers in
8 disease. 200 million people is nothing to blink at.

9 The primary difference between these
10 organisms is loss of information, over 13 percent of
11 the chromosome of *Yersinia pestis* compared to
12 *Yersinia tuberculosis*. It is due to mutations, loss
13 of information.

14 That to me is amazing. It is amazing to
15 me that for my field, in molecular pathogenesis, all
16 virulence factors, toxins, anti-host factors, are
17 all mobile genetic elements. They are out of
18 context. They have been acquired through
19 introduction of a plasma through a virus, through a
20 transposon. They are not part of the aboriginal
21 design of the organism, they are not necessary for
22 the existence of that organism.

23 So although it is early, you know -- you
24 can see genetic change in these organisms, it
25 doesn't look like it was necessarily part of the

00121

1 aboriginal design.

2 That is a loaded, you know, interesting
3 philosophical observation that deals with the
4 question of whether you are going to hold the
5 designer responsible for evil.

6 And this is an age-old problem. This
7 plagued Darwin, from my understanding, that in part
8 what is motivating him to, you know, be looking at
9 an alternative explanation for life as the natural
10 evil that he sees.

11 He talks about a dipteran wasp laying its
12 eggs into a worm and that these eggs, when they
13 develop, eat the worm from the inside out. I mean,
14 that is pretty raw.

15 So the problem of evil is recognized, and
16 it has been recognized for centuries. There are
17 explanations that I think are consist. I'm not a
18 theologian, I'm not a philosopher, but these are
19 dealt with -- I wouldn't deal with them in a
20 scientific context.

21 So you see what I am saying? So I think
22 I understand where you are going in terms of --

23 Q. Do you have an explanation of these, I
24 guess, evil designs from the perspective of
25 intelligent design theory?

00122

1 A. Well, I mean, we are going to have to
2 deal with them, and they are interesting questions.
3 But again, that's more of a philosophical outgrowth
4 of intelligent design theory. All people, I think,
5 regardless have this -- you can be like Dawkins who
6 says evil is really just a perception from our
7 perspective as humans, we expect to see it from a
8 materialistic view point. There is no real evil.
9 That's a human invention.

10 Q. Do you have a personal opinion as to why
11 these apparently evil bacterium were designed or
12 appeared?

13 MR. WHITE: Objection, relevancy.

14 THE WITNESS: Yes, I mean, it is totally
15 conjecture and it is something that I am formulating
16 now and I don't want to be quoted on it because I am
17 changing. My ideas, as I think about these, are
18 evolving, so I don't have a set answer for that.
19 But I recognize it as a legitimate question.

20 BY MR. LUCHENITSER:

21 Q. Is it correct that you are the faculty
22 advisor for Campus Crusade for Christ at the
23 University of Idaho?

24 A. I am.

25 MR. LUCHENITSER: Let's mark this as

00123

1 Exhibit 2.

2 (Deposition Exhibit No. 2 marked for
3 identification.)

4 BY MR. LUCHENITSER:

5 Q. Can you tell me what Campus Crusade for
6 Christ is?

7 A. It's a student organization of
8 Christians.

9 Q. If you could, please, we have marked as
10 Exhibit 2 a document called Student Organizations,
11 Campus Crusade for Christ. If you could flip
12 through the last page of Exhibit 2 where it says,
13 "About the crusade." Let me ask you to -- let's
14 focus on the second paragraph of that page. It
15 says --

16 MR. WHITE: Just a general objection to
17 no foundation showing authenticity.

18 BY MR. LUCHENITSER:

19 Q. Okay, it says under About Crusade,
20 "Working together with these fellow believers, our
21 goal is to help give every man, woman and child in
22 the entire world an opportunity to find new life in
23 Jesus Christ. Our commitment is based on the Lord's
24 command:

25 "All authority has been given to me in

00124

1 heaven and on earth. Go therefore and make
2 disciples of all the nations baptizing them in the
3 name of the Father and the Son and the Holy Spirit,
4 teaching them to observe all that I command of you
5 and lo, I am with you always, even to the end of the
6 age."

7 Do you agree with that goal of the Campus
8 Crusade for Christ?

9 A. I haven't seen this document before. But
10 as a Christian, it is part of the tenant of my
11 faith.

12 Q. Do you perform your work related to
13 intelligent design theory in order to advance that
14 goal?

15 A. No.

16 Q. Does your work relating to intelligent
17 design theory in any way relate to that goal?

18 A. It is consistent with it in terms of an
19 explanation of world views. But again, I don't feel
20 it is my responsibility in the classroom to make
21 those views evident. I don't preach this to
22 students, I don't require a common belief in my
23 laboratory as a requisite for any student that I am
24 working with. I respect their individual beliefs.

25 I am very cognizant of this power

00125

1 differential that I have with my students. So if
2 you are asking, do I evangelize students in my
3 laboratory and in my classrooms? I do not, unless I
4 am specifically asked my view point, then I offer it
5 as my opinion.

6 Q. Do you give speeches or presentations
7 about intelligent design?

8 A. I do.

9 Q. And about how many of those speeches and
10 presentations have you given?

11 A. I don't --

12 MR. WHITE: Object, time frame.

13 BY MR. LUCHENITSER:

14 Q. Ever.

15 A. I don't have an accurate record. I would
16 say it is probably less than 15 over the last 10
17 years.

18 Q. About how often do you give these
19 speeches and presentations?

20 A. It varies, you know. If you averaged it
21 out, maybe once every six months.

22 Q. And have most of the speeches or
23 presentations you have given about intelligent
24 design theory been presented either at religious
25 institutions or at programs sponsored or organized

00126

1 by religious institutions?

2 A. It has been a combination of both. I
3 mean, at Calvin College I participated in a
4 symposium there that was design and its critics, and
5 there were people from all sides of this issue for
6 and against, I mean, looking at a lot of these
7 issues that we have raised.

8 Q. Would you say most of the presentations
9 you have given about intelligent design have been at
10 programs sponsored by religious institutions or most
11 of them, or would that not be the case? Or is it
12 about half and half?

13 A. I don't know. I mean, like I said, I
14 don't keep track of that.

15 Q. Did you give a presentation about
16 intelligent design theory at a retreat sponsored by
17 the Evangelical Free Church of Pullman on or about
18 April 1st of this year?

19 A. I did.

20 MR. LUCHENITSER: Let me ask you some
21 questions about an exhibit relating to this
22 presentation. This is going to be Exhibit 3.

23 (Deposition Exhibit No. 3 marked for
24 identification.)

25 BY MR. LUCHENITSER:

00127

1 Q. What has been marked as Exhibit 3 is a
2 document entitled Church Events, Creation Testifies
3 to Her Creator. Would you agree with the statement,
4 the bold statement right below the photograph?

5 MR. WHITE: Just a general objection to
6 lack of foundation and authenticity on this
7 document.

8 BY MR. LUCHENITSER:

9 Q. Would you agree with the statement:
10 "God's word teaches us that the heavens declare the
11 glory of God," "And they do"?

12 A. I didn't write it. I am not even sure
13 who wrote it. The quote I agree with. I don't
14 really have a problem with it.

15 Q. And would you agree with the next
16 paragraph which says, "From her witness alone,
17 creation teaches us about God's eternity, His power,
18 and His God-qualities, which set Him apart from all
19 created things"?

20 A. Where is this?

21 Q. This is right below that, it's the first
22 paragraph of the text that says, "Creation teaches
23 us that people are absolutely left without excuse
24 for not recognizing God"?

25 A. It's right out of Romans 1, Verse 18.

00128

1 Q. So you would agree with that?

2 A. I think --

3 MR. WHITE: Objection as to relevance.

4 THE WITNESS: Right, I mean, this is in
5 the context of a religious meeting and these are
6 religious views that I think are consistent but not
7 implicit in the intelligent design

8 Position. In other words, if I were
9 asked to give a talk on intelligent design at this
10 university, I'm not going to bring in biblical
11 positions. I think the evidence stands on its own.

12 BY MR. LUCHENITSER:

13 Q. Let me ask you if you agree with the next
14 paragraph. I'll try to read it quickly.

15 "Secular materialism has permeated our
16 American culture under the guise of science through
17 the vehicle of evolution. Evolutionary Theory, or
18 Darwinism, has too long been a stumbling block for
19 some when the opportunity for faith arose. It has
20 produced that cloud of doubt leading some to leave
21 the faith and hindered others from sharing the faith
22 more vigorously."

23 Is that a statement you would agree with?

24 A. No, I didn't write it and I wasn't part
25 of this advertisement.

00129

1 MR. WHITE: Just the same objections I
2 have made, including hearsay.

3 MR. LUCHENITSER: did you want to make a
4 standing objection to all these kinds of questions?

5 MR. WHITE: Yes.

6 BY MR. LUCHENITSER:

7 Q. Would you agree or disagree with the
8 statement that, "Evolutionary Theory destructively
9 impacts us," including because, "It reaches into our
10 courts of law and ousts the Creator's laws"?

11 A. Not to the degree that that is stated. I
12 would look at that as inflammatory.

13 Q. To what degree would you not agree with
14 it?

15 A. I say that Darwinism, materialism has
16 implications as a world view in terms of how we
17 conduct ourselves individually and as a society, and
18 some of it negative, some of it positive, okay?

19 I'd like to clarify that, too, in terms
20 of my participation in this event. You know, I
21 essentially covered the material that is in my
22 expert report. I mean, that's the level of it,
23 okay, making the same observations in terms of a
24 scientist, what I observe and inferences that I
25 make.

00130

1 Q. Now, if you would flip to the next page,
2 your talk was called: Nanomotors & the Genius of
3 God.

4 A. I didn't come up with that title.

5 Q. But was it one of the things where you
6 were trying to present to the people at the event,
7 that nanomotors show the genius God?

8 MR. WHITE: I didn't hear the question.

9 BY MR. LUCHENITSER:

10 Q. Was it one of the things you were trying
11 to present to the people who attended the event, was
12 one thing you were trying to present that nanomotors
13 show the genius of God?

14 A. Right, in terms of the context of that.
15 If I were talking about this in, say, a secular
16 environment, you know -- again, I didn't come up
17 with this title, it was assigned. I had told the
18 program director, whatever, that I was going to be
19 talking about macromolecular machines as evidence
20 for design. And they thought -- I think the
21 thinking was that's a complicated title to the lay
22 person and they pre-formulated it and there it was.

23 To me that is -- personally I wouldn't
24 have chosen that because it's risky. I mean, this
25 is on the internet, my colleagues are looking at

00131

1 this and going, you know --

2 Q. And I get to ask you about it in your
3 deposition.

4 A. Right, exactly. But to clarify this,
5 going back to the point that is even recognized in
6 the Department of Energy's web page, "The molecular
7 machines we find in the simplest of organisms dwarf
8 the engineering feats of the twentieth century, the
9 industrial age."

10 Geniuses make engines, motors, so I don't
11 think it is out of line to ascribe the things that
12 are beyond our present intelligence to produce are
13 the product of a genius, okay?

14 MR. LUCHENITSER: Thank you. Let me go
15 on to the next one, Exhibit 4.

16 (Deposition Exhibit No. 4 marked for
17 identification.)

18 BY MR. LUCHENITSER:

19 Q. Did you give a presentation about
20 intelligent design at Trinity Church on October 13,
21 2002?

22 A. Whoa, where is Trinity Church?

23 Q. It's in the upper right-hand corner of
24 the exhibit. For the record, this document has been
25 marked as Exhibit 4, it's a document entitled:

00132

1 Science and Christianity in Conflict, Trinity
2 Church, October 13, 2002.

3 MR. WHITE: Object to lack of foundation,
4 authenticity, hearsay.

5 BY MR. LUCHENITSER:

6 Q. Was this a program where you had a
7 presentation or was this a document --

8 A. I'm trying to think --

9 Q. -- that was meant to cover the entire
10 thing?

11 A. I don't know, I don't know, I don't
12 recall. I don't know where Trinity Church is. I
13 know Jed. But I haven't talked to them at a meeting
14 with Howard Berg. I think it is part of a
15 curriculum that Jed was teaching at the University
16 of California at Berkley.

17 Q. There is a section on page two, a section
18 nine, "Conclusion: Real Christians Love a
19 Challenge," "A. Scott Minnich's yop cannon."

20 A. I have a cartoon that I had -- one of the
21 students in the lab actually drew that I used in
22 seminars when we were trying to explain the
23 similarity between the flagellum and a type III
24 secretory system. At the time, this was in the
25 early nineties, and this is a radical hypothesis,

00133

1 that we were saying these two are related systems.
2 Yops are -- stand for Yersinia outer
3 proteins. These are the toxins that are injected
4 into mammalian cells responsible for the disease of
5 plague. And so we looked at the basal body of the
6 flagellum as a cannon propelling or secreting these
7 toxins.

8 But, no, I don't know where this came
9 from.

10 Q. Yes, that doesn't seem like a
11 presentation that you did.

12 A. Yes.

13 MR. LUCHENITSER: Let's mark this one as
14 Exhibit 5, please.

15 (Deposition Exhibit No. 5 marked for
16 identification.)

17 BY MR. LUCHENITSER:

18 Q. Did you present --

19 A. I did.

20 Q. -- at the Veritas Forum?

21 A. I did.

22 Q. "From The Big Bang Biology." We have
23 marked as Exhibit 5 a document relating to this
24 presentation.

25 And on the first page it is titled --

00134

1 well, first let me ask you, were one or more of the
2 organizations that sponsored this -- or co-sponsored
3 this event a religious organization?

4 A. I don't have any knowledge that it was
5 other than the sponsors that are listed here.

6 Q. Do you know if any of those are religious
7 organizations?

8 A. American Scientific Affiliation, I'm not
9 a member of, is a group of scientists that are
10 Christian, some of them very adversely against
11 intelligent design. Templeton Foundation, I know a
12 little bit about that in terms of sponsoring --

13 Q. Who are the Templeton Foundation?

14 A. I don't know, I mean -- I don't know.
15 And Veritas Forum, I'm not sure what their history
16 is or who is involved in that.

17 Q. And the title of this event is: "From
18 The Big Bang To Biology, does the latest evidence
19 point back to God?" Was one of the points in your
20 presentation at this event that the evidence that
21 you have studied does point back to God?

22 A. I made it clear that the evidence was
23 consistent with a designer, I don't think I used the
24 word God. I may have, I don't know, I don't recall.
25 I mean, I don't know.

00135

1 Q. And did you also give a presentation
2 about intelligent design at an event called,
3 "Fingerprints of God, intelligent design points to
4 our creator," which was hosted by the Fourth
5 Memorial Church on or about April 9, 2005?

6 A. I did.

7 Q. Are there certain core concepts that
8 provide the scientific basis for the intelligent
9 design theory?

10 MR. WHITE: You were trailing off on the
11 question a whole bunch, I'm sorry.

12 BY MR. LUCHENITSER:

13 Q. Are there certain core concepts that
14 provide the scientific basis for intelligent design
15 theory?

16 A. Yes.

17 Q. What would they be?

18 A. I mean, they would be the concept of
19 irreducible complexity and aspects of information
20 theory. It would be critical analysis of current
21 Darwinian explanations, so there is that aspect of
22 it.

23 (Off the record.)

24 (Lunch recess taken.)

25 MR. LUCHENITSER: We're back in session.

00136

1 BY MR. LUCHENITSER:

2 Q. We were talking about irreducible
3 complexity when left off before, and we go to pages
4 six through seven of your report, the last full
5 sentence on page six of your report. It will say,
6 "Irreducible complexity, a term coined by Michael
7 Behe in his scientific argument for intelligent
8 design, essentially states that molecular machines
9 are comprised of a core set of components essential
10 for function of that machine. If that component is
11 removed from the machine, there is a resulting
12 overall loss of function."

13 Is that your definition of irreducible
14 complexity?

15 A. Yes, that's my interpretation of my
16 exposition.

17 Q. So is it correct, in order to be
18 irreducibly complex, all that is necessary is that a
19 system needs to have multiple required parts?

20 A. I mean, essentially, yes, that you have
21 got a consortium of elements, all of which play an
22 essential function in the machine.

23 Q. Now, on page seven there is a big long
24 paragraph in the middle of the page, and kind of in
25 the middle of the paragraph you say, "The common

00137

1 feature for similar efforts on each cellular machine
2 is that all of the components, or a core subset of
3 movable parts, are essential for function; in short,
4 the systems are irreducibly complex by definition."

5 A. Can I qualify that?

6 Q. Okay.

7 A. Or expound on that? Irreducible
8 complexity, the principle of irreducible complexity
9 is essential in modern day molecular genetics. We
10 can't look at an organism's genome -- you know, when
11 we started out this process and determined which
12 genes were involved in what process in the cell, all
13 of the genes, the 50 genes -- there is some
14 variation, depending upon organism, are identified
15 by mutation, okay?

16 So if I am working with E. coli and I
17 want to know all the genes involved in making a
18 flagellum, I don't have a blueprint for the
19 organism, all I know is that it can swim. I
20 mutantize a population of cells and I screen for
21 ones that have lost the ability to swim, okay? And
22 then I map all those genes, determine which ones are
23 redundant, you know, mutations in the same gene, how
24 many unique genes are involved, that identifies all
25 of the components in that process that either

00138

1 destroy motility, abrogate motility, or attenuate
2 it, they can't change direction, or whatever.

3 So this is -- I mean, this is the bread
4 and butter of molecular geneticists in modern-day
5 biology. This goes back to Beadle and Tatum,
6 historically, the whole concept where they were able
7 to mutantize Neurospora, bread mold, and then play
8 these organisms out, the survivors, and then pick
9 them onto what we call minimal media and identify
10 nutritional mutations, organisms that were --mutants
11 that were conditionally lethal and identify what
12 those genes meant. One gene, one enzyme at that
13 point. Now, it is a little more volatile at this
14 point.

15 But that was a key fundamental discovery
16 in genetics, that mutations produce phenotypic
17 differences that we can identify and that they are
18 specific to that function in general. Now, you can
19 grow pleatrophic genes, regulatory genes that have
20 multiple function.

21 But by and large -- I mean, each
22 component of the bacterial flagellum has been
23 identified because it is irreducibly complex, each
24 gene was identified by mutation.

25 I want to make this point, too, because

00139

1 Ken Miller, I think, skews this a little bit. So if
2 you look at the flagellum, it has 50 components, all
3 of which are required. In the type III secretory
4 system there are a base core of 10 proteins that are
5 similar between these, but all of those are
6 essential for the function of the type III systems.

7 It is not saying that you can't have the
8 same proteins involved in another machine, okay?
9 But it is saying that those two, based on their core
10 composite elements, are identified because of
11 irreducible complexity.

12 Q. Can something be irreducibly complex if
13 it has some components that are not necessary for it
14 to function but a core subset of movable parts is
15 necessary for function?

16 A. Right, like I said, there are some genes
17 involved in motility of bacteria that contribute to
18 chemotaxis in the sense that they are involved in
19 monitoring the environment and feeding those signals
20 back to the flagellum to change its direction which
21 will change the direction the organism is going.
22 You knock out one of those genes, the organism can
23 still swim, but it can't respond to chemical
24 gradients, it can't make -- it is stuck in a default
25 position. It is either swimming straight forward

00140

1 all the time or it just sits there and spins
2 randomly.

3 Q. Is your definition of what is irreducibly
4 complex different from Mr. Behe's or is it the same?

5 A. No, I think we agree.

6 Q. Because it sounds like you are saying
7 that something can be irreducibly complex even if
8 you remove a few components and it still works as
9 long as there is a core subset of components that
10 doesn't work, I mean, can't be removed.

11 A. I mean, look at it in this context. You
12 can have a stripped-down engine in a car, all right?
13 And you can identify the essential parts by removing
14 a drive shaft or a piston rod or a coil plug and say
15 that's equivalent. Now, if you put an air
16 conditioner on there with a vacuum pump that is an
17 accessory, the engine still works but you are losing
18 part of its overall system.

19 So it's not -- you can still drive a car
20 without an air conditioner, all right? So there are
21 other components that play a role, maybe, in the
22 overall function of a machine but are not necessary
23 for its survivability.

24 Q. Now, by your definition wouldn't all life
25 forms be irreducibly complex because they would have

00141

1 some core components that are necessary for
2 function?

3 A. You bet, I would say if organisms were
4 not irreducibly complex, we would know very little
5 about them. Because again, this is the way
6 molecular genetics works by mutational analysis.
7 You knock out, you do a general mutagenesis -- our
8 job, the hard part of our job is developing a
9 screen or a selection to look only at the functions
10 we are interested in and against all the other
11 mutations that are occurring in the cell.

12 Q. Now, maybe I was wrong, but it seemed
13 that Mr. Behe's definition of irreducibly complexity
14 was that all components had to be required, not just
15 the core components. Is that his definition, or am
16 I misinterpreting what his definition is?

17 A. I haven't talked to Mike for a couple of
18 years, so I'm not in terms of, you know, if he has
19 modified his or if I am modifying mine.

20 But I will make the example, a specific
21 example. When I looked at the bacterial flagellum,
22 all of the physical components of the engine itself
23 we know are essential, it is irreducibly complex by
24 definition.

25 Now, there are genes in segments of

00142

1 transcription units that are involved in chemotaxis
2 or sensory perception. You can make a mutation in
3 those, the organism can swim so it is not affecting
4 motor, but it doesn't swim intelligently. In other
5 words, it can't change direction. If there is a
6 food source in this corner, it doesn't know it and
7 migrate in that direction. Or if there is a
8 repellent, something that is harmful, it can't
9 backtrack away from it down a chemical gradient.
10 Does that make sense?

11 Q. Now, your views on irreducible
12 complexity, are they based on Mr. Behe's work or are
13 they based on any independent research or
14 theoretical work of your own?

