

IN THE UNITED STATES DISTRICT COURT
FOR THE MIDDLE DISTRICT OF PENNSYLVANIA

TAMMY KITZMILLER, et al :
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DOVER AREA SCHOOL DISTRICT, :
et al :
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CASE NO.
4:04-CR-002688

TRANSCRIPT OF PROCEEDINGS
BENCH TRIAL

MORNING SESSION

BEFORE: HON. JOHN E. JONES, III

DATE : October 24, 2005
9:09 a.m.

PLACE : Courtroom No. 2, 9th Floor
Federal Building
Harrisburg, Pennsylvania

BY : Wendy C. Yinger, RPR
U.S. Official Court Reporter

APPEARANCES:

ERIC J. ROTHSCHILD, ESQUIRE
WITOLD J. WALCZAK, ESQUIRE
STEPHEN G. HARVEY, ESQUIRE
RICHARD B. KATSKEE, ESQUIRE
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For the Plaintiffs

PATRICK T. GILLEN, ESQUIRE
RICHARD THOMPSON, ESQUIRE
ROBERT J. MUISE, ESQUIRE
For the Defendants

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I N D E X T O W I T N E S S E S

FOR THE DEFENDANTS DIRECT CROSS REDIRECT RECROSS

Steve William Fuller (on qualifications)

By Mr. Gillen 3

Steve William Fuller

By Mr. Gillen 34

1 THE COURT: All right. Good morning to all.
2 And we are going to take testimony out of order, is that
3 correct?

4 MR. GILLEN: That's correct, Your Honor.

5 THE COURT: Okay. Are you prepared? Then
6 you may proceed.

7 MR. GILLEN: Thank you, Your Honor. The
8 defense calls Dr. Steve Fuller.

9 Whereupon,

10 **STEVE WILLIAM FULLER**

11 having been duly sworn, testified as follows:

12 COURTROOM DEPUTY: If you'll state your name
13 and spell your name for the record.

14 THE WITNESS: My name is Steve William
15 Fuller. S-T-E-V-E. W-I-double L-I-A-M. F-U-double
16 L-E-R.

17 **DIRECT EXAMINATION**

18 **ON QUALIFICATIONS**

19 BY MR. GILLEN:

20 Q. Good morning, Dr. Fuller.

21 A. Good morning.

22 Q. We've brought you here to offer an opinion on
23 behalf of the Defendants in this action, and I'd like to
24 briefly introduce you and your academic credentials to
25 the Court. Would you please give us your current

1 position of employment?

2 A. I'm a professor of sociology at the University of
3 Warwick in the United Kingdom.

4 Q. What is the standing of the University of Warwick
5 as in the British education system?

6 A. It's normally regarded as one of the top five
7 research universities in Britain, and we do have a
8 national ranking system, so this is pretty consistent.

9 Q. Do you have a chair at that university?

10 A. Yes, I do. I've had that since 1999.

11 Q. And what does it mean to have a chair?

12 A. Well, in the United Kingdom, only about 10 to 15
13 percent of academics are full professor, which is what a
14 chair amounts to. And I've held a chair in that sense
15 since 1994, since moving to the United Kingdom. So I
16 was also a chair at the University of Durham before
17 then.

18 Q. Let's take a brief look at your educational
19 background. Where did you do your undergraduate work?

20 A. I did my undergraduate work at Columbia
21 University in New York, and I graduated summa cum laude
22 in 1979.

23 Q. After that, did you go on for further study?

24 A. Yes, I won a Kellett fellowship to Cambridge
25 University, which was my first trip to the United

1 Kingdom. That was in 1979. And I was there for two
2 years. I earned a Master of Philosophy and then went on
3 and did a Ph.D. at the University of Pittsburgh, which I
4 completed in 1985.

5 Q. And what is the standing of the University of
6 Pittsburgh as it relates to your academic pursuits?

7 A. My Ph.D. is in history and philosophy of science,
8 and the University of Pittsburgh is probably the best
9 department, certainly in the United States, and probably
10 in the world.