15 A. On my own experience. I mean, this is
16 what I do in the laboratory. I want to know how
17 something works, I don't have the blueprints, I've
18 got to break it down and figure out who the actors
19 are in that play, okay?

20 Q. Would you attribute the concept to Mr.
21 Behe?

22 A. I think he coined the term, but to a
23 molecular geneticist it resonates, I think with all
24 of us. I knew exactly what he was talking about
25 when I read the first few pages in his book,

00143

1 Darwin's Black Box.

2 Q. How do you determine what a core
3 component of a system is?

4 A. By looking at all the essential genes
5 that are involved. If I went into my office and
6 came back with a textbook, Molecular Biology of
7 Escherichia coli and Salmonella typhimurium, I could
8 give you a genetic map of all the 4,000 plus genes,
9 and in there there is a list of all the flagellar
10 genes. Okay? All the genes involved in flagellar
11 biosynthesis, and next to it it will list what we
12 call a phenotype, what is the effect if you make a
13 mutation of this gene.

14 It says those that can't swim, can't
15 swim, loss of chemotaxis, can't build a basal body,
16 can't build a drive shaft. Do you see what I am
17 saying? All the components are determined because
18 if you mutantize that gene you lose function and it
19 is easy to screen.

20 You know, I can take you in the lab and
21 show you, you know, we have a soft auger, that we
22 call it, and Petri dishes, and we can take a mutant
23 colony from a plate, stick it in that soft auger and
24 put in the incubator, come back in 12 hours and say,
25 "Can those organisms radiate out from the center of

00144

1 inoculation?" If they can, they can swim. If they
2 can't, they are stuck there, just a point of
3 inoculum of cells.

4 Q. Now, is the concept of irreducible
5 complexity an essential component of intelligent
6 design theory?

7 A. Yes, because natural selection says that
8 over time you can have mutations that can fashion
9 these sophisticated engines, all right? And you can
10 co-opt and modify existing genes in an organism and
11 build these machines. What it requires is that each
12 step of the way is conferring some selective
13 advantage, but we know in the end product that if
14 you don't have one component, there is no function
15 and therefore nothing to select, nothing for nature
16 to select.

17 Let me describe it this way. Yersinia
18 pestis, the agent of bubonic plague, has a type III
19 secretory system. It also has all of the genes
20 required to build a flagellum. But it has been
21 described, since it was first isolated by Yersin at
22 the turn of the last century, as a non-modal
23 organism. It is one of the classification
24 requirements to identify Yersinia pestis from
25 related organisms.

00145

1 Now, we hypothesize that the flagellum in
2 the type III secretory system initially had
3 overlapping functions, that was the simplest
4 explanation.

5 It also said that because *Yersinia pestis*
6 doesn't have a flagellum, you know, it doesn't swim,
7 our hypothesis stated it has to have the genes for
8 the flagellum, part of which has to be expressed for
9 our yop cannon to function. That's a testable
10 hypothesis. You do the sequence analysis and the
11 genes are there.

12 Now, we know there are separate parallel
13 systems, and we can get into that later, which I
14 discuss in that paper that Steve and I wrote. But
15 here is a situation where you have got 50 genes in a
16 chromosome required to build a flagellum. It has a
17 mutation in the master control switch.

18 So in essence, you know, from a Darwinian
19 perspective, you have now all of the 50 genes
20 required for function, all you need is a mutation to
21 give you the -- excuse me, you have 49 out of 50,
22 let's say hypothetically, you are just waiting for
23 number 50 to come on.

24 What happens, though, in actuality, when
25 I go through the entire genome of *Yersinia pestis*,

00146

1 the other 49 genes, you know, a number of them have
2 been debilitated by deletions, by insertions,
3 because there is no function associated with them,
4 they are silent in the chromosome and they are lost
5 by mutation, never to be recovered again.

6 Now, in one sense a biologist will argue,
7 well, that makes sense. If you don't use it, you
8 lose it, all right? On the other sense, you have to
9 have this gradual accumulation of this information
10 that is ultimately going to cobble itself into a
11 pretty sophisticated machine.

12 You can't have it both ways, all right?
13 It's a conundrum. If you don't have a function
14 there is nothing to select.

15 Q. So is it your position that irreducibly
16 complex systems cannot evolve?

17 A. That's a qualified position. I think
18 that you can get gene duplication. You may even be
19 able to co-opt certain parts of one motor. I think
20 we could look at some of these molecular machines as
21 composite machines. There are, say, multiple
22 components that can have different uses under
23 different environments -- environmental conditions.

24 Q. So some irreducibly complex systems can
25 evolve and some can't, is that what I am hearing?

00147

1 A. It's a fine distinction. The flagellum
2 is an example of irreducible complexity by
3 definition. The type III secretory system shares
4 the components, all right? There are at least 30
5 components of the flagellum that are unique to the
6 flagellum that we don't find in other organisms and
7 the type III secretory system, which shares 10
8 similar proteins, there are about 20 that are unique
9 to the type III system.

10 But the phylogenetic analysis shows that
11 the more complex flagellum arose first from which,
12 you know, the type III secretory system seems to
13 have a sub function compared to the flagellum. It
14 can secrete proteins like the flagellum, but it is
15 not apparently spinning, it is not propelling the
16 cell, it is just a nano syringe.

17 Did the type III system evolve from the
18 flagellum? That's going from more complex to a more
19 simplistic structure. Possibly I was willing to
20 entertain that in the beginning as these results
21 were being dissected.

22 In fact, I gave a talk at a meeting when
23 Ken Miller was there asking the question, is type
24 III secretory -- are the type III secretory systems
25 co-opted from the flagellum. Now, from my further

00148

1 experience, and just what other things have been
2 published about these systems, I am more reticent to
3 say that's the case. I haven't ruled it out.

4 But I think Ken wants to look in -- he
5 says, "Well, here is an intermediate structure, case
6 closed, go home," you know, "what are you arguing
7 about?"

8 I work on these systems. I think the
9 data raises a lot more questions that are difficult
10 for an evolutionist to assimilate than just simply
11 saying this the intermediate that we are all looking
12 for.

13 Q. So is it the case that you believe that
14 some irreducibly complex systems can evolve?

15 A. I don't think we have hardcore evidence.
16 I haven't ruled it out and that's as far as I go.

17 Q. So what is the utility of the concept of
18 irreducible complexity to intelligent design theory
19 if irreducibly complexity doesn't rule out the
20 possibility that something evolved?

21 A. I think our experience shows that these
22 machines are integrated, essential for functions of
23 the cell. There are multiple components. I have a
24 hard time envisioning what the intermediate steps
25 are.

00149

1 Now, Dawkins would say I suffer from
2 credulity, you know. I say I am a scientist and I'm
3 supposed to be skeptical, you know? I don't -- you
4 haven't shown me the necessary intermediates, so at
5 this point the simplest explanation is I know these
6 are irreducibly complex by my own experience in the
7 laboratory. You know, that's where the data sits
8 now. I think that's what the data is driving.

9 Q. Are you familiar with the term
10 exaptation?

11 A. Exaptation? I mean, I have heard it, but
12 I'm trying to place it in terms of the context.
13 That you are accepting something out of something
14 else, is that --

15 Q. What is your understanding of what it
16 means?

17 A. I don't know, I don't want to -- I would
18 have to look it up. I think it is probably similar
19 to co-option.

20 Q. Anyway, what is your response to the
21 suggestion that irreducibly complex systems can
22 evolve because of a less complex version of the
23 system might have had a different function when it
24 had less proteins?

25 MR. WHITE: Objection. Did you say can

00150

1 or can't?

2 MR. LUCHENITSER: Can.

3 MR. WHITE: C-a-n?

4 MR. LUCHENITSER: Yes.

5 THE WITNESS: Say the question again,
6 please.

7 BY MR. LUCHENITSER:

8 Q. Why can't an irreducibly complex system
9 evolve through the process whereby a version of the
10 system that had less proteins or parts serve a
11 different function, and then there was some mutation
12 or mutations leading to the current system that
13 serves the current function?

14 A. I'm not going to rule it out, okay? I
15 think there is probably examples that will come up
16 for specific systems and cells. I mean, organisms
17 change over time. This involves change in function
18 of motors. But looking at overall in terms of
19 advancement and complexity from a bacterium to
20 eukaryote to a mammal, that is a gross extrapolation
21 of the information we now have available to us.

22 And that's what my colleagues, as neo-
23 Darwinists, accept. I have a problem with it. They
24 don't have the evidence to go that far.

25 Q. Would you acknowledge that exaptation or

00151

1 co-option is part of the explanation of how
2 organisms have developed through natural selection?

3 MR. WHITE: Objection, he said he didn't
4 know what exaptation was.

5 THE WITNESS: Can we use co-option?

6 BY MR. LUCHENITSER:

7 Q. Yes, the same thing.

8 A. It's possible, but --

9 MR. WHITE: Just so I understand, so
10 exaptation and co-option you are saying is the same
11 thing?

12 MR. LUCHENITSER: Yes, the same thing.

13 THE WITNESS: But qualify it.

14 Co-option, as we understand it in our natural
15 experience, is a very intelligent process, okay?
16 You know, and the hallmark of a good machine is it
17 has multiple uses, so this could be built into the
18 design as well.

19 If I design a vacuum pump, I can put it
20 on my vacuum cleaner, I can put it on my automobile
21 engine, I can put it on other systems, you know?

22 BY MR. LUCHENITSER:

23 Q. Could an irreducibly complex system
24 evolve from a system that previously functioned but
25 just did not function as well?

00152

1 A. You can get optimization for certain
2 functions if you maintain selective pressure driving
3 it in that direction, but our experience is pretty
4 minimal at this point. It think it's at the
5 enzymatic level, it's at the -- and you can use it.

6 So again, these are micro-evolutionary
7 changes that I'm not arguing with.

8 Q. Can the parts of a system evolve so that
9 parts that initially could have performed a function
10 without the presence of other parts co-adapt so that
11 they become dependent on each other?

12 A. I think that's speculation at this point.
13 It is necessary for an evolutionary perspective. I
14 have seen arguments in the literature purporting
15 that. I'm trying to think, I don't have specific
16 examples in hand, but I think they are still open to
17 question.

18 Q. Is it also possible that an irreducibly
19 complex system can evolve from a larger system that
20 was not irreducibly complex?

21 A. I'm trying to think in terms of -- you
22 know, can you give me an example? So you have a
23 non-irreducibly complex system spinning off of an
24 irreducibly complex system?

25 Q. Right, a system that has got a bunch of

00153

1 parts that weren't necessary and then you lose the
2 unnecessary parts and you are left with the
3 irreducibly complex part?

4 A. I don't know offhand any examples of
5 that.

6 Q. And what about the possibility of a
7 mutation that causes a change in how proteins in a
8 biological system are deployed and affect several
9 proteins at once? For example, a change in a gene
10 that governs how several other genes express
11 themselves, could that lead to the evolution of an
12 irreducibly complex system?

13 A. Again, I'm not sure, without talking
14 about specific systems, what you were getting at. I
15 mean, you have a homeotic gene mutation in a fruit
16 fly and suddenly, you know, you build legs where
17 antenna used to be? Yes, that can happen.

18 Q. Are you aware of any evidence that
19 irreducibly complex systems have in fact evolved in
20 modern -- in recent history?

21 A. No.

22 MR. LUCHENITSER: Let's mark this as
23 whatever the next one is here.

24 (Deposition Exhibit No. 6 marked for
25 identification.)

00154

1 BY MR. LUCHENITSER:

2 Q. Okay, we are marking as Exhibit 6, we are
3 marking an article by Glen Johnson, Rakesh Jain, and
4 Jim Spain, Origins of the 2,4-Dinitrotoluene
5 Pathway. Have you ever seen this article before?

6 A. I haven't, but I am aware -- I mean,
7 there is a group here at the University of Idaho
8 that is doing similar work on TNT degradation. This
9 is done at an air force base, so the military had an
10 express interest in degrading, you know, explosive
11 compounds or their intermediates.

12 But this is a biochemical pathway, all
13 right? Mike Behe talks about biochemical pathways
14 as not being irreducibly complex. This essentially
15 -- not having read this paper, but familiar with
16 this type of work from my colleagues here at the
17 University of Idaho, is that you can take organisms
18 that have the ability to, say, de-nitrophy Benzene
19 rings or de-nitrophy similar compounds, and you can
20 run them through a selective process where this is
21 the only nitrogen and carbon source and modify those
22 enzymes so that now they recognize this compound,
23 which they didn't originally, or very poorly, and
24 develop an organism now that can utilize TNT or DNT
25 as the sole nitrogen and carbon source, or as a

00155

1 major nitrogen/carbon source. But I wouldn't say
2 that's an example of irreducible complexity.

3 Q. Why not?

4 A. It's just micro adaptation, taking
5 information, enzyme systems that have similar
6 function and putting them under stress so that you
7 are selecting for changes, mutations that modify the
8 enzymatic reactive center so that it is more liberal
9 in the sense that it can recognize this compound
10 instead of the ones that it originally was involved
11 in modifying by catalysis.

12 Q. But isn't the new system not irreducibly
13 complex and don't you need both the bacteria and the
14 DNT to have this biochemical system?

15 A. Again, I would say biochemical pathways
16 are not the same as a molecular machine. These are
17 a series of enzymes that are involved in
18 modification of substrates. And if you remove one
19 part, you can still have some of those enzymes in
20 the pathway functioning in other enzymatic
21 modifications.

22 This is a good example of
23 micro-adaptation. I don't think that this is, by
24 definition, irreducibly complex by Mike Behe's
25 example. So, you know, I mean there is a

00156

1 distinction here. I think that it is an important
2 distinction.

3 Q. Are the bacteria themselves irreducibly
4 complex?

5 A. They are comprised of irreducibly complex
6 components. I mean, they are functions of
7 macromolecular machines, all of which, as an
8 integrate unit, are required.

9 Q. Doesn't the degeneration pathway have
10 multiple required proteins?

11 A. Right.

12 Q. So I'm still not understanding why it is
13 not an irreducibly complex system.

14 A. It is not, you know, the -- I know what I
15 want to say, but in terms of articulating it to a
16 non-scientist -- let me cogitate on that for a
17 minute in the sense that, again, not everything in
18 the cell is irreducibly complex, and biochemical
19 pathways are one of the things that we have agreed
20 have the ability to evolve over time and be modified
21 in terms of especially catabolism/anabolism, all
22 right?

23 If you feed a group of organisms a single
24 carbon and nitrogen source, you are going to select
25 for organisms that can use that, if that's the only

00157

1 thing available, based on the information that they
2 have in other systems.

3 MR. WHITE: Who highlighted all of this
4 on Exhibit 6?

5 MR. LUCHENITSER: I did.

6 THE WITNESS: Can I try and clarify this
7 again?

8 MR. WHITE: What you are dealing now is
9 Exhibit 6.

10 THE WITNESS: Right, Origins of the
11 2,4-Dinitrotoluene Pathway.

12 This is an example of micro adaptation.
13 These organisms possess a series of enzymes that can
14 make -- and, you know, in this case I haven't read
15 this paper in full -- four modifications to open up
16 this benzene ring, which is a very, you know,
17 difficult process for organisms to do.

18 The enzymes involved in this process are
19 modifications of the information that is already
20 there where -- I am speculating, that enzyme one has
21 a normal function in a different pathway normally.
22 But you put that organism under selective pressure,
23 you can modify that information and get a new
24 function for those enzymes. This is micro
25 adaptation. No one is arguing that point.

00158

1 It is -- you know, we have already got a
2 cell that is information rich that is producing a
3 number of enzymes that are involved in different
4 processes, some of which may be involved in an
5 unrelated biochemical pathway, say for tryptophan
6 regulation, another one that is involved in a
7 different function, and under selective pressure you
8 can get all of these participating in a novel
9 pathway based on modification of their regulation.

10 But these were all present initially.
11 You've got point mutations that are expressing them
12 under different contexts, and, you know, you get a
13 new function in terms of expanding the substrates
14 this organism can live on. I don't have any problem
15 with that.

16 (Deposition Exhibit No. 7 marked for
17 identification.)

18 BY MR. LUCHENITSER:

19 Q. Can you tell me how you determine whether
20 something is irreducibly complex?

21 A. Again, in terms of -- maybe this is a
22 good way to look at it.

23 With the bacterial flagellum I remove one
24 part, one gene, mutate one gene, you lose function.
25 All of the other components are dedicated to that

00159

1 system and they are rendered useless. In this
2 system you remove one enzyme, but you've got the
3 other set of enzymes that can be used in other
4 metabolic processes.

5 Okay, so you are not completely
6 destroying the system. You know, there are --
7 enzymes have, by definition, substrate specificity
8 that can be narrow or broad and they can still
9 function in the cell.

10 Q. So the enzymes can be used to perform a
11 different function other than the function that the
12 system performs?

13 A. Under the conditions that you are making
14 your assay. If you give this organism
15 dinitrotoluene as a sole carbon and nitrogen source
16 and you throw out one of these genes, then you have
17 knocked out the ability of that organism to grow
18 under those conditions. But if you supply some
19 other carbon source that is maybe a little bit
20 different from this, you only need three out of the
21 four enzymes, the system still works.

22 Whereas the bacterial flagellum, you
23 know, we know that that's what their dedicated
24 function is in terms of a rotary engine.

25 Q. But now is it correct that there are

00160

1 various proteins or enzymes in the flagellum that
2 can serve different functions in different kinds of
3 cells?

4 A. No, there can be other machines that
5 employ similar proteins for that similar function.
6 But they are, by definition -- by Mike Behe's
7 definition, those are irreducibly complex even if
8 they have the same component.

9 Look, you pull out your cell phone and
10 you remove a transistor your cell phone doesn't
11 work. You go to a computer, you remove the exact
12 same transistor out of it, you lose function on your
13 computer.

14 Q. But you can use a transistor for
15 something else?

16 A. But you can use the transistor for -- you
17 employ it in different functions on designed
18 systems and, you know --

19 Q. So is a cell phone irreducibly complex?

20 A. Do you want to do the experiment? Hand
21 me yours, let's find out.

22 Yes, I'm sure there are components on
23 there that are necessary. I mean, you could still
24 operate it maybe without the screen. But you pull
25 out your battery or transistor or relays on there

00161

1 and it is not functioning.

2 Q. Let me just make sure I get this
3 straight. If a component of those systems can have
4 a function in a different system, is the first
5 system irreducibly complex? If you have system A
6 and --

7 A. Sure, that's what I am saying. If the
8 trans -- you find the same transistor with the same
9 serial number that is made by the same company and
10 two different systems, they are essential for those
11 functions, right? It doesn't mean that the green
12 board from your computer evolved into the little
13 chip board in your cell phone.

14 Q. Now, let's get back to figuring out
15 whether some of these are irreducibly complex or
16 not. How do you determine what the proper system to
17 look at is? And let me give you an example with
18 respect to the flagellum, how do you decide whether
19 you should be looking at the entire bacterium or
20 just the flagellum? How do you define what the
21 system is?

22 A. By mutational analysis, you make
23 mutations, you screen for organisms that have lost
24 the ability to swim and you identify how many genes
25 are involved, and you can say this essential core of

00162

1 genes coding for this essential core of proteins
2 make this rotary engine. If I remove a drive shaft,
3 it doesn't work, if I remove a u-joint, it doesn't
4 work, if I remove the propeller, it doesn't work, if
5 I remove the stator, it doesn't work, if I remove
6 the rotor, it doesn't work, if I remove the battery,
7 it doesn't work.

8 Q. But how did you decide whether to look at
9 the entire bacterium or just the flagellum in the
10 first place?

11 A. Because I am interested in the flagellum
12 biosynthesis. I mean, the whole organism is pretty
13 complex. Yes, I can make you mutations and identify
14 a core set of essential genes, you know, that are
15 essential to that organism, but that's tricky stuff.
16 You have to get temperature sensitive mutants or
17 partial diploids to allow that analysis.

18 In other words, DNA replication is
19 essential for the existence of an organism, right?
20 Transcription is essential, translation is
21 essential. All of those have been identified by
22 mutational analysis and then identifying how many
23 components are involved in those molecular machines.

24 Q. How do you determine -- when you are
25 looking at the system, how do you determine what the

00163

1 limits of the system are? And again, for example,
2 with respect to the flagellum, what if you have
3 particular proteins that function both inside and
4 outside the flagellar system?

5 A. Well, you look for pleiotropic effects,
6 many-fold effects. Now, there was a gene that I
7 have worked on extensively that is referred to as
8 FLHDC, that's a master control switch. All the
9 early experiments, it was identified because you
10 knock it out, you don't get any expression of
11 flagellar genes.

12 When we have available, you know,
13 micro-array analysis, we can look at the global
14 effect a mutation has and find that it is also
15 regulating multiple -- at least 30 other
16 non-flagellar operons in the cell. I have done that
17 work myself, as well as colleagues at the University
18 of Illinois.

19 That is a regulatory gene that is
20 involved in the regulation of multiple systems in
21 the cell, we call it a global regulator.

22 Q. And now how do you -- in trying to figure
23 out whether something is irreducibly complex or not,
24 how do you determine what the parts are? Again,
25 with respect to the flagellum, how do you make the

00164

1 decision as to whether the part should be considered
2 to be the proteins or each specific gene?

3 A. Okay, again, that's somewhat a redundant
4 question. It is a mutational approach, or you can
5 use a biochemical approach as well. You can purify
6 these structures, which is, you know, possible, and
7 dissect it in terms of -- if I have a good
8 biochemical purification scheme where I can purify a
9 flagellum away from the rest of the cell, then I can
10 disrupt that and ask how many proteins are present,
11 that's one approach, that's a biochemical approach.

12 Or I can use a molecular genetic approach
13 and mutagenize a population of cells, expose them
14 to ultraviolet light, expose them to some
15 carcinogenic compound that causes mutations, hit
16 them with a transposon and collect survivors on a
17 Petri dish and then pick them individually into a
18 soft agar, and then ask, "Can you swim or not?"

19 I can, say, isolate 4,000 mutants that
20 now cannot swim and then I start mapping those by
21 genetic techniques to where they lie in the
22 chromosome and then differentiate how many are
23 redundant mutations in the same gene, how many
24 different genes are involved. That's how you do it.

25 So you reduce -- you are looking at a

00165

1 large number of mutations that have the same outward
2 expression, they can't swim, map those genes and
3 find out how many different positions there are on
4 the chromosome and then determine how many genes are
5 essential for building a flagellum.

6 Then you go on to intermediate stages of
7 the flagellum and say if I knocked out the u-joint,
8 I know biochemically how many components are there,
9 I look at mutations of one gene and ask, you know,
10 how many components does the cell assemble at that
11 point and which ones are missing. And I can look at
12 what we call epistasis, what genes are required to
13 get to this point, to get to this point. Is that
14 making sense?

15 Q. You are explaining how you figure out
16 whether something is irreducibly complex, but I'm
17 not sure how you first made the decision as to what
18 system you look at, what the limits of the system
19 are, and what should be considered the parts. For
20 example, why do you look at proteins as opposed to
21 the individual molecules or larger parts?

22 A. This is all boiler plate standard --
23 biochemistry standard molecular genetics. There is
24 a genetic approach to these problems, there is a
25 biochemical approach to these problems, you can

00166

1 combine both to get to the answer.

2 You are asking the question, how do you
3 determine all the component parts of the flagellum?
4 I mean, that's a valid question, I am really
5 interested in that, a lot of people are. It has all
6 been assembled by reverse engineering, by reverse
7 genetics. Make a mutation, find out what you
8 screwed up.

9 You know, have you got a drive shaft,
10 have you got your stators, you have got your
11 u-joints, et cetera, and find out which is missing
12 or which parts are missing.

13 Q. Are there any animal species that you
14 believe are irreducibly complex?

15 A. All right, I mean --

16 Q. Are humans irreducibly complex?

17 A. Do you want to do that experiment?

18 Q. I wouldn't want to have it done to
19 anybody here.

20 A. All right, yes, I think we have essential
21 components that if you remove them, you know, it is
22 going to have a profound effect on your health and
23 well being.

24 But there are parts that aren't
25 essential. I mean, you can look at the eye in terms

00167

1 of its function as, you know, irreducibly complex as
2 a camera lens, but is it essential for the human as
3 a whole? No, you can live without your eyes.

4 Q. So it sounds like what it comes down to
5 is anything that has essential components is
6 irreducibly complex?

7 A. By definition, to perform that function,
8 there is a core set of proteins required, that if
9 you remove one, you lose function, okay? And
10 therefore, you can identify each component that
11 plays a role in that function for that specific
12 machine or system that we are talking about.

13 Q. And does every living system have
14 essential components?

15 A. You bet.

16 Q. And so I am getting a little lost as to
17 what the utility of the irreducible complexity is.
18 If every living system has essential components and
19 every living system is therefore irreducibly
20 complex, then does that mean no living system at all
21 can evolve?

22 A. No, no, it is not saying that. The
23 flagellum is an irreducibly complex machine but it
24 is not essential for the life of a bacterium to a
25 adapt to changing environments. In fact, there is a

00168

1 strong selection for pathogenic organisms to lose
2 flagellum biosynthesis.

3 Q. Let me just try and see if I can
4 understand what the utility of irreducible
5 complexity is -- of the concept of irreducible
6 complexity is to the intelligent design theory. It
7 seems like you are not saying that if something is
8 irreducibly complex that that necessarily means that
9 it was intelligently designed; is that correct?

10 A. I think you can infer intelligent design.
11 I think you are misinterpreting what I am saying or
12 maybe not understanding these ideas, so I have a
13 hard time following your train of thought or your
14 question, where you are going with this.

15 Because again, go back to the flagellum.
16 It is a machine that is -- what?

17 Q. I'm going to interrupt you. It seems
18 like you are saying --

19 MR. WHITE: Let him finish what he was
20 saying.

21 THE WITNESS: You were just giving me an
22 odd look and --

23 BY MR. LUCHENITSER:

24 Q. I was confused. It sounds like you are
25 saying all living systems are irreducibly complex?

00169

1 A. No, that's what you are saying, I'm not
2 saying that. Or you are trying to get me to say
3 that for some reason.

4 MR. WHITE: Why don't you ask the
5 professor what he is saying, if you are having a
6 hard time.

7 BY MR. LUCHENITSER:

8 Q. Okay, you are saying all -- anything that
9 has essential components is irreducibly complex?

10 A. Right.

11 Q. And all living systems have essential
12 components.

13 A. For specific functions, not all of which
14 may be essential for the life of that organism. A
15 bacterium can live fine without a flagellum, okay?

16 Q. So you are not saying all living systems
17 are irreducibly complex?

18 MR. WHITE: Objection as misstating prior
19 testimony and confusing everything.

20 BY MR. LUCHENITSER:

21 Q. So it is not your opinion that all living
22 systems are irreducibly complex?

23 MR. WHITE: Objection.

24 THE WITNESS: All organisms have
25 irreducible complex components, all right? You are

00170

1 dependent upon -- your cells are dependent on DNA
2 replication which involves a macromolecular machine
3 that transcribes your DNA, all right? If you remove
4 one component of that apparatus you are dead, okay?

5 So I don't know why you want to broaden
6 that and -- but, yes, by definition there are
7 irreducibly complex macromolecular machines in all
8 living organisms from the simplest to the most
9 complex, but I'm not saying they are all essential
10 for the organism to live. They are essential for
11 the functions that they are designed to carry out.

12 Q. Is it correct that you claim that the
13 bacterial flagellum is irreducibly complex?

14 A. Right.

15 Q. Is there a particular strain of bacterium
16 that you are referring to when you claim that the
17 flagellum is irreducibly complex?

18 A. I think the gold standard in this is E.
19 coli and salmonella and Caulobacter crescentus, but I
20 want to qualify that in the sense that there are
21 different structural components of different
22 bacterium. You know, if you look at a gram-positive
23 organism compared to a gram-negative organism, like
24 E. coli and salmonella, they don't have an outer
25 membrane, gram-positive organisms don't have an

00171

1 outer membrane so they don't require the O-ring in
2 that structure as part of the -- what is the word I
3 want, anchoring of the structure in the cell. Okay.
4 So there are modifications from organisms
5 in terms of their structural constraints from one
6 group to another.
7 Q. How many different strains of bacteria
8 that have flagella are there?
9 A. Nobody knows.
10 Q. Is it hundreds, thousands?
11 A. Thousands, right.
12 Q. Have you studied each and every strain's
13 flagellum to ascertain whether it is irreducibly
14 complex or not?
15 A. Nobody has.
16 Q. So is it possible that there are some
17 strains of bacteria there have flagella that are not
18 irreducibly complex?
19 A. I think for that organism, under the
20 conditions that are irreducibly complex, you would
21 apply the same criteria to identify the players.
22 There are marine organisms in the genus vibrial that
23 instead of running a proton motive force run a
24 sodium motive force, and that implies that you have
25 differing constituent parts for the environments in

00172

1 which these organisms live, and I don't have a
2 problem with that. But if you remove the sodium
3 pump from vibrial it is screwed, just like you
4 remove the proton pump from E. coli.
5 Q. When you say that the flagellum is
6 irreducibly complex -- well, first let me ask you,
7 how many proteins are there in the flagellum
8 principle? You say E. coli is the best example you
9 want to use, how many proteins are there in that
10 flagellum?
11 A. In terms of the structural components
12 there are about 30. In terms of when you expand
13 that to include the chemotaxis sensory transduction
14 system and the regulatory genes, it requires about
15 50.
16 Q. So is it 50 total or 30? 50 if you
17 include the regulatory.
18 A. Fifty with the regulatory and the hard
19 wiring to a sensory perception system that is
20 monitoring the chemotaxis system.
21 Q. And 30 if you don't include those?
22 A. Right, just the core flagellum.
23 Q. Now, is it your claim that removing any
24 one of the 50 proteins will keep the flagellum from
25 working at all or it just that some proteins that

00173

1 can be removed and the flagellum wouldn't work as
2 well?

3 A. The 30 core elements that make up the
4 structure are essential, we know that by mutagenic
5 analysis. As I mentioned before, if you knock out a
6 chemotaxis protein, you can still have an engine
7 that will spin, it may not be able to reverse
8 direction so it has lost its sensory perception
9 mechanism.

10 If I take out your eyes you can still
11 walk. You may walk across a street in traffic and
12 that can be a problem, but you can still walk. So
13 that's what I am saying.

14 When you knock out chemotaxis, you knock
15 out your sensory perception, and the organism is at
16 risk in terms of being able to monitor its
17 environment in making decisions in terms of there is
18 a food source over there and I want to go in that
19 direction, you know? There is a repellent over
20 here, I want to move away from it.

21 Q. So there are some proteins you can
22 remove from the flagellum and it will work but it
23 just won't work as well, is that what it comes down
24 to?

25 A. These are involved in a hard-wired system

00174

1 that is driving the flagellum in terms of, you know,
2 making decisions based on the environment.

3 As I said before, there are irreducible
4 complexity, you knock out a component, you either --
5 if you remove one component, you lose function or
6 you attenuate that function.

7 Q. By attenuating, you mean impair?

8 A. Right, right.

9 Q. Are you aware of any scientific articles,
10 any articles published in the scientific literature
11 that have a contradictory claim that the flagellum
12 is irreducibly complex?

13 A. Yes, Ken Miller and I disagree on that.

14 MR. LUCHENITSER: Let me have you mark
15 this.

16 (Off the record.)

17 BY MR. LUCHENITSER:

18 Q. Before we get to that, the one that is
19 marked as Exhibit 7, let me just ask you, have you
20 ever seen this article before?

21 A. Yes. Not the specific one, but, yes,
22 it's the one Tonegawa won the Nobel prize for.

23 Q. You say you have read this article?

24 A. I don't know if I have read this specific
25 one. I have read reviews on this. I'm not an

00175

1 immunologist, but in general I know the system that
2 he is talking about.

3 Q. And this system he is talking about, is
4 that an irreducibly complex system? Just for the
5 record, we are looking at Exhibit 7, an article by
6 Sakano, Huppi, et al, called: Sequences at the
7 somatic recombination sites of immunoglobulin light-
8 chain genes.

9 MR. WHITE: And I'll object as he hasn't
10 seen this article before.

11 THE WITNESS: Yes, I mean, I don't want
12 to box myself in, because that's a very broad
13 question. Are you saying is the immune system
14 irreducibly complex? Is immunoglobulin biosynthesis
15 irreducibly complex? Are B-cells irreducibly
16 complex? Are the recombination sites involved in
17 cassette shuffling of the variable sites of
18 antibodies irreducibly complex? I would speculate
19 there is a core of genes in this system that are.

20 BY MR. LUCHENITSER:

21 Q. Do you know whether anybody has explained
22 how that core of genes could have evolved?

23 A. Again, I'm not an immunologist. I am
24 familiar with this in the sense of, this was a
25 conundrum for years in immunology. I mean, the

00176

1 basic principle that Tonegawa worked out was looking
2 at the question: If I immunize a mouse with foreign
3 materials, they can mount a repertoire of over, you
4 know, 10 million different antibodies. These are
5 all proteins, they are all different, they have the
6 potential to be different, and our thinking at the
7 time was one gene, one enzyme, one protein, where is
8 that information coming from? Because we are
9 thinking that one gene codes for one, in a sense,
10 antibody, well, this exceeds the genetic capacity of
11 these organisms.

12 So it was a real paradox in biology in
13 terms of explaining this. And what Tonegawa showed
14 was that you have cassettes of DNA that are involved
15 in antibody synthesis, you have differential gene
16 splicing that can give you different reading frames
17 for different amino acid sequences, and that B cells
18 can undergo a higher rate of somatic mutation than
19 normal cells.

20 All of these contribute to generating the
21 variation that we find in antibody systems. You
22 have this built-in genetic scrambler that is
23 producing variant amino acid sequences in specific
24 sites in these proteins that can then recombine in
25 different sequences with heavy chain, light chain,

00177

1 constant regions.

2 MR. LUCHENITSER: Let's mark this article
3 here as the next exhibit.

4 (Deposition Exhibit No. 8 marked for
5 identification.)

6 (Recess taken.)

7 MR. LUCHENITSER: Back on the record.

8 BY MR. LUCHENITSER:

9 Q. We are looking at Exhibit 8, it's an
10 article by Robert Macnab, and it is called: How
11 Bacteria Assemble Flagella. And was Mr. Macnab
12 considered one of the top researchers in the
13 flagellum field?

14 A. You bet, he was at Yale University, I
15 knew him.

16 Q. Have you read this article before?

17 A. I don't know if I read this specific one.
18 I probably read parts of it, but I have a good
19 understanding of this in terms of my own work.

20 Q. If you could, flip to page 82 which is
21 where I have the tab marked Table 1. Can you -- I
22 believe there is a list of about 34 proteins, can
23 you tell me which of the proteins are required parts
24 in which ones are not?

25 MR. WHITE: Required parts of what?

00178

1 MR. LUCHENITSER: Of the flagellum.

2 BY MR. LUCHENITSER:

3 Q. Can you just say which ones you think are
4 not required?

5 A. Well, all of these are -- it doesn't have
6 chemotaxis proteins in here. All of these are
7 required for flagellum function, okay? Some of them
8 are involved in protein export in terms of these
9 type III systems. These are the channels for which
10 these proteins are exported.

11 But, yes, if you make a mutation in any
12 one of these genes, they have been identified by
13 loss of function.

14 Q. You are saying each one of these 34 or so
15 proteins is required?

16 A. Right, for optimum assembly. I mean, you
17 could look at a negative regulator FliH. If you
18 lose that, then you may have deregulation of some
19 components.

20 Q. What was that one called?

21 A. FliH. Chaperones FliJ, you can still get
22 export. Without a chaperone it is just not as
23 efficient.

24 Q. Now, are any of these parts missing from
25 some bacteria?

00179

1 A. Sure, we talked about it before,
2 gram-positive bacteria don't have an outer membrane
3 so you don't need that outer ring structure. FlgH,
4 I'm not sure, outer membrane.

5 Q. So if some bacteria don't need these
6 parts, how is it that all of these parts are
7 essential?

8 A. You anticipate that question. In terms
9 of the individual organism, there are different
10 constraints. If you are gram-positive, you don't
11 have an outer membrane, there is a not an essential
12 requirement for having an O-ring, but you can't take
13 that gram-positive bacillus flagella and put it in
14 E. coli and expect it to work.

15 So there are constraints by the system
16 that determine which parts are necessary, you know,
17 by definition. If you want to then extrapolate and
18 say at some point, you know, the flagellum evolved
19 from a gram-positive into a gram-negative, well,
20 that's speculation.

21 But, you know, it may be that that could
22 have occurred, that there is enough core function
23 that if you need another O-ring structure, you can,
24 you know -- but if you ask is FlgH essential for
25 function in E. coli or salmonella or Yersinia? You

00180

1 bet. Is there an FlgH counterpart in a
2 gram-positive organism that lacks an outer membrane?
3 No, there is not.

4 Q. And for the moment, let's see, on the
5 page of your report, nine --

6 A. Page nine of what?

7 Q. Of your report, Exhibit 1. You say that
8 -- somewhere in there you say that of the 30
9 proteins or so that are found in the flagellum that
10 are not found in the type III secretion system, none
11 of those 30 proteins are present in any other living
12 system.

13 A. Other than bacteria.

14 Q. Yes, at the beginning of the second
15 paragraph on page nine. First sentence,
16 "Additionally, the other 30 proteins in the
17 flagellum motor that are not present in the TTSS are
18 unique to the motor or are not found any other
19 living system."

20 A. Okay.

21 Q. So are you aware of anything that makes a
22 claim to the contrary?

23 A. Not at this point.

24 Q. Are you aware of any scientific
25 literature that describes or explains that there are

00181

1 many proteins, excluding the type III secretion
2 system, there are many proteins in the flagellum
3 that are homologous with proteins in the
4 non-flagellar systems?

5 A. I don't know. I mean, not at this point,
6 but there may well be in terms of new information
7 that has come out. Give me an example, if you have
8 one.

9 MR. LUCHENITSER: Let's mark this as the
10 next exhibit here.

11 (Deposition Exhibit No. 9 marked for
12 identification.)

13 THE WITNESS: Let me qualify that. I'm
14 not sure of that, but there is a --

15 MR. WHITE: Go ahead.

16 THE WITNESS: I am just thinking here in
17 terms of examples of how that would extrapolate. I
18 mean, there are ATPase involved in flagellar protein
19 assembly and export, there are ATPase also involved
20 in other systems in the cell. That's a sub
21 component of the flagellum. Is this it?

22 Q. Exhibit 9 we have marked is an article by
23 Cascales, Lloubes and Sturgis, and it is called:
24 The TolQ-TolR proteins energize TolA and share
25 homologies with the flagellar motor proteins MotA

00182

1 and MotB --

2 A. MotA and MotB, these are motor proteins.

3 Q. Have you reviewed this article before?

4 A. No, I haven't.

5 Q. Are you familiar with the work described
6 in this summary of the article?

7 A. Part of it, but I haven't read this
8 paper. Yes, I would like to, if I could.

9 MR. LUCHENITSER: Let's mark this as the
10 next one.

11 (Deposition Exhibit No. 10 marked for
12 identification.)

13 BY MR. LUCHENITSER:

14 Q. We have marked as Exhibit 10 an article
15 by Kojima and Blair entitled: Conformational Change
16 in the Stator of the Bacterial Flagellar Motor.
17 Have you seen this article before?

18 A. I haven't seen this one, but I know David
19 Blair's work.

20 Q. From the abstract, or from reviewing the
21 abstract, can you tell me if you are familiar with
22 what this article is about?

23 A. Yes, I mean, he works on the motor of the
24 flagellar MotA and MotB in terms of proton
25 channeling. Yes, I am familiar with some of this

00183

1 work.

2 Q. If you could flip to page 13048, if you
3 could read the two highlighted sections on that
4 page?

5 A. MotA?

6 Q. Yes. Just tell me when you are done
7 reading the highlighted sections.

8 A. Okay, I've read the first part, okay.

9 Q. Are you familiar with the work described
10 in those highlighted sections?

11 A. Right, MotA and MotB are involved in the
12 stator, conformational changes that drive direction
13 of the rotor, okay.

14 Q. This work here, does it contradict your
15 claim in your report that the 30 proteins in the
16 motor that are not in the TTSS are --

17 A. Look at the --

18 Q. -- not a living system?

19 A. Look at the wording, "A membrane complex
20 that undergoes proton-driven conformational changes
21 could perform useful work in contexts other than
22 (and simpler than) the flagellar motor, and
23 ancestral form of the MotA/MotB complex might have
24 arisen independently of any part of the rotor."

25 Those are speculative, you know,

00184

1 conjectures. Could, might, possibly, you know?

2 "Together, these facts make a reasonable
3 case for an evolutionary connection between the Mot
4 proteins of the flagellar motor and the Exb proteins
5 of outer-membrane."

6 So this is part of reasonable discussion
7 saying this is speculation. That doesn't mean it is
8 true, and -- but it is part of this argument and I
9 have no problem with it.

10 Q. Now, I think before you said that some of
11 the proteins in the flagellar motor was one called
12 the ATA system or --

13 A. ATPase, right.

14 Q. So those are used in some other living
15 systems, too?

16 A. Well, if you look at Macnab's -- so this
17 is Exhibit 8, where that table?

18 Q. Table 1, page 82, the one that is marked
19 by the little orange tab.

20 A. I think -- I can't remember the
21 nomenclature. It has changed over the years.
22 Several of these proteins, in terms of export
23 function, are ATPase, they are components of an
24 ATPase that you find in other systems in the cell.

25 Q. So are you standing by the opinion you

00185

1 expressed on page nine of your report, that first
2 sentence in the second paragraph where you said,
3 "Additionally the other 30 proteins in flagellar
4 motor (that are not present in the TTSS) are unique
5 to the motor and are not found in any other living
6 system," is that an opinion you are standing by or
7 is that an opinion that you modified?

8 A. I think in general I will modify it. I
9 mean these TolQ and TolR may be related proteins,
10 but it doesn't necessarily mean that they have
11 evolved from MotA or MotB. They are involved in
12 proton channeling in the cell and there are other
13 systems that require protein channeling hooked up to
14 Tone B and some of these other ones.

15 If you want to make the speculation that
16 one is derived from the other or they are one and
17 the same, we are not at that point yet.

18 Q. Are you aware of flagellar use for
19 functions other than swimming?

20 A. Yes.

21 Q. What functions are these for other than
22 swimming?

23 A. I am collaborating with Mike Conkle with
24 Washington State University and *Campylobacter jejuni*
25 and -- this was actually one of my original

00186

1 hypotheses when we were working on type III
2 secretion systems, that the flagellum -- we were
3 limited in our understanding of the flagellum as an
4 outboard motor propel the cell. Within that
5 function is also a highly dedicated specific protein
6 secretory device, all of the proteins that are
7 involved in the assembly of the flagellum, you know,
8 the propeller that can go out to ten cell lengths,
9 ten micrometers in length, are transported through
10 the hollow core and they assemble or preliminarize
11 at the distal tip.