11 Q. Okay.

12 MR. GILLEN: Your Honor, may I approach the
13 witness?

14 THE COURT: You may.

15 MR. GILLEN: Thank you.

16 BY MR. GILLEN:

17 Q. Steve, I've just given you a copy of your CV,
18 which is Defendants' Exhibit 243. I'd like you to take
19 a look at that, and I'm going to ask you a little bit
20 about your credentials. As we go on, let me ask you,
21 have you been a visiting professor at other
22 institutions?

23 A. Yes, at several different countries, in fact,
24 including Sweden, Israel, Japan, and, of course, I've
25 been back in the United States as well.

1 Q. In terms of your -- let's take a look, a brief
2 look at your publications. Can you give us an idea in
3 general for the number and kind of your academic
4 publications?

5 A. Well, roughly speaking, I have 200 published
6 articles or book chapters, vast majority of which have
7 been peer reviewed. And also, I have a lot of book
8 reviews and incidental pieces, including pieces in the
9 media. And this has been over the last 20 years.

10 And in terms of books, I have -- well, nine books
11 actually published at the moment. There will be two
12 more coming out by the beginning of next year. And
13 altogether, my works, one sort or another, have been
14 translated into about 15 languages.

15 Q. Have you given academic presentations and talks?

16 A. Yes. I have given them throughout the world, 500
17 maybe altogether. They are listed in the curriculum
18 vitae. They've been on every continent. Many keynote
19 addresses in a wide variety of fields. Yeah.

20 Q. How many countries approximately?

21 A. About 25 to 30.

22 Q. I'd like to draw attention to two elements of
23 your CV. I notice that you received a post-doc from,
24 was it the National Science Foundation?

25 A. Yes, I was the first National Science Foundation

1 post-doctoral fellow in history and philosophy of
2 science in 1989, and that was at the University of Iowa.

3 Q. You mentioned history and philosophy of science.
4 What was your nature of your work in that post-doctoral
5 fellowship?

6 A. Well, I was working on the rhetoric of science,
7 and that is to say, the means by which science is made
8 persuasive for larger public social audience, and they
9 have a program there. And the idea was basically to
10 bring scholars into places where they would have some
11 kind of synergy.

12 Q. Then in terms of firsts, I note you were also the
13 first research fellow in the public understanding of
14 science at the United Kingdom's Economic and Science
15 Research Council?

16 A. Social Research Council.

17 Q. Thank you. What did that position entail?

18 A. Well, the United Kingdom has been very much in
19 the vanguard of public understanding of science; that's
20 to say, the need to study the role of science in society
21 and how people perceive it. And I was the first fellow
22 in this while I was at the University of Durham.

23 And during that time, I ran a global cyber
24 conference where people around the world were able to
25 discuss matters having to do with the, you know, their

1 perceptions of science and forth. And a lot of
2 different issues got raised in that context.

3 Q. You mentioned peer review. Do you participate in
4 that process?

5 A. Yes, very heavily. In fact, I've just about peer
6 reviewed anything you could peer review. I mean,
7 people, books, articles. In my CV, I list -- I've peer
8 reviewed for about 50 journals. I mean, at the moment,
9 while I'm here I'm supposed to be peer reviewing eight
10 articles, which I'm not being able to get to.

11 And these are in a wide range of disciplines,
12 mostly in the humanities and social sciences, but there
13 have been a couple of occasions in the natural sciences
14 where I would be a peer reviewer, having to do with
15 issues in the history, philosophy, or sociology of
16 science that would arise in those adjourns.

17 I also peer review for academic publishers both
18 in Britain and the United States. And I also peer
19 review grant applications, including still in the United
20 States, as well as in Britain for the European Union and
21 for Australian and Canadian Research Councils. I
22 recently chaired the International Advisory Board that
23 basically signs off on peer review grants for the
24 Academy of Finland, and -- yeah, that about sums it up,
25 I suppose.

1 Oh, also not to mention tenure and promotion
2 cases which are, in a sense, kind of, of that kind as
3 well academically.

4 Q. You've mentioned that your work is in philosophy
5 and the history of science. I take it that work started
6 with your Ph.D. dissertation?

7 A. That's correct. Yes.

8 Q. Tell us about that briefly.

9 A. My Ph.D. at the University of Pittsburgh was done
10 under the supervision of J.E. a/k/a Ted McGuire, James
11 Edward McGuire, who's probably America's leading expert
12 on Sir Isaac Newton's, the relation between Sir Isaac
13 Newton's science and his religious beliefs.