12 So there is a protein secretory component
13 of the flagellum. We hypothesis that the flagellum
14 could be used for other secretion of flagellar
15 proteins and we made mutants to show that, and we
16 actually gave those mutations to Virginia Miller at
17 Washington University in St. Louis and she showed
18 that -- her students showed that a phosphorataase is
19 used as a means of export, the flagellum is used to
20 export a protein that is required for virulence, and
21 this was our original hypothesis; that in talking
22 with Bob Macnab and other people in the field in the
23 early nineties, they considered this a whimsical
24 idea at the time, but it has proven to be true. And
25 that was in part from reverse engineering.

00187

1 I am working with Mike Conkall over at
2 Washington State University, Campo Bacter Dejun
3 secretes a set of proteins that by all trade marks
4 are type III secretory proteins, but there is no
5 type III syringe in the genome of the cell, which
6 perplexed him.

7 I said, "Well, you've got one, you have a
8 flagellum, and maybe the flagellum is being used to
9 secrete these proteins." And through collaboration
10 that has been shown to be the case.

11 Q. Can a flagella also be used for the
12 purpose of bacteria making contact with other
13 bacteria or cells of other living bodies?

14 A. Sure, it can be used as an adhesant.
15 That's another thing that we are looking at with E.
16 coli 0157, which is a pathogenic strain of E.
17 coli. But there are -- we have hypothesized that
18 the flagella could interfere with type III secretory
19 systems that are involved in secretion of anti-host
20 factors, and that this would fit together a lot of
21 observations why significant major human pathogens
22 like Yersenia pestis, Shigella dysentery, Gordetella
23 pertussis are non-modal, but they have the remnants
24 of flagellar genes in their genomes.

25 So there was a strain -- a highly

00188

1 virulent strain of E. coli 157 that has been
2 isolated in Germany and Cechoslovakia that is non-
3 modal, and based on our experience we predicted it
4 would have a mutation of the same gene that we find
5 in these others. One is in collaboration with Peter
6 Fang at the F.D.A., that that's certainly been the
7 case, and have actually reconstructed that mutation,
8 and its kind of the gold standard pathogen, and have
9 been doing animal studies that show that they don't
10 colonize the rectal anal junction of cattle when
11 they are missing the flagella. It seems to be
12 important in adherence in the early stages of
13 infection.

14 Q. Now, these other functions that you
15 described, other than swimming, are all the proteins
16 of the flagellum necessary to perform these other
17 functions, or are they seldom involved in these
18 other functions?

19 A. The flagellum can interact with receptors
20 on the surface of host cells and they could be
21 paralyzed in terms of you could have loss of
22 flagellum function, but as long as those proteins
23 are displayed on the surface, they can adhere and
24 interact with that receptor protein, that
25 recognition.

00189

1 Q. So for these alternative functions only
2 some of the proteins are required; is that correct?

3 A. For that alternative purpose, yes.

4 Q. Doesn't that support the hypothesis --
5 the suggestions or hypotheses that some scientists
6 have made that the flagellum evolved via -- the
7 first cell in the proteins evolved from one and
8 then --

9 A. No, that's a gross conjecture, okay? I
10 think that adherence properties are, you know,
11 indirect functions of the flagella, that there are
12 protein protein interactions that occur by chance
13 and, you know -- but the flagella wasn't an original
14 aboriginal structure to allow it to attach to some
15 surface.

16 Q. Have you done any experiments or
17 empirical studies that would conclusively rule out
18 that possibility?

19 A. It would be tough to rule it out. It's
20 in interpretation. I mean, it's really an
21 interpretation of the data and your perspective in
22 terms of where you want to go with it.

23 Q. Let's go to page one of your report, and
24 you say --

25 Q. Can I go back to that question again?

00190

1 And this is where it is interesting in how evolution
2 has this ability to explain everything.

3 There are organisms that can use a
4 flagellum to attach to host surfaces, okay?
5 That's a dangerous interaction with the host,
6 because the host has a whole set of receptors that
7 are keyed to find certain patterns of bacterial
8 systems or other pathogenic systems. There is what
9 we call a toll-like receptor that will bind
10 bacterial flagellum and induce the inflammatory
11 response.

12 Other bacteria have sacrificed flagellum
13 biosynthesis because it's a dangerous protein to
14 display on the surface, and that's why we don't see
15 it in *Yersinia pestis*, even though at one time it
16 had the ability to make one, *Shigella* and now new
17 strains of *E. Coli*.

18 So who is to say that, you know, the
19 original function was to bind on the surface when
20 you see organisms going in the opposite direction
21 sacrificing motility because of that potential role
22 that the host that they are infecting can mount of
23 inflammatory immune response against them.

24 Q. Let's go on to page one of your report.
25 You say, on page one, under sub-heading one, the

00191

1 second sentence under sub-heading one, "Given that
2 even the simple cells are comprised of nano machines
3 that currently defy our own intelligent capability
4 to produce, yet have the general features of many
5 machines we have made on a larger scale.
6 Intelligent design theory is simply an inference to
7 the best explanation as to the origin of this
8 design."

9 Can you explain what you mean by
10 inference to the best explanation?

11 A. Well, I mean, we use inferences all the
12 time, right, in terms of explaining things. That's
13 part of the definition of a theory, you can infer,
14 you can make predictions.

15 The bacterial flagellum, as I have
16 outlined in my expert report, is, according to the
17 scientific community, a highly sophisticated rotary
18 engine. It has all the hallmarks and components of
19 engines that we have built, you know, Mazda
20 engineers have built.

21 These are the products of highly
22 intelligent design engineering. We find these on
23 the scale that at this point we don't understand, of
24 physics and chemistry, in which they operate. They
25 self-assemble, they have an elaborate algorithm or

00192

1 genetic program that regulates their assembly.

2 You know, these are, because in our
3 experience that we find such sophisticated machines,
4 the product of intelligence, are we willing to say,
5 infer, that unintelligent, undirected natural law is
6 more creative than intelligent agents that build
7 these things in the macro scale?

8 Q. Is what you describe as an inference, the
9 best explanation, is that a scientific concept or is
10 that --

11 A. It's a logical concept, it is logical.

12 Q. Do you have to be a scientist to make
13 that type of inference or can just any lay person
14 make it?

15 A. Some of these, I think, are common sense.

16 Q. So it seems like you are saying that
17 these are really complex living systems and you are
18 very skeptical about the ability of natural
19 selection to produce these systems, and then you --
20 it seems from those two premises you go to the
21 conclusion that the systems were intelligently
22 designed, can you explain how you get from that
23 premise to that conclusion?

24 MR. WHITE: Objection, I don't think
25 that's a fair characterization, it's an overly

00193

1 complicated question, over broad, misstates prior
2 testimony, et cetera.

3 THE WITNESS: I want to qualify what you
4 said in the sense that nature can produce complex
5 things, all right? You know, some people have
6 ascribed evolution as, you know, a tornado going
7 through a junk yard and assembling a fully
8 functional 747, you know? A pretty rare event. But
9 at the same time it can go through and disburse junk
10 in a very complex unique pattern, and every tornado
11 is going to give something different.

12 Complexity alone is not what drives me to
13 this conclusion, it is specificity with it. Just
14 complexity is only part of the equation. When I
15 look at the bacterial flagellum and it has all the
16 hallmarks of machines that are the product of
17 intelligent design and the product of intelligent
18 agents, then I can infer, because this is even more
19 sophisticated, by our own admission in the
20 scientific community, than anything that has been
21 made by intelligent agents, that it, too, may be the
22 product -- or at least we should consider that it
23 may be the product of an intelligent designer. And
24 that is a perfectly logical inference. And it is
25 just in part common sense, too.

00194

1 Q. I believe you used the word specified,
2 you said the complexity is specified?

3 A. Right, there is a pattern there that I
4 can look from, an outside experience, you know? I
5 can go to an engineer and show him the bacterial
6 flagellum and all the parts that have been
7 identified, and they know what a stator is, they
8 know what drive shaft is, they know what a u-joint
9 is, these are labels that we have assigned to these
10 components and they have the same function in
11 intelligently designed machines.

12 But these, again, are more complex.
13 These machines self-assemble, these machines can --
14 are programmed by a genetic algorithm that is more
15 complex than some of the engineering programs that
16 -- or the computer programs that we have that are
17 driving functions.

18 So, you know, what is the problem with
19 even entertaining the idea that these machines,
20 which again, Howard Berg has determined the most
21 efficient machines in the universe, are the product
22 of unintelligent chance and necessity?

23 Q. Is specified complexity a concept that is
24 used in intelligent design theories?

25 A. It is.

00195

1 Q. Is it the same thing as reducible
2 complexity or is it different?

3 A. No, no, it is different, it is looking at
4 it in terms of how you identify design and natural
5 systems. Complexity is one component. What is the
6 probability that this can happen by chance? You
7 know, if it is a small probability, it doesn't rule
8 out that it is necessarily designed. If it is
9 specified in the sense that there is a pattern that
10 we can recognize outside of the system that we are
11 looking at, then that's another component as well.

12 If we only find codes, you know, whether
13 they are alphabets or mathematical symbols or
14 musical scales, if we only find information storage
15 systems as a product of design and then we look in
16 systems and find that they are the most information
17 rich systems in the universe that we know of, they
18 have the most sophisticated information storage
19 system that we know of, our context, whenever we
20 have a code that bears information, is the product
21 of intelligence, and we find a system more
22 sophisticated in living organisms, then we can infer
23 that it might be correct to assume there is an
24 intelligence behind these organisms?

25 A. So if something displays irreducible

00196

1 complexity but not specified complexity, is it
2 likely to have been an intelligent design or not?

3 A. I don't know -- I don't think I
4 understand the distinction you are trying to make.
5 Specified complexity and irreducible
6 complexity are two different concepts. Specified
7 complexity means that you find something in a
8 natural system that is similar to something we find
9 in our own experience as intelligent agents. It
10 doesn't necessarily imply that it is irreducibly
11 complex.

12 Q. Now, on page nine you --

13 MR. WHITE: Page nine of what, Alex?

14 MR. LUCHENITSER: Oh, page nine of the
15 report.

16 BY MR. LUCHENITSER:

17 Q. You say -- in the second sentence of the
18 last paragraph you say, "In all irreducibly complex
19 systems in which the cause of the system is known by
20 experience or observation, intelligent design or
21 engineering played a role in the origin of the
22 system."

23 A. All right, I'm having a hard time finding
24 it.

25 Q. Second sentence of the third paragraph.

00197

1 A. Okay.

2 Q. Now, is it the case that all irreducibly
3 complex systems whose cause we know were ones that
4 were designed by human beings?

5 A. That's the context in which I am looking
6 at this, or intelligent agents.

7 Q. Are there any irreducibly complex systems
8 that were designed by animals? How about insects,
9 do insects create irreducibly complex systems, like
10 a bee honeycomb or various kinds of ant hills?

11 A. That's a good question, I would have to
12 think about it. I wouldn't call, say, a honeycomb
13 or an ant hill an irreducibly complex system. You
14 know, that's a structure that they are building that
15 is a community for, you know, cohabitation, and I
16 don't see the distinction. I would have to think
17 about that.

18 Q. Is there anything you can think of that
19 was not designed by a human and is not living that
20 is irreducibly complex?

21 A. Irreducibly complex that is not --

22 Q. That was not designed by a -- that is not
23 a biological system. Do you think the earth is
24 irreducibly complex?

25 A. I mean, that's an extrapolation outside

00198

1 of my area, so, you know -- I mean, to me it is
2 not --

3 MR. WHITE: Object, it is calling for an
4 opinion beyond his expertise.

5 BY MR. LUCHENITSER:

6 Q. Let me see if we can take you a little
7 down this road. The earth has bodies of water, land
8 masses, it has the earth's crust, it has got the
9 magma, it has the core, it has the atmosphere. If
10 you remove any of those components, would the earth
11 still be able to serve the function of a supporting
12 life?

13 MR. WHITE: Same objection.

14 THE WITNESS: It's an inanimate object, I
15 mean, it has no -- if we assign purpose to it, you
16 know, at this point -- I mean, I don't see the
17 point.

18 BY MR. LUCHENITSER:

19 Q. Can the theory of irreducible complexity
20 apply to inanimate objects?

21 A. It's possible. I mean, there are
22 environmentalists that certainly assume that, you
23 know? The whole Gaia principle that the ecosystem
24 is intricately coordinated and interdependent for
25 the sustaining of life, and if we get in there and

00199

1 screw up the ozone layer that it is going to have
2 consequences to biological systems.

3 Q. So if under that type of thinking you
4 conclude that the earth is irreducibly complex,
5 would that mean that the earth was designed?

6 A. Oh, I think you can make the inference
7 that the earth has design in it, you know? And this
8 goes in with the physics and the anthropic
9 coincidences that the requirements for life are, you
10 know, pretty well defined and rare to support life.

11 So, yes, I would agree the earth has the
12 appearance of design for the support of life.

13 Q. On the bottom of page nine, the third
14 paragraph, third sentence.

15 MR. WHITE: We are back on which exhibit?

16 MR. LUCHENITSER: If I don't specify a
17 document, we are talking about the report.

18 BY MR. LUCHENITSER:

19 Q. You say that, "Given that neither
20 standard neo-Darwinism nor co-option has adequately
21 accounted for the origin of these machines, or the
22 appearance of design that they manifest, one might
23 now consider the design hypothesis as the best
24 explanation for the origin of irreducibly complex
25 systems in the living organisms."

00200

1 Now, is it correct that at one point
2 science could not explain where any feature of the
3 earth came from? For example, where oceans came
4 from, where various geological features came from,
5 such as the Grand Canyon, where land masses came
6 from or where a mountain might have come from?

7 A. If you are thinking of in terms of
8 tectonic plates and continental drifts, yes, before
9 we had a concept of these ideas, it wasn't on the
10 drawing board. And when it was introduced, it was a
11 pretty radical idea that was met with a lot of
12 opposition, now accepted as fact.

13 All I am saying here is that given our
14 experience that these are complex specified systems,
15 that their counterparts that we know from experience
16 are the product of design or engineering, that we
17 don't have the phylogenetic history of any of these
18 machines that neo-Darwinism hasn't produced it,
19 co-option, I think, is an inadequate explanation at
20 this point, that everybody agrees that nature has
21 the appearance of design, it can be real or only
22 apparent, that it is a viable valid argument to say
23 it is real design.

24 Q. Do you accept the theory of plate
25 tectonics?

00201

1 A. Yes.

2 Q. Would you accept that mountain ranges are
3 caused by two plates crashing into one another?

4 A. Sure.

5 Q. Now, before scientists developed the
6 theory of plate tectonics, did the absence of that
7 theory mean that mountain ranges were designed?

8 A. No, no, I think you could say they are
9 the products of wind and erosion over time. I mean,
10 there may be aspects of it that -- I don't know. I
11 don't think by definition they have to be designed.

12 Q. Why does the absence of a complete and
13 detailed evolutionary explanation of how certain
14 biochemical systems were designed -- how certain
15 biochemical systems developed mean that you can
16 scientifically say that they were intelligently
17 designed?

18 A. I don't understand the distinction here.
19 I think that's a false dichotomy. Let's talk about
20 something I do know about. I don't know plate
21 tectonics, I'm not a geologist, but I do know how
22 new ideas in science can have a profound effect on
23 how we act.

24 We are celebrating the hundredth year of
25 Robert Koch's receiving the Nobel prize in medicine,

00202

1 all right? Author of the germ theory of disease. A
2 radical hypothesis in medicine. Okay. The fact
3 that microorganisms that we can't see without the
4 aid of a microscope are responsible for all these
5 infections and death in the world. When he isolated
6 the organism that causes tuberculosis which caused
7 the death of one of seven people in the
8 eighteen-hundreds, the late eighteen-hundreds, he
9 gave that lecture at the University of Berlin, not
10 in the pathology department but in a different
11 department, I forget which one. Because Verchow,
12 who was the standard leading pathologist in the
13 world, refused to believe the scientific theory of
14 the germ theory of disease, okay? It went against
15 ages of medicine as how it was practiced.

16 So new ideas -- what you are trying to
17 get me to say is that, all right, our old perception
18 in terms of intelligent design as a necessary
19 component can be explained away by new information,
20 at the same time, new theories, when they are
21 presented -- I'm losing my train of thought because
22 I'm getting tired. Let me back up.

23 A new theory in science is always going
24 to be challenged at some level when it is going
25 against the conjecture, the consensus of present day

00203

1 body of knowledge.

2 Q. Now, with this germ theory of disease,
3 would it be correct that it became an accepted
4 scientific theory when its proponents supported the
5 affirmative evidence that the theory actually
6 explained how the disease developed?

7 A. Right, right.

8 Q. But it seems here, and tell me what your
9 response to this is, it seems that proponents of
10 intelligent design are simply saying that there are
11 problems with evolution but they are not presenting
12 any affirmative evidence that in fact shows or
13 explains that life forms were in fact designed?

14 A. That's changing. Like I said, it's a
15 young theory and people are working on these
16 questions. I think Bill Dembski has mentioned it in
17 his expert report, which I have just looked at. The
18 design proponents that are publishing in
19 peer-reviewed literature, Doug Axe, as an example,
20 in terms of protein structure enfolding sequence
21 space, you know, that are looking at it from a
22 design perspective.

23 You know, so we are at this stage, yes,
24 where we are going to have to come up with the data,
25 we are going to have to come up with the

00204

1 interpretations, we are going to have to come up
2 with the supporting evidence that will persuade
3 people based on that evidence.

4 But nonetheless, this is a human
5 endeavor. There are people that went to their grave
6 in the nineteen-hundreds, I'm sure, that refused to
7 believe the germ theory of disease. There are
8 people that refused to have their children
9 vaccinated because they didn't agree with it, even
10 though I think the evidence was overwhelming.

11 So once you have wed yourself to a
12 certain set of ideas, theories, it is difficult to
13 change those ideas. And, you know, this is a
14 Kuhnsisian way of looking at things. You have
15 paradigm shifts and scientific revolutions, and in
16 part you have to let a generation of scientists die
17 off so that you can get these ideas on the table
18 with an unbiased group of people that are willing to
19 consider them.

20 Q. Let's go on to the next sentence of your
21 report, the fourth sentence on the bottom of page
22 nine which says, "That we have encountered systems
23 that tax our own capacities as design engineers,
24 justifiably lead us to question whether these
25 systems are the product of undirected, un-purposed,

00205

1 chance and necessity."

2 But now, is it correct that we can
3 already genetically engineer some microscopic -- I
4 mean, some other life forms?

5 A. We can modify organisms by genetic
6 engineering.

7 Q. But we can't build one from scratch yet?

8 A. Right -- well, I mean people have in part
9 synthesized a viral genome and introduced it into a
10 cell and gotten viruses as progeny. But that's
11 going on the template of what we know that genome is
12 and just reproducing it chemically, and that's not
13 creating life de novo, it is copying it and
14 providing the environment in which it is allowed to
15 replicate.

16 Q. So now if we some day figure out how to
17 build more complex life forms from scratch, will
18 that support the intelligent design theory or will
19 that undermine the theory?

20 A. It's going to be a very intelligent
21 process, so I think it would support it.

22 Q. How does the fact that we can't engineer
23 such structures right now support the theory?

24 A. Because they are of such complexity and
25 specificity that we don't understand how to do it.

00206

1 That's not to say that we won't do it at some point,
2 but it is going to take a lot of intelligence and
3 engineering to do it, right?

4 Have we made any machines that can
5 self-replicate, a true touring machine in the Neuman
6 sense? No. Have we made a true artificially
7 intelligent system? No, but we have got pretty
8 smart computers that are making, you know,
9 decisions, but these are the product of intense
10 efforts and intelligence.

11 Q. Now, are humans able to build bridges and
12 create artificial lakes?

13 A. Yes.

14 Q. And are there also natural lakes and
15 natural bridges?

16 A. Yes.

17 Q. And at one time was it the case that
18 humans could not build bridges or create artificial
19 lakes?

20 MR. WHITE: Objection, what do you mean
21 by a bridge, a log across a stream?

22 BY MR. LUCHENITSER:

23 Q. Let's stick to artificial lakes, just to
24 keep it simple.

25 A. I mean, how far back in history are we --

00207

1 recorded history? I think, yes, there is evidence
2 that people have diverted water into reservoirs and
3 used it for their purposes, or dug wells, or
4 whatever. What do you call a pond, what do you call
5 a lake? It's an intelligent process, you know?

6 In terms of -- now, can you distinguish
7 between a man-made or a naturally causing lake? It
8 may be difficult, but I think you probably could.

9 Q. I guess that gets us into the next line
10 of questioning. What kind of scientists attempt to
11 determine whether something was designed by an
12 intelligent cause or not, other than intelligent
13 design theorists?

14 A. I think that's a component of several
15 disciplines. Forensics, is one I can think of off
16 the top of my head. Anthropology, you know? I
17 think I mentioned before the SETI project.

18 Q. Do you have any expertise in how forensic
19 scientists or anthropologist or SETI scientists
20 attempt to determine whether objects were designed
21 by intelligent actors?

22 A. I don't know if you are specifically
23 talking about objects, but in terms of events, you
24 know, objects or information for a SETI scientist,
25 yes. I mean, they have -- they are looking for,

00208

1 again, complex specified information. It is
2 illustrated, I think, in Contact that Sagen wrote.

3 Q. Do you have any expertise in SETI
4 science?

5 A. No.

6 Q. What about anthropology or forensic
7 science?

8 A. No. In forensics, I mean, some of the
9 techniques I use, forensic scientists use in terms
10 of preliminary chain reaction, DNA sequencing,
11 restriction enzyme profiles.

12 Q. Now, when a forensic scientist or an
13 anthropologist considers whether something was
14 designed by a human, do they consider what abilities
15 humans have?

16 A. Right, in terms of, you know, intelligent
17 agents and experience.

18 Q. Do they also consider what technological
19 knowledge or abilities were available to potential
20 human designers at whatever time the object may have
21 been designed?

22 A. Again, for me this is kind of
23 speculative. But, yes, I think that's part of an
24 intricate aspect.

25 Q. I mean, do they consider what materials

00209

1 were available to the human -- the potential human
2 designers at the time the object was designed?

3 A. Yes.

4 Q. And do they consider what motivations the
5 potential human designers might have had?

6 A. I don't know, I don't know. That's
7 speculation, whether that's part of their discipline
8 or not.

9 Q. Do they consider the question of how the
10 humans could have achieved the design of the object
11 they are looking at?

12 A. Yes, I think if you look at the -- I
13 mean, as an example, in Florence, the Dome of the
14 Chapel, that was a pretty complex engineering feat
15 and there weren't any records left in terms of how
16 that was made, or Stone Henge, where did those
17 materials come from, how were they moved, how were
18 they constructed?

19 Q. Now, is intelligent design theory able to
20 consider any of the factors that we have just listed
21 that anthropologists or forensic scientists
22 consider?

23 A. In terms of motivation or --

24 Q. Yes, the factors or abilities,
25 technological possibilities, what materials were

00210

1 available, what the motivations were and how the
2 design could have been achieved?

3 A. Not at this point. I don't want to
4 speculate. I mean, we can look at what materials
5 are available, certainly, in terms of what
6 differentiates inorganic from organic. In terms of
7 motivations of designer, I mean that's speculative.
8 If it's a product of designer creation, what
9 motivates any creative act?

10 Q. And when anthropologists and forensic
11 scientists are looking at or trying to figure out
12 what an inanimate object was created by human
13 behavior, they are able to rule out the possibility
14 that it was created by a self-replicating non-human
15 system; is that correct?

16 A. I don't know what you mean by a
17 self-replicating non-human system.

18 Q. That's much more confusing than the way I
19 could have asked the question.

20 They are only looking at inanimate --
21 they are not looking at living biological forms,
22 they are looking at physical objects; is that right?

23 A. Anthropologists, yes. And so you can ask
24 the question, based on my experience can wind, sand,
25 and erosion produce this rock or is it the product

00211

1 of engineering? Whether it's an arrowhead or a
2 carving, or something like that. Yes, you can
3 infer.

4 Q. And an anthropologist or forensic
5 scientist is trying to determine whether something
6 was created by a human, they have other things that
7 were created by humans to compare with, right?

8 A. Right.

9 Q. And does intelligent design have any life
10 forms that we know for sure were created by an
11 intelligent designer to make a comparison with?

12 A. Again, it's the inference in terms of
13 what we have intelligently made that show homologous
14 structures with things that we are finding in living
15 systems. We have codes, we make codes, we find a
16 code inherent in all organisms. Our experience
17 tells us that codes, alphabets come from
18 intelligence.

19 If we find one that is much more
20 sophisticated, I infer there is an agent. Molecular
21 machines that nobody anticipated 20, 30 years ago
22 that are more sophisticated than our intelligent
23 engineers can build, I can infer that, yes, this has
24 inherent design in their construct.

25 Looking at nature there is -- again,

00212

1 nobody argues with the fact that there is design
2 present. It boils down to is it real or is it just
3 apparent? Can natural law produce it?

4 And I think -- look at it this way. The
5 stakes have increased. The complexity and
6 specificity of the cell is orders of magnitude above
7 what we thought 30, 40 years ago, you know, well
8 beyond what Darwin ever considered. The mechanism
9 to produce that change has remained fairly static,
10 mutation, natural selection.

11 Is it wrong then to ask that because we
12 don't have any new mechanism now to account for this
13 unanticipated complexity in these systems that there
14 may be something else at play. The natural alone is
15 insufficient to explain it. Those are valid
16 questions.

17 And we are still stuck with mutation,
18 natural selection, throw a little lateral gene
19 transfer in there, but we have got some stuff that
20 we didn't know existed 30 years ago, you know? It
21 is equivalent to whoa, you know? The galaxies are
22 expanding. We thought it was a static universe.

23 What does that imply? Are we right?
24 Should we go back and reexamine our initial
25 assumptions? Are we going to stick to the same

00213

1 consensus mechanism that has been under contention
2 for the last 120 years?

3 Q. But now, isn't it the case also that over
4 the last 30, 40 years our knowledge of evolutionary
5 pathways and evolution theory has also increased?

6 A. Go back to Carl Woese's article. Simon
7 Conway Morris's article, you know? We can account
8 for the appearance of novel information at this
9 point. Look at the beginning of Simon Conway
10 Morris's article in Cell. The only real consensus
11 is evolution happened. We don't have mechanism.
12 Everything else is in contention, all right?
13 Because we have to deal with molecular clocks and
14 fitting them with geological time scales and they
15 are not in synch.

16 I mean, these are things that weren't
17 anticipated 20, 30 years ago. And these are things
18 that are being debated in the scientific community
19 and I don't think they are adequately being
20 presented to -- no, I won't say -- I'll leave it at
21 that.

22 Q. Would you agree that in the last 30 to 40
23 years evolutionary theory has made considerable
24 progress in presenting hypotheses and potential
25 explanations as to how complex molecular biochemical

00214

1 systems could have evolved?

2 A. It has been a major component of
3 evolutionary science and I don't think it has been
4 that successful in the sense that we still can't
5 come up with a mechanism where phylogenetic history
6 of how one of these macromolecular machines evolved,
7 okay? We have a lot of just-so stories, we have a
8 lot of of icons and speculations. Do the
9 experiment, get an evolutionary book -- an evolution
10 book and look at the evolution of genomes, how much
11 is fact, how much is speculation and conjecture?

12 You can do that experiment, you know?
13 Just like this other paper by Blair, this might --
14 we can conjecture. There is a lot that we don't
15 know, and I think we are in some part errant in
16 presenting this idea that the evidence is
17 overwhelming when amongst ourselves we are debating
18 these issues.

19 I wouldn't be here, you wouldn't be here
20 if my position wasn't being taken seriously by the
21 Ken Millers and other people in biology. It
22 wouldn't be in Time magazine, it wouldn't be in
23 Wired magazine, it wouldn't be addressed by National
24 Geographic. If we are flat-earthers, nobody would
25 give us the time of day.

00215

1 Q. Do you think the Ken Millers and other
2 major pro-evolution scientists are responding to
3 intelligent design theory because they think it's
4 science theory or just because the work of
5 intelligent design theorists has gotten considerable
6 public attention?

7 A. I don't want to speculate in terms of
8 what their motivation is. I think we have
9 scientific arguments that are valid, they are on the
10 table, they are in opposition to some basic
11 fundamental tenants of evolutionary biology and we
12 are hitting some hot buttons.

13 Stephen Jay Gould is going to come out
14 and write a four-page article in Scientific American
15 reviewing Phillip Johnson's book, a lawyer that is
16 not a scientist, back in the early nineties, why,
17 unless he is making valid points. You bring out the
18 heavy guns when you are taking fire, otherwise you
19 ignore it.

20 Q. Can biologists distinguish human
21 engineered life forms from non-human engineered
22 ones?

23 A. Please repeat the question.

24 Q. Can biologists distinguish life forms
25 that were engineered by humans practicing genetic

00216

1 engineering from life forms that were not engineered
2 by humans who were conducting genetic engineering
3 work?

4 MR. WHITE: Object just because it is
5 very confusing.

6 THE WITNESS: I mean, if I modify
7 Escherichia coli or Yersinia by adding new genetic
8 information and ask -- you know, give that to 20
9 scientists, are they going to be able to tell if
10 this phenotype is something that I modified versus
11 something that is natural? I'm not necessarily
12 sure.

13 I mean, we are taking natural genetic
14 information that is already present or cutting and
15 splicing genes from different systems making fusion
16 proteins that, you know, we may not have seen before
17 and asking can someone tell the difference? I don't
18 know.

19 (Recess taken.)

20 BY MR. LUCHENITSER:

21 Q. Can you explain what a peer review
22 journal is?

23 A. A peer review journal is one in which you
24 submit a manuscript to the editor, the editor will
25 usually read the abstract or look at the title and

00217

1 determine whether or not, you know, it is worthy of
2 publication. If he thinks it is an interesting
3 topic or it fits with the scope of their journal, he
4 will identify experts in the area, usually from my
5 experience three to five, copy the paper, send it
6 out to them, have them read it, criticize it,
7 determine whether or not it is worthy of publication
8 or not, or worthy of publication with certain
9 modifications, and then send it back.

10 Q. Are articles in the conference proceeding
11 volumes generally considered to be peer reviewed?

12 A. Not with the same rigor that normal peer
13 reviewed journals are. If you are referring to
14 Design and Nature, that was reviewed by scientists,
15 but not on the same level as the meeting. So, you
16 know, people look at meeting or symposia, publishing
17 from those with a little bit different view in terms
18 of the rigor in which they have been reviewed.

19 Q. So we are talking about the 2004 article
20 wrote Mr. Meyer there which you quote in your report
21 on page nine; is that correct?

22 A. Right.

23 Q. And so you would not characterize that
24 article as peer reviewed?

25 A. Not on the same level as I would from

00218

1 papers I have in the Journal of Molecular
2 Microbiology or Journal of Bacteriology or the
3 proceedings of the National Academy of Science.
4 They are not under the same constraints.

5 What makes one point interesting is that
6 this is in a meeting referred to now as biomimetics.
7 Engineers, architects are coming to biologists
8 because they recognize biological systems have
9 solved some pretty sophisticated complex problems in
10 structure and engineering. So they are coming to
11 us, intelligent engineers are coming to biology to
12 ask how these problems were solved in this
13 interface.

14 Engineers are interested in the flagellar
15 motor because it is a true nano machine and they
16 recognize it has a lot of potential and applications
17 to systems they can develop.

18 So I think it is somewhat ironic that
19 intelligent engineers are looking to products of
20 non-intelligent chance and necessity of how did you
21 do this?

22 Q. You have published a number of articles
23 reporting the results of research you did in
24 scientific peer-reviewed journals; is that correct?

25 A. Yes.

00219

1 Q. Can you tell me why you decided to
2 publish these articles in the peer-review
3 journals? MR. WHITE: I'm sorry, did you
4 ask --

5 BY MR. LUCHENITSER:

6 Q. Can you tell me why you decided to
7 publish the articles in the peer review journals?

8 A. That's my job. To get funding I have to
9 produce. That's judged by not only the number, but
10 the quality of publications that are generated.

11 Q. Have you ever served as a reviewer for
12 any peer review journals?

13 A. I have ad hoc review, I have been on
14 grant review panels as well that have as rigorous
15 peer review process.

16 Q. And which journals are considered the
17 most prestigious in the biochemistry area or
18 molecular biology?

19 A. Cell, Journal of Molecular Biology,
20 Proceedings of the National Academy of Science,
21 Nature, and my own sub-discipline, Journal
22 Bacteriology and Molecular Microbiology, Journal of
23 Biological Chemistry, those are -- I can give you a
24 whole list, if you want.

25 Q. Have you ever published any articles in

00220

1 any peer review journals, any articles discussing
2 intelligent design in any peer review journals?

3 A. I mean, we just alluded to that before.
4 I think a lot of the results that I have have
5 implications for intelligent design, but they are
6 not papers that are published specifically
7 supporting that position. Consider -- well, I'll
8 leave it at that.

9 Q. So you have not published any articles in
10 a peer review journal that actually discusses
11 intelligent design -- any articles that actually
12 discuss intelligent design?

13 MR. WHITE: That's mischaracterizing what
14 he just said.

15 BY MR. LUCHENITSER:

16 Q. Is that's correct?

17 A. There is one 2004 paper.

18 Q. The Minnich/Meyer paper?

19 A. Right, and that's minimally peer
20 reviewed, but it was reviewed by scientists and, you
21 know -- but Alex, I'm not stupid, you know? I'm not
22 stupid. There is not an open avenue for this.

23 Steve Meyer, I'm sure you are well aware
24 of, got one through a journal that has a citation
25 indices of, you know, just barely on scale, it's a

00221

1 journal that nobody reads, purporting intelligent
2 design, and the results were -- the editor was
3 threatened with loss of his job, they wanted to know
4 who the reviewers for this paper were in a journal
5 that is inconsequential.

6 So when you criticize me for not
7 producing peer reviewed journals on intelligent
8 design, there is a reason for it, you know? There
9 are risks involved in terms of the consequences.

10 Peer review works both ways. It keeps
11 junk out, but it also traditionally has kept novel
12 new ways of looking at things out as well. Okay?
13 Anything that doesn't mesh with the consensus is
14 going to cause a problem, especially with this
15 implication.

16 Q. Have you submitted any articles that
17 explicitly discuss intelligent design to any peer
18 reviewed journals?

19 A. No.

20 Q. And can you tell me why not?

21 A. I just told you why.

22 Q. But people already know you are an
23 intelligent design proponent; is that correct,
24 people in the community?

25 A. In my people that -- you know, in my

00222

1 department, yes, at this university they know where
2 I stand.

3 Q. Do you think people in the general
4 scientific community know, people who read these
5 journals?

6 A. I don't know.

7 Q. So you think you might have some -- you
8 might lose standing in the scientific community by
9 submitting articles advocating for intelligent
10 design to a peer reviewed journal?

11 A. That looks like the way it is.

12 MR. WHITE: Object to the phrasing of
13 that question.

14 BY MR. LUCHENITSER:

15 Q. But you are not worried about the
16 publicity you might get, either serving as an expert
17 in this case or from your speaking?

18 A. You bet I am. There is a real risk
19 involved here, and don't minimize it, you know? Ken
20 Miller can do this same thing and be supported by
21 the consensus community. I am taking a real risk.

22 MR. LUCHENITSER: Could you mark this as
23 exhibit whatever it is?

24 (Deposition Exhibit No. 11 marked for
25 identification.)

00223

1 MR. WHITE: Do you have an extra copy?

2 MR. LUCHENITSER: Oh, sure.

3 BY MR. LUCHENITSER:

4 Q. We have marked as Exhibit 11 the article
5 entitled Scott Minnich and Stephen Meyer, Genetic
6 analysis of coordinate flagellar and type III
7 regulatory circuits in pathogenic bacteria.

8 And is this article the one you have been
9 referring to several times, your article concerning
10 intelligent design published in 2004?

11 A. Correct.

12 Q. Can you tell me which part of the article
13 you drafted and which part Mr. Meyer drafted?

14 A. I essentially wrote the entire paper when
15 I was on sabbatical with the Iraq Survey Group in
16 Baghdad in 2004. Steve and I had discussed at
17 length the implications of the bacterial flagellum
18 as a model for intelligent design. I roughed out
19 the philosophical implication section and e-mailed
20 it to Steve.

21 I also had him look at the rest of this
22 and, you know, go over it for general content and
23 clarity. But he revised part of the philosophical
24 implications. He is a scientific philosopher, and
25 that was our collaboration on this.

00224

1 Q. After he revised it did he give you a
2 chance to edit it?

3 A. Yes. I want to say one thing, too, in
4 light of this. Like I said, I was on sabbatical in
5 Baghdad. This was a risky paper for me to write. I
6 thought about just leaving out this last section,
7 okay? because of the implications and being, you
8 know -- coming out in print. But I believe it, but
9 I have a family to feed.

10 The night I was writing this, you know --
11 this is just incidental, you know, we took nine
12 mortar rounds right on top of our position, and I
13 thought, I don't care, you know, I might not be here
14 tomorrow, hit the send and off it went and I was
15 committed.

16 Q. Did your service in Iraq in any way
17 affect your thinking about intelligent design
18 theory?

19 A. No, no. It gave me a different
20 perspective of life, though.

21 Q. Has any journals ever asked you to
22 publish or to submit an article to them on the
23 subject of intelligent design?

24 A. No.

25 Q. Have you ever served as a peer reviewer

00225

1 of any articles relating to the subject of
2 intelligent design, that explicitly discussed
3 intelligent design?

4 A. For peer review journals or -- I'm trying
5 to think. I reviewed a couple of Mike Behe's papers
6 in the past, you know, that have gone into -- I'm
7 not sure which journal it went to, Journal of
8 Theoretical Biology, or something like that. And
9 Doug Axe's paper I was privy to before it was
10 published. And that is an intelligent design paper,
11 but laid kind of between the lines, not explicitly,
12 but that was its impact.

13 Q. Behe's paper you were referring to, were
14 those published in peer review journals?

15 A. I'm not sure, it has been a while ago.
16 Some of journals I'm not familiar with or venues of
17 publications, and even the ones that I have read, if
18 they eventually were published, I don't know.

19 Q. Are you aware of any articles published
20 in peer review journals that explicitly advocate in
21 favor of theory of intelligent design?

22 A. Yes, Steve Meyer's paper and the
23 Smithsonian Journal, the Biological Society of
24 Washington D.C., you know. That was a fire storm.

25 Q. You say is that the only one?

00226

1 A. Doug Axe's papers that are in the Journal
2 of Biological Chemistry, I think.

3 Q. Is there anything else?

4 A. There may be some, I'm not sure, in terms
5 of what my colleagues are doing. It's a pretty
6 loose affiliation. I mean, I don't have time to
7 interact with these people all the time.

8 Q. You said that Doug Axe's -- did you say
9 before that his work didn't really explicitly
10 discuss intelligent design or was just kind of in
11 between the lines, or what?

12 A. You mean from my conversations with Doug?

13 Q. So the articles he had in peer reviewed
14 journals that were published, were they articles
15 that explicitly advocate for I-D, intelligent
16 design, or just stuff that kind of -- articles that
17 implicitly --

18 A. They have an impact in terms of how we
19 interpret sequence phase and protein folding, but I
20 think they are more consistent with an intelligent
21 design perspective than Darwinian, okay?

22 Q. Have you ever received any grants to work
23 on -- to do work in the field of intelligent design
24 theory?

25 A. No.

00227

1 Q. Can you tell me which individuals have
2 provided the content of the intelligent design
3 theory?

4 MR. WHITE: Objection as to what do you
5 mean by content?

6 MR. LUCHENITSER: The specific components
7 of whatever intelligent design theory.

8 THE WITNESS: You mean who are the people
9 that are really leading this area, this field? Yes,
10 Steve Meyer, Bill Dembski, Paul Nelson, Mike Behe,
11 you know, those are -- I mean, you have a stack of
12 their books there.

13 BY MR. LUCHENITSER:

14 Q. Would you include yourself among those
15 people?

16 A. Not in the front line. I mean, that's
17 not my primary focus and my scientific endeavor. I
18 am a research microbial geneticist, I study
19 pathogenesis, that's what pays the bills, you know?

20 Q. Have you developed any specific elements
21 of the intelligent design theory?

22 A. In a consulting aspect, you know, in
23 terms of irreducible complexity of the bacterial
24 flagellum is a paradigm for intelligent design.

25 Q. Is it correct that you a fellow of the

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1 Discovery Institute's Center for Science and
2 Culture?

3 A. Correct.

4 Q. And is the Discovery Institute's Center
5 for Science and Culture recognized as an authority
6 on intelligent design?

7 MR. WHITE: Objection, recognized by
8 whom?

9 BY MR. LUCHENITSER:

10 Q. Generally recognized by people in the
11 intelligent design community?

12 A. Yes, I mean that's a think tank where a
13 lot of people have associations.

14 Q. Were you awarded like a specific
15 fellowship for specific time period?

16 A. No, no, I mean, it's a pretty loose
17 affiliation. I don't know -- you know, I agreed to
18 be a fellow and they put my name on a list.

19 Q. So they didn't give you a project or any
20 money, or anything like that?

21 A. No, no. In fact, that's an area of
22 contention I have with Robert Pennock, because when
23 he came here, he informed the biology faculty
24 upstairs that I was on the Discovery Institute
25 payroll and I was receiving \$47,000 a year; that I

00229

1 was running a haven of graduate students in
2 intelligent design, which blew me away.

3 I have never been on the payroll of the
4 Discovery Institute, and how an individual can come
5 on this campus and accuse me or foment this
6 conspiratorial perspective, I mean it just -- you
7 know, he is an expert witness, and boy, if he
8 performs with that same amount of integrity in his
9 general work, I have a problem with it.

10 Q. Can you tell me what you do in your
11 capacity as a fellow for the Discovery Institute
12 Center for Science and Culture?

13 A. I have no job description. I have never
14 been given any assigned tasks. Occasionally I am
15 called up and they say, "Will you review this?" Or,
16 "Do you want to -- what do you think about this?"
17 More as a consultant.

18 But it is pretty minimal, you know? I am
19 good friends with Steve Meyer. But in terms of a
20 defined job description or what it means to be a
21 fellow, no.

22 Q. And are you familiar with a document
23 called The Wedge Document?

24 A. I have never read it. I am familiar with
25 it. What I have have read about it is, you know,

00230

1 what other people have said about it.

2 MR. LUCHENITSER: I will ask you to mark
3 this.

4 (Deposition Exhibit No. 12 marked for
5 identification.)

6 BY MR. LUCHENITSER:

7 Q. We have marked as Exhibit 12 a document
8 called The Wedge Center for the Renewal of Science
9 and Culture, Discovery Institute. And I am going to
10 ask you to flip to -- okay, this says page two up
11 here, it might be page four of the document?

12 A. It's got this table?

13 Q. Yes, there is a table with three columns
14 and --

15 MR. WHITE: I also object on the grounds
16 of foundational identifications. Professor Minnich
17 said he has never seen this thing and doesn't know
18 about it.

19 BY MR. LUCHENITSER:

20 Q. Where it says, "Goals, governing goals,"
21 in the first column, and the second goal listed is,
22 "To replace materialistic explanations with the
23 theistic understanding of nature and human beings
24 are created by God," do you agree with that goal of
25 The Wedge document?

00231

1 MR. WHITE: Objection, this is -- you are
2 asking about Discovery Institute's alleged document
3 here.

4 MR. LUCHENITSER: I just want to know if
5 Dr. Minnich agrees with that goal.

6 THE WITNESS: Which one are you asking
7 about?

8 BY MR. LUCHENITSER:

9 Q. The second goal listed in the first
10 column.

11 A. "To replace materialistic explanations
12 with the theistic understanding that nature and
13 human beings are created by God." That's not part
14 of my agenda, you know?

15 Q. Do you think that's a worthwhile goal to
16 pursue?

17 MR. WHITE: Objection.

18 THE WITNESS: That's a loaded question.
19 Turn it around, and, you know, Richard Dawkins and
20 Dan Dennett have an agenda to, you know, replace
21 religious belief with a materialistic viewpoint of
22 the world, is that not legitimate? I mean, they are
23 driven by their world view and they want to see it
24 adopted. Other people have a different position,
25 you know. I don't think there is anything

00232

1 inherently wrong with this.

2 Q. Is it a goal of yours or is it not
3 relevant to what you are doing?

4 MR. WHITE: Objection, asked and
5 answered.

6 THE WITNESS: No. I mean, my goal in
7 life is to do science, be a father, pay my bills, be
8 a contributing citizen. I am a Christian and with
9 that comes holding Christian tenants and doctrines.
10 There is a commandment in terms of evangelism or
11 defending your position, but I am not a missionary.

12 BY MR. LUCHENITSER:

13 Q. Now, are you aware that the Discovery
14 Institute has issued a press release that is
15 critical of the actions taken by the Dover School
16 District that led to this lawsuit?

17 A. I haven't seen it.

18 Q. Okay, I'll give you a copy of it.

19 A. Okay.

20 (Deposition Exhibit No. 13 marked for
21 identification.)

22 BY MR. LUCHENITSER:

23 Q. Okay, we have marked as Exhibit 13 a
24 document called: Discovery Calls Dover Evolution
25 Policy Misguided, Calls For Its Withdrawal.

00233

1 And if you could read the first two
2 paragraphs of that press release and let me know if
3 you agree or disagree with the opinions expressed by
4 the Discovery Institute.

5 MR. WHITE: And I will object to the lack
6 of foundation, no showing of authenticity, and you
7 are asking him to go into the head of the Discovery
8 Institute.

9 BY MR. LUCHENITSER:

10 Q. I just want to know if you agree or
11 disagree with any of the positions expressed there.

12 A. I'm not a policy expert so that's not my
13 area, it's not my expertise so I don't want to
14 comment. So that's my answer.

15 I will say that from the viewpoint of the
16 Discovery Institute and my own personal opinion,
17 intelligent design is not -- should not at this
18 point be part of any curriculum in a public school.

19 Q. So you do agree with that, that it should
20 not be a part of the curriculum?

21 MR. WHITE: Objection, that's not what
22 this paragraph is saying.

23 THE WITNESS: That's not what this is
24 saying. I am just saying, you know -- and they are
25 not -- the Dover -- from my understanding of the

00234

1 Dover School Board, they are not saying that they
2 are going to incorporate intelligent design into
3 their curriculum, they are going to teach the state
4 board requirements in terms of Darwinian evolution,
5 and that's what they should do.

6 I haven't talked to anybody on the school
7 board and I am not aware of the motivation for the
8 policy that they have written.

9 Q. Are you a member of any other
10 organizations?

11 MR. WHITE: Time out. Exhibit 14 is
12 withdrawn now?

13 MR. LUCHENITSER: I didn't have it
14 marked.

15 MR. WHITE: I'm sorry.

16 BY MR. LUCHENITSER:

17 Q. Are you a member of any other
18 organizations that are in any way involved with
19 intelligent design theory?

20 A. Yes, I think I am. Bill Dembski has a
21 society of -- I don't know what they call it, but
22 they asked me if wanted to be a fellow and put my
23 name on that as a member, and I have, but I have
24 never -- I mean, I've never done anything or gone to
25 any meetings or participated in any discussions.

00235

1 Q. Have you ever read the book: Of Panda
2 and People?

3 A. I have skimmed it.

4 Q. Do you know which edition you skimmed?

5 A. The 1993 edition. I think that's the
6 last edition, right?

7 Q. Do you understand that to be the edition
8 that has been made available to students the Dover
9 School District?

10 A. That's my understanding.

11 Q. So you didn't read the whole thing?

12 A. You know, I skipped through -- I have
13 skimmed the whole book. I know what the contents
14 are, basically.

15 Q. Do you believe the book to be an accurate
16 presentation of the intelligent design theory?

17 A. Yes and no. I mean, again, contextually
18 this was written in 1993 and things were just
19 getting off the ground at that point in time. So it
20 is outdated, as any textbook would be that is a
21 biology textbook because of just the rapidity in
22 which data is collected. But the basic arguments, I
23 think, stand in terms of alternative views of
24 looking at the basic principles of it.

25 Q. Is there anything in the book you believe

00236

1 is incorrect?

2 A. I'm sure any textbook has inaccuracies in
3 it. I don't know of any specifics.

4 Q. Are you aware of a new textbook under
5 development called: The Design of Life?

6 A. I just heard about it in the context of,
7 you know, this lawsuit.

8 Q. Do you have any role in the development
9 of: The Design of Life?

10 A. No.

11 (Deposition Exhibit No. 14 marked for
12 identification.)

13 BY MR. LUCHENITSER:

14 Q. We have marked as Exhibit 14 a document
15 entitled: Dover Area School District News, Biology
16 Curriculum update, and I want to ask you to flip to
17 page two of this newsletter document and read the
18 third paragraph of the first column which starts
19 with the words, "In simple terms on a molecular
20 level scientists have discovered a purposeful
21 arrangement of parts which cannot be explained by
22 Darwin's theory. In fact, since the
23 nineteen-fifties advances in molecular biology and
24 chemistry have shown us that living cells, the
25 fundamental units of life processes, cannot be

00237

1 explained by chance."

2 Do you agree with that statement?

3 A. In part. You know, I think this is
4 written for the lay public. You know, I would
5 qualify some of these.

6 Q. Do you think the statement is too strong?

7 A. Yes, I mean it's -- I mean, it has a
8 flavor of an absolute and I hesitate -- you know, I
9 wouldn't have written it like that.

10 Q. How would you qualify the statement?

11 A. I wouldn't use words like, "Have
12 discovered a purposeful arrangement of parts which
13 cannot be explained by Darwinian theory." I would
14 say when you have -- as I have mentioned before, we
15 have discovered macromolecular machines that all of
16 us agree are pretty amazing that we didn't
17 anticipate, and this throws a new light in terms of
18 Darwinian mechanism to produce them, and they need
19 to be reevaluated -- or our consensus viewpoint
20 needs to be reevaluated.

21 Q. Do you think the statement could mislead
22 its readers about what the current state of
23 scientific knowledge is?

24 MR. WHITE: Objection, calls for
25 speculation.

00238

1 THE WITNESS: I mean, that's speculative,
2 I don't know how the lay public -- I don't know who
3 this is written for or what context -- I mean, is it
4 the newspaper article? Is this a --

5 BY MR. LUCHENITSER:

6 Q. Actually, it's Dover Area School District
7 News, so this -- I believe it is made available to
8 both students and parents in the school district.

9 MR. WHITE: I will just object to lack of
10 foundation showing authenticity, especially since
11 Professor Minnich hasn't seen this before.

12 THE WITNESS: Right. I mean, there is
13 no, you know, title in terms of journal or
14 publication that this is present in.

15 BY MR. LUCHENITSER:

16 Q. That's all right, we can establish that
17 elsewhere at trial.

18 But would you, from your standpoint as an
19 educator, would you support the making of this
20 statement I quoted to high school students?

21 A. This one here?

22 Q. Yes.

23 A. Not as it is written.

24 (Deposition Exhibit No. 15 marked for
25 identification.)

00239

1 BY MR. LUCHENITSER:

2 Q. We have marked as Exhibit 15 a document
3 called: Intelligent Design. It's in an article
4 that was published in Touchstone by Dembski called:
5 A Primer on the Discernment of Intelligent Design.

6 And if you could flip through the last
7 page of this article and look at the last paragraph,
8 I am just going to read you the paragraph and ask
9 you if you agree or disagree with this.

10 It states, "The world is a mirror
11 representing the divine life. The mechanical
12 philosophy was ever blind to this fact. Intelligent
13 design, on the other hand, readily embraces the
14 sacramental nature of physical reality. Indeed,
15 intelligent design is just the Logos theology of
16 John's Gospel restated in the idiom of information
17 theory."

18 MR. WHITE: Also object, you are having
19 him take this paragraph out of context of this
20 article, which is about 11 pages long which he has
21 never seen before.

22 THE WITNESS: Yes, I haven't read this
23 article.

24 This is Journal of Mere Christianity,
25 this is a Christian publication written to a defined

00240

1 audience. "Mechanical philosophy was ever blind to
2 this fact. Intelligent design, on the other hand,
3 readily embraces the sacramental nature of physical
4 reality."

5 I'm not really sure what that means,
6 "just the Logos theology."

7 "The world is a mirror representing the
8 divine life."

9 It's a question of semantics, but I think
10 this is consistent with Christian doctrine. Again
11 going back to Romans, Chapter One, I mean it says
12 that God has revealed Himself in what has been
13 created. It is clearly evident, his attributes.

14 Traditionally, Christian theology has
15 looked at nature as a second set of scriptures, and
16 this is really, I think, reforming what that says,
17 that we can learn about God from the study of
18 nature. This has been a motivating force even in
19 the development of science as we practice it today,
20 agreed to by secular historians and scientists.

21 So in one sense I don't have a problem
22 with this. "Intelligent design is just the Logos
23 theology of John's Gospel," I assume he is referring
24 to that: In the beginning was the word; in the
25 beginning was information. That's consistent with

00241

1 an intelligent design perspective with, I think, our
2 view of the world.

3 Q. I want to read you a quote by William
4 Dembski, which is, "Any view of the sciences that
5 leaves Christ out of the picture must be seen as
6 fundamentally deficient." Would you agree with
7 that?

8 A. I don't know the context of what he is
9 stating.

10 MR. WHITE: Do you have the actual
11 written statement from The Lookout?

12 BY MR. LUCHENITSER:

13 Q. Let me show it to you.

14 MR. WHITE: Do you want to mark that as
15 an exhibit?

16 MR. LUCHENITSER: Yes.

17 (Deposition Exhibit No. 16 marked for
18 identification.)

19 BY MR. LUCHENITSER:

20 Q. Exhibit 16 has been marked as: William
21 Dembski, Intelligent Design, The Bridge Between
22 Science and Thrology.

23 We are looking at page 206, the first
24 full paragraph, the first sentence of the paragraph
25 starting with words, "If we take seriously."

00242

1 MR. WHITE: And again, I will just
2 object, that you are asking Professor Minnich to
3 comment on a sentence out of a multi-page article he
4 has yet to read.

5 BY MR. LUCHENITSER:

6 Q. I'm just interested in Professor Dembski,
7 whether you agree --

8 A. Yes, Bill Dembski is a trained
9 philosopher and has theological training as well as
10 mathematics. I am neither -- I think that --
11 Chalcedon --

12 So that any view of the sciences that
13 leaves Christ out of the picture must be seen as
14 fundamentally deficient. Is that the main point
15 that --

16 Q. Yes, the question is, do you agree with
17 that or disagree?

18 A. I would have to think about it. I mean,
19 I don't know the theological context that he is
20 drawing in this. I think -- I would have to think
21 about it, I'm not sure.

22 Can I make a point? Again, in terms of
23 contrast. If that is seen as a problem, you
24 contrast that to Depchamski's quote, "Nothing in
25 biology makes sense outside the light of evolution,"

00243

1 I mean, that's a pretty dogmatic statement, too.
2 There are materialists that say, "Any other than a
3 materialistic viewpoint of nature is fundamentally
4 deficient."

5 In one sense I see this as the antithesis
6 of statements that are coming out from a
7 materialist's world view. So in that respect, it's
8 a legitimate statement.

9 Q. I am going to read you a quote from Paul
10 Nelson, which I don't know if we have it here or
11 not, but I am going to at least ask you to assume he
12 said it.

13 MR. WHITE: Just for this whole line of
14 questioning, I just object on the basis of
15 relevancy.

16 BY MR. LUCHENITSER:

17 Q. Tell me if you agree or not. There is a
18 quote from Paul Nelson from Touchstone Magazine that
19 refers to intelligent design, and the quote is, "We
20 don't have a theory of biological origins, just
21 notions and intuitions." Assuming he made that
22 statement, would you agree or disagree with that?

23 A. Similar evolutionists have made
24 statements like that. I mean, that has been a
25 criticism, my own self-criticism within the

00244

1 scientific community, is that we have just got a
2 body of just-so stories. You know? And that's a
3 problem that is recognized, that, you know, there is
4 a lot of conjecture and speculation.

5 There have been -- you know, James
6 Shapiro has said that as well. I think it is
7 implied in Carl Woese's review article that I
8 provided in my expert opinion.

9 Q. But do you think that statement would be
10 an accurate description of intelligent design
11 theory?

12 A. Read it again. Again, I don't know the
13 context.

14 Q. Let's forget about the context, because I
15 am going to be asking you these things without
16 quotes.

17 Would you agree with the proposition that
18 intelligent design does not have a theory of
19 biological origins, just notions and intuitions?

20 A. Theory of intelligent design?

21 Q. Yes.

22 A. In terms of origins, specifically
23 origins, is that what Paul is saying?

24 MR. WHITE: Would you have him read it?

25 THE WITNESS: I don't want to speculate

00245

1 on something that I don't know the context in which
2 it is being written

3 BY MR. LUCHENITSER:

4 Q. Would you agree with the following
5 statement, "Intelligent design means that various
6 forms of life began abruptly through an intelligent
7 agency with their distinctive features already
8 intact: Fish with fins and scales, birds with
9 feathers, beaks, and wings," et cetera?

10 A. Not completely, you know? No, no. I
11 mean, I think that's a pretty general statement in
12 terms of --

13 Q. Tell me if you agree or disagree with the
14 following statement, "Who or what were man's
15 ancestors? The fossils surely don't give us any
16 conclusive ancestor. Darwinists are convinced that
17 homo erectus was nearly human and directly ancestral
18 to man. Design adherents, however, regard homo
19 erectus as well as other hominids in a discussion of
20 human ancestors as little more than apes and point
21 instead to the abrupt appearance of the culture and
22 patterns of behavior which distinguish man from
23 apes."

24 MR. WHITE: I also object unless you let
25 him read that, it's unfair.

00246

1 THE WITNESS: You are asking me if I
2 agree with that statement?

3 BY MR. LUCHENITSER:

4 Q. Yes.

5 A. Not completely. I'm not a
6 paleontologist, I'm not an expert in human
7 evolution. I do find it interesting, though, that
8 every time a new fossil is found, you know, the
9 general way in which it is presented is that, wow,
10 you know, we have got to go back and rewrite the
11 evolution of man, whether it is these new fossils
12 that were found in Micronesia, these new
13 contributions, all that tells me is that every time
14 a new set of fossils are found that require a
15 modification of human evolution is that we don't
16 know a whole lot about it, okay?

17 Q. Let me ask you if you would agree with
18 the following statement, "Design proponents point to
19 a role of intelligence in shaping clay into living
20 form."

21 A. You know, again, I don't know who wrote
22 this or what context it is. Salvador Luria, who is
23 a Nobel laureate at M.I.T, you know, in terms of his
24 hypotheses of the origin of life, incorporated the
25 idea that clay was the matrix on which original life

00247

1 replicating forms originated. So even
2 non-intelligent design people look at clay as
3 playing a role in origins of life, okay?

4 Now, if that is taken right out of
5 Genesis in terms of, you know, God molded dirt or
6 clay into a human form, I don't know if that is a
7 literal interpretation. I think in the general
8 sense, since we are made of the same components of
9 the earth's crust, that it serves a purpose, that it
10 is not inconsistent with the idea that the designer
11 used materials that are available. But did he just
12 pick up a piece of clay and mold, you know, the
13 first human? I don't know.

14 Q. Let's get the context. Do you have the
15 book?

16 I am going to show you -- this is a copy
17 of the 1993 edition of Pandas and People.

18 A. Okay.

19 Q. I assume this is a book you want to keep
20 and not lose.

21 (Off the record.)

22 MR. LUCHENITSER: Is it okay if we don't
23 mark this as an exhibit?

24 MR. WHITE: That's fine. It's Pandas and
25 People, Second Edition, 1993; is that correct.

00248

1 MR. LUCHENITSER: Yes, we are looking at
2 the 1993 edition of Pandas and People.

3 BY MR. LUCHENITSER:

4 Q. If you could flip to page 77. And the
5 quote I read, "Design proponents point to the role
6 of intelligence in shaping" -- somewhere on that
7 page, maybe you could help him find it.

8 (Off the record.)

9 THE WITNESS: Yes. I mean, in the
10 context of this, you know, it is a looking at
11 ancient myths in terms of -- let me just read it.

12 "A common explanation of origins in most
13 ancient cultures was creation by the Gods. On
14 closer inspection we see most of these ancient
15 creation myths were personifications of nature.
16 Even so, in the same data from antiquity, modern
17 views of intelligent design and macro evolution find
18 their ancient roots."

19 Okay, intelligent design and macro
20 evolution find their ancient roots.

21 "Design proponents point to the role of
22 intelligence in shaping clay into living form.
23 Evolutionists, on the other hand" -- and this is
24 Salvadore Luria that I mentioned before, and Karen
25 Smith, "point to the clay itself as the stuff of

00249

1 which life is spontaneously generated by nature,
2 stuff, which most of the time, was personified as a
3 god. Those two alternative concepts of origins does
4 have long histories extending from ancient times to
5 the present."

6 Earth material is the essence of human
7 beings.

8 Q. So is it your opinion that that statement
9 that you just read accurately reflects intelligent
10 design theory?

11 A. I think it is an accurate representation
12 in terms of how we view the origin of life and man
13 from both sides, that clay is an integral part. It
14 is interesting that this is also in ancient myths
15 that, you know, anthropomorphise nature.

16 Yes, so I think they are just pointing to
17 commonalities in the role of inorganic as a source
18 of life.

19 Q. Have you ever been retained as an expert
20 witness in litigation before? Have you ever served
21 as an expert witness?

22 A. No.

23 Q. Have you ever testified about intelligent
24 design theory or about evolution in any kind of
25 public context, such as before legislative body or

00250

1 before a school board or administrative body?

2 A. From a private school board. I mentioned
3 before, when they were reviewing -- from a local
4 Christian school that was reviewing their biology
5 curriculum. On my recommendation they incorporated
6 Ken Miller's book and this book as well and got rid
7 of their -- I think it was Bob Jones University
8 curriculum that I thought was, you know, just over
9 the edge.

10 Q. So they incorporated both Ken Miller's
11 book and Of Pandas and People as --

12 A. Ken Miller's book as their primary
13 biology text. This is what I find ironic, that you
14 find most parochial schools and private religious
15 schools studying evolution intently with the
16 materials that are available that the secular
17 schools are using, and looking at it and analyzing
18 it critically. And, you know, this local Christian
19 school brings in biology professors on occasion and
20 says, "All right, you have an hour, convince us."

21 It is great, you know? I think it is
22 really a valuable tool for these kids.

23 Q. So Pandas and People is a supplemental
24 text in that school?

25 A. Yes.

00251

1 Q. Can you tell me how you first got
2 involved in this case, this litigation?

3 A. I was called up by one of the attorneys
4 at Thomas More and asked if I would provide expert
5 witness that -- I think they said Mike Behe had
6 recommended that I would be a potential witness for
7 it, and that was my contact.

8 Q. Do you remember approximately when you
9 were first contacted by Thomas More about this
10 lawsuit?

11 A. I don't know a specific date. I have it
12 on my computer, I could go back and look at my e-
13 mails and I can approximate it.

14 Q. Did you have any interactions with any of
15 the officials of the Dover School District before
16 you were retained as an expert?

17 A. No.

18 Q. Can you tell me what you did in order to
19 prepare your expert report?

20 MR. WHITE: Now, just so we are clear,
21 communications with counsel, that's all privileged
22 based on our stipulation.

23 MR. LUCHENITSER: Whatever the
24 stipulation is.

25 MR. WHITE: Right, so we are just talking

00252

1 about the face of the document, not behind.

2 THE WITNESS: Yes, I don't want to get
3 into that, I don't know what the stipulation covers.
4 I don't think it will become an issue.

5 But what did I do to prepare it?

6 BY MR. LUCHENITSER:

7 Q. Yes.

8 A. I mean, there was a deadline involved, as
9 I recall, and there wasn't a great amount of time to
10 invest. So I think I spent a total of 12 hours
11 sitting down on my computer, typing, revising,
12 thinking, you know, and then submitted it.

13 Q. So is that the total amount of work that
14 you did in order to prepare the report? Was that
15 just the time you spent writing it or --

16 A. I did it over the course of probably a
17 week and a half, but the actual time that I
18 committed to this, which I was keeping track of just
19 for remuneration aspects, was probably about 12
20 hours.

21 Q. And did you review any documents before
22 starting to write your report?

23 A. I had written my report and I consulted
24 some of the references, some of these books just to
25 clarify some of my positions, the semantics that I

00253

1 wanted.

2 Are you asking if I looked at any of the
3 other expert witness reports?

4 Q. Did you look at a --

5 MR. WHITE: Like a court file? What are
6 you talking about?

7 THE WITNESS: I had the complaint.

8 BY MR. LUCHENITSER:

9 Q. Yes, did you look at the complaint?

10 A. I looked at the complaint.

11 Q. Did you look at the answer?

12 A. The answer --

13 Q. The defendant's answer in the litigation.

14 A. I didn't spend a lot of time with it,
15 because it would say point whatever this or that,
16 and I didn't have the time to go back and look at
17 what point are they talking about: He said this and
18 it is referenced in -- you know? I didn't.

19 Q. Did you read a copy of the statement that
20 is the statement that the Dover School District
21 officials read to the students?

22 A. I did. I didn't study it, but I read it.

23 Q. Did you read any of the other expert
24 reports prepared on behalf of the defendants?

25 A. I don't recall if I had already submitted

00254

1 mine and one of the attorneys from Thomas More sent
2 me Mike Behe's report or that was just when I was
3 finishing mine up in terms of the format of how I
4 wanted it to look in terms of how this stuff was
5 being done in other reports.

6 So I don't recall. Certainly I wrote
7 this, and after I was just about done I looked at
8 Mike Behe and thought, is this the amount of content
9 that they want? Are these the subject areas that
10 are pertinent? This is my first experience, so I
11 didn't even know what the format of an expert report
12 was. I think I asked to see in terms of how it is
13 organized, do you put subheadings in it? How do you
14 reference information and journals, et cetera? So
15 it was more for format.

16 Q. After you were done with your report did
17 you review any of the other expert reports that --

18 A. I have looked at a few of them. I have
19 -- I don't know if I have all of them, but I haven't
20 had time to read them in depth.

21 Q. Do you disagree with anything stated in
22 any of the other expert reports filed on behalf of
23 the defendants?

24 MR. WHITE: Are you talking about
25 defendant experts or plaintiff's experts?

00255

1 MR. LUCHENITSER: Yes, defendant experts
2 only.

3 THE WITNESS: You mean people on my side
4 of the aisle?

5 BY MR. LUCHENITSER:

6 Q. Yes.

7 A. Not anything overtly that, you know, I
8 have a gut reaction against.

9 Q. Is there anything specific you remember
10 that you disagreed with?

11 MR. WHITE: Do you want to establish
12 which one he has looked at, if any of them?

13 THE WITNESS: Yes, I have looked at Mike
14 Behe's but I haven't read it in detail. I have Bill
15 Dembski's that I have read about half of. I agree
16 with most of what he has presented. I agree with
17 Mike's analysis of the theory and how it is just a
18 definition of a theory and how it is used in
19 different contexts.

20 Who else? I don't know. I mean -- I
21 haven't read the ones from the educators that are
22 involved.

23 MR. WHITE: Did you also ask about the
24 plaintiff's, Alex, or did you just say defendants?

25 MR. LUCHENITSER: Just the defendants.

00256

1 (Recess taken.)

2 BY MR. LUCHENITSER:

3 Q. Are you also being represented by the
4 Alliance Defense Fund in this case?

5 A. No.

6 Q. Can you tell me who is paying your fees?

7 A. I don't really know. Is it Thomas More?

8 MR. WHITE: You are talking about his
9 expert fees?

10 MR. LUCHENITSER: Yes.

11 THE WITNESS: I am assuming it is Thomas
12 More.

13 MR. WHITE: He is retained by us.

14 BY MR. LUCHENITSER:

15 Q. Let's see, now, on page one of your
16 report, somewhere you say, "Proponents of evolution
17 recognize, as they must, the significant gaps in
18 problems with the theory of evolution"?

19 A. Where are we?

20 Q. We're on page two, actually.

21 A. At the bottom of the page?

22 Q. Yes, see at the bottom of the page, the
23 last paragraph at the bottom.

24 A. Right.

25 Q. Can you tell me what gaps you are

00257

1 referring to?

2 A. In terms of the gaps in the fossil
3 record, in terms of the gaps in our understanding of
4 synchronizing geological clocks with molecular
5 clocks. These are all inherent in the articles that
6 are referenced in my report. Simon Conway Morris, I
7 mean, the whole article deals with problems of
8 evolution. Carl Woese alludes to these as well. So
9 this isn't anything that isn't in the peer reviewed
10 literature.

11 Q. When you are referring to problems, are
12 you referring to something different from gaps or
13 are you referring to the same thing? Or are you
14 referring to problems with evolution?

15 A. Problems in terms of intermediates, both
16 at the molecular and the macro stage, developmental
17 programs.

18 Let me give you an example. In a
19 quotation on page three, by an article out of Nature
20 that is co-authored by one of the expert individuals
21 on the complaint side, Robert Pennock.

22 "From the outset, Darwin realized that
23 'organs of extreme perfection and complication,'
24 and this is a quote, from Pailee, such as the eye
25 posed a difficulty for his theory. Such features

00258

1 are much too complex to appear de novo, and he
2 reasoned that they must evolve by incremental
3 transitions through many intermediate states,
4 sometimes undergoing changes in function. There now
5 exists substantial evidence concerning the evolution
6 of complex features that supports Darwin's general
7 model. Nonetheless," and this is my emphasis, "it
8 is difficult to provide a complete account of the
9 origin of any complex feature owing to the
10 extinction of intermediate forms, imperfection of
11 the fossil record, and incomplete knowledge of the
12 genetic and developmental mechanisms that produce
13 such features."

14 Q. What is the basis of your knowledge about
15 the gaps and problems with evolution that you refer
16 to?

17 A. Well, I mean, that's it. I mean, we
18 don't have --

19 Q. Is it this article?

20 A. No, I am saying the highlighted aspects
21 of Darwinian theory which are reliant upon fossil
22 records that is consistent with gradual evolution
23 are transitional forms, homology studies that can
24 trace the phylogenetic history of subcellular
25 organelles or components, genomic analysis in terms

00259

1 of comparing organisms that are related or closely
2 related and accounting for information that is not
3 present in either, genetic and developmental
4 mechanisms that produce complicated structures.

5 Q. My question is, what is your basis for
6 your knowledge about these things you have just been
7 referring to?

8 A. I am a biologist, okay? I am a molecular
9 geneticist. I have done developmental biology
10 before in terms of dissecting these complex features
11 in organelles. And I don't know any of my
12 colleagues that can come up with a defined mechanism
13 or scenario whereby they are able to appear simply
14 under the neo-Darwinian theory. Okay? There is a
15 lot of speculation and conjecture.

16 Q. Thank you. Are you aware of -- well, you
17 make a statement at the bottom of page two, "We have
18 no phylogenetic history of a single biochemical
19 pathway or subcellular organelle."

20 Are you aware of any published articles
21 that have provided such histories?

22 A. No, I mean, that's a statement by James
23 Shapiro at the University of Chicago who is a not an
24 intelligent design expert.

25 (Deposition Exhibit No. 17 marked for

00260

1 identification.)

2 BY MR. LUCHENITSER:

3 Q. We have marked as Exhibit 17 an article
4 entitled: Mitochondrial Evolution, by Michael Gray,
5 Gertraud Gurger, and B. Franz Lang. Is this an
6 article you have ever seen before?

7 A. I haven't read it.

8 Q. So if you could, look at page 1478, the
9 highlighted portion.

10 A. Right, phylogenetic relationships among
11 mitochondria and alpha-Proteobacteria.

12 Q. If this article provides -- if it is the
13 case that this article, Phylogenetic History for
14 Mitochondria, would that change your opinion that
15 you express in your report that we have no
16 phylogenetic history of single biochemical pathways
17 as a --

18 A. I don't think this is a defined
19 phylogenetic history, I think this is based on
20 sequence comparisons, and there are inherent
21 assumptions built into that system.

22 No, I don't -- I would read this, but I
23 don't think this is a definitive historical account
24 of the evolution of mitochondria. It is a
25 hypothesis based on sequence comparisons.

00261

1 Q. Let's go to page three of your report.
2 You say, "Proponents of Darwin's theory of
3 evolution," this is like after a long quote. You
4 say, "Thus, the proponents of Darwin's theory of
5 evolution assume that evolution is true, even though
6 we lack the intermediate structures, we lack
7 fossils, and we do not have adequate knowledge of
8 how natural selection can introduce novel genetic
9 information."

10 Now, when you say, "We lack the
11 intermediate structures, we lack fossils," are you
12 speaking only about microbiological systems or are
13 you also referring to fossils and intermediate
14 structures with respect to complex animals?

15 A. From a legal perspective I can see where
16 you are going, because you've established that I am
17 not a paleontologist, I am not, but this is from the
18 general scientific reading, Stephen J. Gould, other
19 people that I have read, that have acknowledged, in
20 Simon Conway Morris's article, that is really
21 rephrasing of the statement above, right?

22 What I see Lenski saying is, we know
23 evolution is true but we don't have a complete
24 account of any complex feature owing to the
25 extinction of intermediate forms.

00262

1 Let's go back, I want to clarify this
2 paper here on mitochondrial evolution. This is
3 written --

4 MR. WHITE: Just to clarify, Exhibit 17.

5 THE WITNESS: Exhibit 17. You are saying
6 this is a phylogenetic genetic history, this was
7 published in 1999. Here is Lenski and Pennock
8 saying, in 2003, that we don't have the complete
9 origin of any complex feature, which would include a
10 mitochondria, owing to the extinction of
11 intermediate forms, et cetera, et cetera.

12 So what does that mean? This is a
13 contradiction that you are -- it's in the
14 literature. This is making an assertion. I haven't
15 read this paper and come to the context of what they
16 are basing their phylogenetic history on in Exhibit
17 17.

18 But you tell me how you can have these
19 two statements in peer reviewed literature and they
20 are consistent.

21 Q. Let me ask you, the statement you are
22 quoting from the Lenski article is that he is saying
23 it is difficult to provide a complete account of the
24 origin of any complex feature. Is that the same
25 thing as saying that there is no phylogenetic

00263

1 history at all for any biochemical pathway or
2 subcellular organelle?

3 A. Combine that with other statements.
4 Again, James Shapiro, I can't remember -- I can't
5 recall the guy's name, he is a professor emeritus at
6 Colorado State University, that has also written in
7 journals, microbiology journals, stating the same
8 thing. We don't have the phylogenetic history of
9 any subcellular organelle, all we have is a lot of
10 speculation, okay? I mean, do you agree with
11 that? I guess I shouldn't ask you, you are not part
12 of this. Okay.

13 I mean, as a scientist, this is not in
14 conflict with my colleagues in terms of what we know
15 and understand.

16 Q. Let's go back to this question of
17 intermediate structures. When you say we lack
18 intermediate structures, do you mean that there are
19 no intermediate structures at all?

20 A. There are some. Those are the exception,
21 not the rule. There are individuals that are
22 evolutionists that are quoted in Simon Conway
23 Morris's article that have gone so far to account
24 for the lack of intermediates saying, well, in
25 actuality they don't exist because we have these

00264

1 hopeful monsters that can be produced by mutations
2 and homeotic genes, and we can make these quantum
3 leaps in body plans.

4 So in part, trying to account for the
5 lack of information, you hypothesize that, well,
6 they never were there in the first place, we can
7 make these grand transitional leaps based on
8 rearrangements or mutations and homeotic genes that
9 are dictating body structure and plan. Okay? In
10 part to address this problem. That's in the peer
11 reviewed literature.

12 Q. Now, when evolutionary biologists do
13 identify intermediate structures between various
14 kinds of species, aren't there always going to be
15 other intermediate structures that are missing in
16 between what has been identified?

17 A. In a sense you can play that game of
18 infinite regression. But at this point I don't
19 think it is necessary to evoke that, you know?

20 Q. And can you explain what you mean by the
21 game of infinite regression?

22 A. In other words, where did that
23 intermediate come from and where did that
24 intermediate come from, and, you know, a complete
25 lineage. We have such gaps, you know, at this point

00265

1 -- we have been searching for fossils for a pretty
2 long time, and the intermediates are the exception,
3 not the rule, and they are generally in the same
4 group of organisms. Okay, and this is driving in
5 part evolutionary biologists and it is causing
6 problems.

7 Q. What level of intermediate structures
8 would satisfy you?

9 A. I mean, I would have to think about it.
10 It is going to be a body of evidence that is going
11 to convince me. I'm not going to -- give me a true
12 phylogenetic history that is not based on
13 interpretation or that has been allowed to be
14 examined critically by people on both sides of this
15 issue.

16 Q. Is it feasible that the fossil record
17 will ever become detailed enough to satisfy you that
18 evolutionary theory is correct and intelligent
19 design is wrong?

20 A. That's speculation. I mean, on a present
21 track record, it doesn't look like it.

22 Q. And might that be because there aren't
23 enough surviving fossils to be able to make the
24 reconstruction that you would be happy with?

25 A. That's a question that implies a certain

00266

1 interpretation. Not surviving fossils, implying
2 that they were there at one time and weren't
3 preserved, or the fact that they never were there in
4 the first place. Regardless, if you don't have the
5 data, you can't make the conjecture. Okay? Whereas
6 you have to recognize that you are dealing with
7 speculation.

8 Q. Let's assume hypothetically that we are
9 not -- that science isn't going to find a whole lot
10 more fossils just because they have been destroyed,
11 because they haven't survived. How could it be
12 possible for anybody to then make a conclusion as to
13 whether evolution theory is correct or whether
14 intelligent design theory is correct?

15 A. Well, if you go by the data and you say,
16 what does the fossil record -- what is it most
17 consistent with? You know, from my understanding of
18 the fossil record, stasis is the norm, okay? Change
19 over time.

20 There is a fossil bed 40 miles to the
21 east of us in Clarkia, Idaho that you can walk out
22 there and pay five bucks to a guy that is running a
23 motor-cross field, pick up a piece of shale, crack
24 it open, and you have got magnolia leaves that are
25 so well preserved that they are still green that are

00267

1 dated at 20 million years old. You can isolate by
2 PCR mitochondrial DNA and compare it to magnolia
3 mitochondrial DNA and there isn't a whole lot of
4 difference. That's a long time.

5 So I am saying stasis -- Darwin predicts
6 that this is a gradual transition. With that
7 prediction is that there should be a gradual
8 blending of forms all across the board, and you
9 don't find that. You find, again, forms that we
10 find presently.

11 Turtles, you can go back a long time in
12 the geologic record and find things that looked like
13 turtles, trees, et cetera, insects that you can
14 identify through the species.

15 Q. Now, the statement you made about the
16 fossil record, is that based on any personal review
17 or analysis of the fossil record?

18 A. This is from my knowledge of reading that
19 I think is substantiated by peer reviewed
20 literature, by knowledge of work that I know my
21 colleagues are doing here at the University of
22 Idaho, okay? But, no, I am not a paleontologist and
23 I'm the first to admit it. I'm not an expert in
24 that field.

25 But there is public evidence, there is

00268

1 the recognition by evolutionists that they have a
2 problem. This is implicit in some of the papers I
3 have have quoted in my expert report. I don't think
4 it is an area of contention. We are missing
5 intermediates, it's a problem.

6 Q. Now, you also say in that same statement
7 we have been talking about, "We do not have adequate
8 knowledge of how natural selection can introduce
9 novel genetic information." Are you aware of any
10 scientific literature that does explain how natural
11 selection can introduce such information?

12 A. I am aware of the immune system that is
13 referenced in Exhibit 7, which we haven't discussed.
14 At one point this the exception in which you can
15 generate novel amino acid sequences in the immune
16 system, where you can scramble genes as cassettes
17 and have differential gene splicing and get
18 components of proteins that are then spliced
19 together that have different sequences.

20 Q. So is it correct, then, that natural
21 selection can introduce novel genetic information in
22 some circumstances?

23 A. That's not what I said. That's not
24 saying that natural selection produced this. In
25 fact, the immune system is a very dangerous system.

00269

1 Anytime you have this novel scrambling of DNA
2 sequences, it has got to be fairly controlled or it
3 can be a problem. I look at the immune system as an
4 incredibly engineered system that has, you know,
5 anticipatory foresight in terms of the organisms
6 that possess them.

7 (Deposition Exhibit No. 18 marked for
8 identification.)

9 BY MR. LUCHENITSER:

10 Q. We have marked as Exhibit 18 an article
11 by Manyuan Long, Esther Betran, et al, entitled:
12 The Origin of New Genes: Glimpses From The Young
13 And Old. Is this an article you have ever seen?

14 A. I haven't read this one. I would like
15 to, though.

16 Q. From the abstract in the article can you
17 tell whether you are familiar with the work
18 described in the article?

19 A. Can I read it?

20 Q. The article or just --

21 A. No, no, the abstract.

22 Q. Oh, sure.

23 A. "Genome data have revealed great
24 variation in the numbers of genes in different
25 organisms, which indicates that there is a

00270

1 fundamental process of genome evolution."

2 That's an assumption. The origin of new
3 genes. "However, there has been little opportunity
4 to explore how genes with new functions originate
5 and evolve. The study of ancient genes has
6 highlighted the antiquity and general importance of
7 some mechanisms of gene origination, and recent
8 observation of young genes at early stages in their
9 evolution have unveiled unexpected molecular and
10 evolutionary processes."

11 Okay, I would know -- if I sat down and
12 read this I could do a critique of this in terms of
13 a different interpretation from a design
14 perspective, or a limitation of the application of
15 this, I think. I am making that assumption.

16 Q. But you are not familiar with the
17 specific work that Long and Betran describes?

18 A. No.

19 Q. Now, you said -- on page four of your
20 report you say that the flagellum is the most
21 efficient machine in the universe, that's the second
22 sentence on page four, "People working on the
23 bacterial flagellum" --

24 A. Right, Howard Berg gave that in a seminar
25 at W.S.U. in 1989 in which I was in the audience.

00271

1 Q. And is Mr. Berg an expert on the
2 flagellum?

3 A. Yes, a biophysicist, he's at Harvard
4 University.

5 MR. LUCHENITSER: Let me have this
6 marked.

7 (Deposition Exhibit No. 19 marked for
8 identification.)

9 BY MR. LUCHENITSER:

10 Q. We have marked as Exhibit 19 an article
11 on Physics Today on the web. It is a feature
12 article, Motile Behavior of Bacteria, by Howard
13 Berg. And if you could flip to page six, and the
14 page number is in the lower left-hand corner of the
15 article -- I may be looking in the wrong place.

16 If you look at the first paragraph at the
17 top of the page, not the stuff in small type, the
18 paragraph starting with, "Flagellar mechanics." At
19 the end of the paragraph it says, "This scheme may
20 not be very efficient, but it works."

21 So is Mr. Berg saying that the flagellum
22 is not in fact very efficient?

23 MR. WHITE: If you would allow Professor
24 Minnich time to read this.

25 THE WITNESS: I think what he is

00272

1 referring to here is the chemotaxis process, which
2 is a random walk which is, you know, a very, very
3 primitive sensory transducing system. This isn't
4 referring to the motor itself, this is referring to
5 the mechanism in which this motor is hard-wired to
6 the chemotaxis system, which if -- and I am looking
7 at the random walk up here in terms of tracking
8 bacteria as they are taxing towards a stimulant
9 that, yes, in one sense it is inefficient because
10 you don't have, you know, a camera eye to look at
11 the environment nor the neuron capacity to process
12 that information. This is a phosphor relay system.

13 But I will add here, that this process is
14 inefficient, but given the primitiveness of it, it
15 is incredible in terms of how well fine-tuned it is
16 to the environment. Bacteria are extremely small,
17 on the order of micrometers in size, okay? They are
18 subject to brown motion, which means that just the
19 molecular vibration of the environment can have an
20 effect in terms of the movement of these organisms.

21 E. coli is faced with a problem of, you
22 know, there is probably an amino acid here that this
23 organism is chemotaxing towards. It wants to run
24 its flagella, once it is oriented in the right
25 direction, toward that source of food. So, are you

00273

1 following my argument?

2 The problem is that brown motion, over
3 the course of four seconds, is going to deflect its
4 motion 60 degrees off its original track. And that
5 if you go longer than four seconds, that your
6 direction towards what you have perceived as a
7 source of, you know, the highest concentration of
8 gradient to amino acid you want is over there, it
9 suddenly becomes irrelevant and you have been pushed
10 off course by brown motion.

11 The chemotaxis system is fine tuned so
12 that the half life of all these proteins that are
13 guiding that process is on the order of two to four
14 seconds, so that after that time period you make --
15 you know, E. coli is faced with this decision: I
16 have receptors on my surface that are looking for
17 what I want to eat, okay? I have got to take as
18 many samples as I can over the longest period I can
19 so that I can make a decision to go in that
20 direction. If I wait too long, then my decision is
21 irrelevant because I am pushed off course by brown
22 motion.

23 The system is fine tuned and extremely
24 efficient given the parameters to ensure that E.
25 coli can wipe the slate, reverse its engines,

00274

1 tumble, and then start off in a new direction.

2 Again, I haven't read this. In reaction
3 the cell body translates and rolls, so there is
4 torque with these engines that can also -- you know,
5 is a problem with aircraft engines, you know? The
6 old radial engines that the torque driving it could
7 also pitch an aircraft in the direction in which the
8 propeller is rotating, and that has a problem in
9 terms of staying on course.

10 (Deposition Exhibit No. 20 marked for
11 identification.)

12 BY MR. LUCHENITSER:

13 Q. We have marked as Exhibit 20 an article
14 by Edward Purcell from October 14, 1997. Let me
15 draw your attention to an abstract at the top in
16 smaller type which apparently was written by Berg.
17 And there is a highlighted passage there that says
18 the, "The propulsion efficiency cannot exceed 3
19 percent under any circumstances, and with more
20 realistic values he estimated a maximum of 1.7
21 percent."

22 Does that contradict your opinion that
23 the flagellum is the most efficient engine --

24 A. That's -- I am quoting Howard Berg, you
25 know, in terms of how he looked at it. I think

00275

1 looking at it holistically in terms of the fact that
2 it's a self-assembling motor, it's got all the
3 components that we find in a true engine that is
4 water-cooled, it has two directions, two gears
5 forward and reverse, you know, a true propeller, et
6 cetera, is run on battery power, in terms of the
7 fact that you can have an engine that can
8 self-assemble, that's pretty efficient.

9 In terms of the propulsion, I don't know
10 in terms of the context, I haven't read this paper.
11 So we may be talking about about two different thing
12 here. I don't want to confuse the issue. I'm not
13 sure it's fair to pull this out and talk about
14 efficiency, efficiency of what?

15 You know, one of the articles that I
16 cite, Kinoshita in Cell on page four, talking about
17 another rotary engine, and he says that the
18 efficiency of this motor, quoting directly, "If one
19 ATP is consumed per 120 degree turn, as one may
20 anticipate from the make of this motor, the
21 efficiency is nearly 100 percent, far superior to a
22 Honda V6."

23 So again, I want to clarify the context,
24 that we are talking about the bacterial flagellum.

25 MR. WHITE: For the record, the quote

00276

1 that Professor Minnich just read was on his expert
2 report, was it not?

3 THE WITNESS: Right. So, you know, I
4 would like to read this and get the context, but --
5 BY MR. LUCHENITSER:

6 Q. We can come back to that at trial.

7 You said the flagellum is water cooled,
8 can you explain what you mean by water cooled?

9 A. I mean, again, that's based on Howard
10 Berg's description of it. I mean, these organisms
11 are growing, for the most part, in a liquid
12 environment. They can be rotating at up to a
13 hundred-thousand rpm's. I don't know how much
14 frictional force or heat that generates, but it has
15 been said that they are water cooled.

16 Q. Do you know what protein in flagellum are
17 responsible for that cooling system?

18 A. No, I don't. It could be just the fact
19 that you are in a liquid environment and there is
20 water flowing freely through the membrane and this
21 is playing a part in terms of dissipation of heat.

22 Q. Okay, on page six, let's see, where is
23 it? In the middle of --

24 A. Can I clarify one thing, too? Going back
25 to this efficiency and the language that has been

00277

1 used in the past in terms of describing the machines
2 that are in discussion here.

3 I find it interesting that 10 or 15 years
4 ago these words like highly efficient, you know,
5 most efficient, you know, esoteric words like
6 beautiful, et cetera, fine tuned, well designed, in
7 the literature are now being replaced with things
8 like, "Well, this is a Rube Goldberg apparatus," or,
9 "This is sloppy," you know?

10 Mark Pstahe, in his book The Genetic
11 Switch, in describing the repressor of Landa
12 protein, said this is exactly -- you know, he says,
13 all the parameters that are required for the
14 expression of the genes he is talking about is
15 exactly what you would do to design a repressor.

16 And now, I think, getting caught by that
17 language, I find my colleagues going back and using
18 this. Now Mark Pstahe looks at Landa repressor as,
19 you know, a sloppy system, just what you would
20 expect as an undirected, unintelligent driving force
21 producing it.

22 Our knowledge of Landa repressors hasn't
23 changed, you know? But the language we are using
24 is. I find this in the literature, and it is
25 perplexing to me in terms of why suddenly people are

00278

1 changing their view. I think it is because of the
2 fact that the language that we have used to describe
3 these systems in the past is very descriptive
4 teleologically, efficiency, engineering, the same
5 language you would be describing intelligent design
6 processes.

7 Q. You say on page six, the first paragraph
8 after the quote, "The fact of the matter is that the
9 scientific evidence for real design is
10 overwhelming." Now, if that's the case, why is
11 evolution and not intelligent design not the
12 dominant scientific theory of the developing
13 science?

14 A. That's a good question. Like I said, I
15 asked my colleagues, "Given all of our admittance
16 that these things have the appearance of design, why
17 won't you even entertain the idea that it is real
18 design?"

19 And the response overwhelmingly is that
20 they don't like metaphysical implications. This is
21 a human response, it's a religious response, it's a
22 philosophical response, it's no different than
23 Einstein looking at the implications of his
24 equations and saying, whoa, the universe isn't
25 static. And that is loaded with metaphysical

00279

1 ramifications. So, you know, it is dangerous stuff.

2 Q. When you use the word overwhelming, do
3 you think you might have used too strong a word
4 there?

5 A. Oh, I am -- you know, perhaps. But
6 Francis Crick says, looking at nature you have to
7 continually convince yourself, I am paraphrasing
8 him, that what you are seeing is not designed, okay?

9 Why? Why do you have to convince
10 yourself that what you are seeing is not designed?
11 Maybe it really is. Why aren't you willing to
12 entertain that idea and why isn't it a legitimate
13 avenue of inquiry? Why can't we develop mechanisms
14 to differentiate real design from the products of
15 natural laws?

16 Q. Is it correct that you have done some
17 experiments on the Touran shroud?

18 A. Oh, no. I was --

19 Q. You helped design experiments; is that
20 correct?

21 A. I was kind of an informal -- I wouldn't
22 even say a consultant, an advisor to a guy that was
23 interested in coming up with a natural explanation
24 for what people have assumed is a supernatural
25 product, and just illustrated or outlined, in the

00280

1 course of about 45 minutes, Well, if this is your
2 hypothesis, that you can take a painted piece of
3 glass and put it over a piece of linen and with the
4 sun rotating across the horizon, can imprint an
5 image that -- you need to do controls, you know?
6 You need do -- if you think the sun, as it is
7 changing across the horizon, is blending the image,
8 do the same experiment and abase it with a sun
9 lamp. Do it horizontally, et cetera. And that was
10 my limit in those experiments.

11 Q. Did those experiments in any way
12 influence your thinking about intelligent design
13 theory?

14 A. No, no. But I think it is -- again, you
15 are looking at a phenomenon and asking the question,
16 is this real, is this a supernatural event, or is
17 there a natural way that you can explain it? And
18 I'm all for saying, all right, this guy has a theory
19 for a natural explanation that nobody has looked at
20 before and do it. You know, I don't have a problem
21 with that.

22 Q. Let's go back to page one of your report.
23 And you say --

24 A. Can I clarify one thing? I was in Iraq
25 when these experiments were actually performed and

00281

1 had no input other than that.

2 Q. Let's go to page two, the top of page
3 two, the third full sentence: "Evolution is such a
4 broad discipline that it has in reality played only
5 a minor role in experimental science."

6 A. Carl Woese says that, Simon Conway Morris
7 also, you know, refers to that in his paper, and
8 these are Microbiology and Molecular Biology reviews
9 and the other one is in Cell.

10 Q. Are those two papers the primary basis of
11 that statement that you make there?

12 A. No, I mean, again, it goes back to my own
13 experience. I have been a contributor to my
14 discipline. I never once took a course in evolution
15 that has been required. I haven't gone to the bench
16 and used any principle of evolution in designing and
17 carrying out an experiment, nor, when I ask my
18 colleagues, they haven't either.

19 Q. Now, did the scientific theory of
20 evolution play any role in the discovery of
21 heredity?

22 A. It would have been found regardless of
23 whatever paradigm was invoked. The question -- you
24 know, who discovered heredity and when was that
25 discovered? In the eighteen-sixties, the same time

00282

1 Darwin was writing his book, Gregor Mendel was doing
2 his experiments on peas and inheritance in peas. He
3 is a Catholic priest. So, no, he didn't know about
4 evolution.

5 Q. What about the discovery of genes, did
6 the theory of evolution in any way aid in that
7 discovery?

8 A. I think retrospectively. But again, this
9 was a question, a major question that was driving
10 biology, you know, in terms of what is the nature of
11 the gene, what is life? Schroedinger's book as a
12 physicist asking, "Can we describe inheritance in
13 chemical and physical properties?" It doesn't say
14 anything whether or not it was an evolved entity or
15 not.

16 Q. Does the scientific theory of evolution
17 play any role in medicine?

18 A. I teach in the medical program here, you
19 know, for med students from Idaho that are in the
20 University of Washington program. So we have 20
21 slots, W.S.U. -- or Washington has 20 slots. So I
22 teach infectious disease to close to 40 medical
23 students.

24 I am not aware that evolution is an
25 integral part of their scientific training. We can

00283

1 use evolution studies in terms of designing of
2 molecules or therapeutic agents, like protease
3 inhibitors using a random type of synthesis of amino
4 acids or RNA zip codes for amino acids and get
5 something that sticks to those proteins.

6 But that's kind of due to the fact that
7 we don't now have the properties whereby we can
8 predict the three dimensional structure of proteins
9 and actually go to the -- or are we starting to the
10 point where we can actually go to the computer
11 monitor and call up these structures and model
12 another protein and how it will interact.

13 Q. Is the scientific theory of evolution
14 important to the development of the antibiotics or
15 to doctors' decisions as to when antibiotics should
16 be prescribed?

17 A. I think, you know -- well, I address part
18 of that in my expert report in the terms of
19 antibiotic resistance as a paradigm for evolution.
20 I think because there is such a strong fitness cost
21 associated with spontaneous mutations that can bring
22 about antibiotic resistance, that long ago we should
23 have instituted a regimen where you introduce the
24 antibiotics for a given time period on a national
25 and international level and then remove them before

00284

1 resistance can present itself in the compensatory
2 mutations necessary to give that organism in the
3 niche of a mammalian host the ability to compete.
4 Okay?

5 So I think there are components that are
6 involved in micro adaptation and looking at these
7 things from a design perspective that could have
8 been implicated long ago.

9 In part I think this is where evolution
10 can impede science, because you look at antibiotic
11 resistance, it appears, what are we going to do?
12 We've got to go get another drug?

13 No, I think you could pull things off,
14 recognize there is a fitness cost with it before
15 these compensatory mutations then appear locking
16 that organism into that environment and maintain the
17 use of these antibiotics for a longer period of
18 time.

19 (Off the record.)

20 BY MR. LUCHENITSER:

21 Q. Can natural selection and random
22 mutation, can those processes improve organisms or
23 can they only lead to the degeneration of organisms
24 or design forms?

25 A. Can natural selection lead to the

00285

1 improvement of organisms or only the degeneration of
2 organisms? I think you will find examples of both.
3 If I can clarify that? Again in my
4 report, there is a hypothesis in biology in
5 evolutionary circles in terms of Meuller's ratchet.
6 A mutation has a cost that is associated with it,
7 and it, under given conditions, inhibits the
8 organism's ability to change to differing
9 environmental insults or changes. We can
10 demonstrate that in the lab.

11 Q. Let's go to page three, and there you are
12 discussing something, you discuss orally a paper by
13 Lenski. Let me pull out the paper I think you are
14 relying on.

15 (Deposition Exhibit No. 21 marked for
16 identification.)

17 BY MR. LUCHENITSER:

18 Q. Now, we have marked as Exhibit 21 a paper
19 by Lenski, Winkorth, and Riley called: Rates of DNA
20 Sequence Evolution in Experimental Populations of
21 Escherichia coli During 20,000 Generations.

22 And in your report you -- well, in your
23 report you characterize the paper as to --

24 A. This isn't the same one that I am
25 referencing.

00286

1 Q. I think you might have had a -- the
2 reference might have been -- so we don't spend time
3 on this, we pulled the paper that cited it here and
4 it didn't seem to be the paper describing these
5 experiments, this seems to be a paper that actually
6 describes the experiments.

7 A. I'd have to go back and check that.

8 Q. But on page 506 of this paper it says, at
9 the end of the paragraph that carries over from page
10 505, so the first paragraph on 506 there is the
11 conclusion that, "The average population has
12 accumulated fewer than 10 synonymous substitutions
13 in its genome during 20,000 generations."

14 And in your report I believe you said,
15 "The admitted results of these experiments are that
16 it is remarkable how little change does occur."

17 What is your basis for making the
18 judgment that 10 changes in 20,000 generations is a
19 small amount?

20 A. Well, I mean I am extrapolating from our
21 perspective, what is 20,000 generations in human
22 experience? 20,000 times 20 years average
23 generation, 400,000 years. I mean, in terms of the
24 evolution of man over that time period, it is pretty
25 significant.

00287

1 Q. How long is bacterial generation?

2 A. Twenty minutes.

3 Q. So if there is a --

4 A. I don't know. I mean, the optimum
5 generation for E. coli Saccharomyces is going to be
6 longer. What are we talking about here? E. coli,
7 okay.

8 Q. So if you have 10 substitutions every 20
9 generations couldn't that add up to a huge change
10 over millions of years?

11 A. Wait a minute, this is over 20,000
12 generations you have 10 mutations? Clarify what you
13 just said.

14 Q. Yes, based on this conclusion, over
15 millions of years couldn't that rate of change add
16 up to very substantial changes in the population of
17 bacteria?

18 A. That is speculation in terms of how many
19 mutations can be tolerated in this organism. You
20 know?

21 Q. Have you done any analysis independently
22 of what kind of change that rate of -- what kind of
23 changes in the population can be produced by that
24 rate of change over --

25 A. Well, you can run out the math and say,

00288

1 okay, I can have, you know, what, 50,000, 100,000
2 mutations, but that's irrelevant in terms of what
3 you are going to have and what E. coli can tolerate
4 and how many genes are going to, you know, be
5 involved in this process.

6 My point is, over 20,000 generations
7 under these conditions, you don't have a lot of
8 change, and my interaction with people that are
9 doing these types of experiments are, I think
10 sometimes over-interpreted.

11 Frank Rosenzweig, who was in this
12 department and who is now in Montana, has been doing
13 these experiments -- I don't know if he came out of
14 Lenski's laboratory or, you know, a laboratory as a
15 post doc doing similar things, where you can put
16 Saccharomyces cerevisiae under stress conditions
17 where there are low levels of glucose, run it out to
18 20,000 generations and ask what happens. Well, you
19 see an efficiency the organism to grow on these low
20 concentrations. You get gene amplification for key
21 genes in the pathway that are involved in either the
22 enzymatic breakdown or the transport in.

23 But the question remains, all right, add
24 glucose back to point 1 or point 2 percent and what
25 happens to your changes? I would predict that you

00289

1 are going to recombine them back out if you have any
2 amplified genes. And this is what happens in
3 bacterial systems.

4 So we have changing environments. Our
5 experience, when we are doing these experiments in
6 the real world, are examining under natural
7 conditions that you are fluctuating across a mean.
8 You can have selection over a time period, but as
9 environmental conditions change, you go back to a
10 base line. You are always fluctuating around a
11 mean. This is the experience of the Grants in the
12 Galapagos Island study with Darwin finches.

13 Again, this is the type of experiment
14 that I think is disingenuous to the argument. You
15 can show antibiotic resistance overnight in
16 bacteria. You can show mutations conferring
17 difference in pigmentation in moss, and then you ask
18 the students, speculate over millions of years these
19 gradual processes are occurring and what will happen
20 to that organism?

21 Well, yes, I mean, you can say given that
22 there is no cost to mutations, that I can go from E.
23 coli to a mouse, right? But in actuality, that's
24 extrapolation.

25 Q. In your report, primarily on page seven

00290

1 and also starting at the bottom of page six and some
2 other places, you purport the proposition that
3 techniques essential to design engineers and not the
4 theory of evolution have produced the vast inroads
5 we have made in our understanding of the cell.

6 A. Right.

7 Q. And do I understand correctly that this
8 is -- your claim is based on the experimental
9 processes that molecular biologists use to figure
10 out how cells work where they selectively disable
11 genes?

12 A. Right, I mean, this is what Carl Woese's
13 complaint is. We have ignored evolution -- there
14 are scientists that have looked at evolution as
15 being inconsequential or irrelevant to the study of
16 biology. The process that produced this tremendous
17 revolutionary understanding of the cell is a reverse
18 engineering process. That is consistent with the
19 design hypothesis.

20 Q. Now, how is intelligent design theory
21 helpful to people who conduct these experiments?

22 A. I mean, it is an engineering process,
23 just like going into a shop and looking at a motor,
24 or something, and you are not quite sure how it
25 works. You don't have the blueprints, you start

00291

1 pulling pieces off and asking how does that affect
2 function, all right?

3 Q. But once someone understands this
4 technique, this experimental technique, what does
5 knowing about intelligent design theory add to their
6 abilities as a biologist?

7 A. You ask me. Now, Bruce Alberts, in
8 another paper that I submitted as part of my expert
9 report, says that, "Design engineering principles
10 should be incorporated into our college curriculum
11 for biology students." Because we dissect these
12 organisms, we are going to ask the next series of
13 major questions in terms of how these machines
14 interact. That is very, very similar to how a
15 design engineer looks at the interaction and
16 optimization of machines that are all functioning in
17 concert. All right?

18 So this is my question that I bring up.
19 If we are going to require design engineering as
20 part of our curriculum, are we going to benefit from
21 that as a discipline? Yet we have ignored the
22 incorporation of evolution. I wasn't required to
23 take it. Very few people that I know of in my field
24 have been required. Design has a lot to offer in
25 terms of understanding biological processes and how

00292

1 these consortium of molecular machines are working
2 in the cell.

3 Q. On page three, at the bottom of page
4 three, The last paragraph, you use the term apparent
5 design?

6 A. Right.

7 Q. Is that a scientific term?

8 A. That's taken from Dawkins' book: The
9 Blind Watchmaker.

10 Again, he poses the question, "All
11 biologists agree there is design in nature. Is it
12 real design, the product of intelligence, or is it
13 only apparent design that we can explain by natural
14 law and time, chance, and necessity?"

15 So apparent design looks like design but
16 it's not really design, nature can do it in an
17 unintelligent process.

18 Q. Does the term apparent design have
19 scientific content or is that something just a lay
20 person can conclude?

21 A. No, I think it has scientific content.
22 This is the thing that evolution has to deal with.
23 You know, we all recognize that there is design in
24 nature, and I think the evidence is overwhelming
25 that it is design. It has always been an integral

00293

1 part of natural history throughout recorded history
2 until Darwin's theory, and, you know, we are in a
3 unique time period where the materialists' paradigm
4 is dominant.

5 But this has been a question going back
6 to the Greeks, you know? Is the eye a product of
7 nature by itself or is there a designer?

8 But it is a real question and there are
9 two answers to that question. Why do we exclude one
10 avenue of inquisition? And in my view, recognizing
11 that can have consequence in the progress of
12 science?

13 Q. Can you identify something that exhibits
14 apparent design but that you believe was not in fact
15 designed by intelligent causes?

16 A. I think there are examples that you can
17 look at. The Man Mountain in Vermont, or whatever,
18 that is part of their state symbol. You look at it
19 from the side, it looks like the profile of a face.
20 But you can go up to it and look at it from a
21 different facet and see that it is really -- you
22 know, that image disappears, it's a product of wind
23 and erosion over time.

24 Similar things in terms of looking at the
25 surface of Mars right back in the twenties and

00294

1 thirties, it looked like there were canals and it
2 was evidence that there was a past civilization or
3 there were aliens living there. But from our
4 perspective we can see that this is also the product
5 of natural law.

6 If you look at Mount Rushmore, I think
7 Bill Dembski uses that example, and there is no
8 question because there is specificity. We
9 recognize the profile of Teddy Roosevelt or George
10 Washington or Jefferson from photographs and we can
11 say that's real design.

12 All right, the same principles can be
13 involved in application to systems that are under
14 contention.

15 (Off the record.)

16 MR. LUCHENITSER: Okay, I am going to
17 wrap it up, I don't have the time to go any further.

18 (Deposition concluded at 6:00 p.m.)

19 (Signature requested.)

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00295

1 CERTIFICATE OF SCOTT MINNICH, Ph.D.
 2 I, SCOTT MINNICH, Ph.D., being first duly
 3 sworn, depose and say:
 4 That I am the witness named in the foregoing
 5 deposition consisting of pages 1 through 294; that I
 6 have read said deposition and know the contents
 7 thereof; that the questions contained therein were
 8 propounded to me; and that the answers therein
 9 contained are true and correct except for any
 10 changes that I may have listed on the change sheet
 11 attached hereto.

12 Dated this _____ day of _____, 2005;

13
14

 SCOTT MINNICH, Ph.D.

15

SUBSCRIBED AND SWORN to before me this _____
 16 day of _____, 2005

17
18

 NAME OF NOTARY PUBLIC

19

NOTARY PUBLIC FOR _____

20

RESIDING AT _____

21

MY COMMISSION EXPIRES _____

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00296

1 REPORTER'S CERTIFICATE
 2 I, NEIL O. COOLEY, Certified Shorthand
 3 Reporter, do hereby certify:
 4 That the foregoing proceedings were taken
 5 before me at the time and place therein set forth,
 6 at which time any witnesses were placed under oath;
 7 That the testimony and all objections made
 8 were recorded stenographically by me and were
 9 thereafter transcribed by me or under my direction;
 10 That the foregoing is a true and correct
 11 record of all testimony given, to the best of my
 12 ability;
 13 That I am not a relative or employee of
 14 any attorney or of any of the parties, nor am I
 15 financially interested in the action.
 16 IN WITNESS WHEREOF, I have hereunto set my
 17 hand and seal this 3rd day of June, 2005.

18
19

20 NEIL O. COOLEY, C.S.R. # 328
Notary Public
21 816 Sherman Ave., Suite 7
22 Coeur d'Alene, Idaho 83814
My Commission Expires 02/25/08.
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24
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