14 I mean, my Ph.D. wasn't on that topic
15 specifically, but I took a lot of courses with regard to
16 that and have followed that up in many respects. But
17 the Ph.D. itself was on bounded rationality in a legal
18 and scientific decision making. And there I was --

19 Q. I'm sorry. Tell us, just give us an idea for
20 what that bounded rationality means?

21 A. Bounded rationality is an expression from Herbert
22 Simon, and it has to do with basically making decisions
23 under conditions of material constraints; so whether
24 we're talking about resource constraints, time
25 restraints, so forth.

1 For Simon, who was a Nobel Prize winner in
2 economics and originally trained as a political
3 scientist, this was kind of the, main kind of reasoning
4 that was involved in a field that he called the sciences
5 of the artificial, which was meant to be a kind of
6 universal science of design, and in which case, one
7 could, as it were, interpret all sorts of issues that
8 wouldn't be normally thought of as designed based issues
9 as designed based ones.

10 Q. Do you see that work you did on bounded
11 rationality as having relevance to this case?

12 A. Yes, indeed, because it seems to me that one of
13 the things that's at stake here is the idea that
14 intelligent design, as it were, is something more than
15 just a kind of a fig leaf for the idea of God or some
16 other kind of religious entity.

17 And the point here about Herbert Simon, who has
18 no very clear, no theistic views whatsoever, is that he
19 actually thought it was possible to have a universal
20 science of design, and that was what the sciences of the
21 artificial were about. And bounded rationality was a
22 key kind of inference and form of reasoning within that.

23 Q. Let me take a brief look at some of your books.
24 And just, we'll briefly describe the subject matter and
25 how it bears on your expertise. The first book I see

1 listed is Social Epistemology. Would you briefly
2 describe the subject matter of that text?

3 A. Yes. Social Epistemology, it's not a phrase that
4 I coined, but in the sense I'm most closely associated
5 with it. It was the title of my first book. It
6 basically kind of lays out the foundations for the kind
7 of work I currently do, which has to do with looking at
8 the social foundations of knowledge, as the title
9 indicates, both from an empirical and historical
10 standpoint, but also what you might say, normative in
11 policy standpoint.

12 Given what we know about the nature of knowledge
13 and how it's developed, what sorts of policy should we
14 be setting for it, and how, and for whom. And that's
15 the general scope of the book. And --

16 Q. I'm sorry. Does that book relate to some of the
17 issues in this case?

18 A. Yes. The one chapter of my Ph.D. that I ever
19 published is, in fact, a chapter of this book. And it's
20 on consensus formation in science. And one of the
21 things that I address there, which I do think is
22 relevant to the case, is how exactly does consensus form
23 in the scientific community.

24 Given that there are many scientists working in
25 many different locations, how does one get a sense that

1 there is a dominant theory or paradigm operating at any
2 given point. And my view on this, which I developed,
3 is, in fact, there is never -- it's very rare to
4 actually find a decision point where you say, well, some
5 crucial test has been done, and this theory has been
6 shown to be true, and this one has been shown to be
7 false.

8 But rather, what you have is kind of a
9 statistical drift in allegiances among people working in
10 the scientific community over time, and especially if
11 you add to it generational change. What you end up
12 getting is kind of a, what Thomas Kuhn would call, a
13 paradigm shift; that is to say that, where over a
14 relatively short period of time, simply by virtue of the
15 fact that the new people come in with new assumptions
16 and new ideas, that you actually do get a massive shift,
17 but not necessarily because there's ever been any
18 decisive moment where someone has proven one theory to
19 be true and another theory to be false.

20 THE COURT: Wendy, is he going too fast?

21 COURT REPORTER. Yes.

22 THE WITNESS: I'm sorry. My apologies.

23 THE COURT: I sensed that. A little slower.
24 And it's important that we get a good record here, so
25 just take the pace down.

1 MR. GILLEN: I warned him, Your Honor.

2 THE WITNESS: I'm sorry. My apologies, Your
3 Honor.

4 THE COURT: That's all right.

5 MR. GILLEN: It's just part of the process.

6 THE COURT: I'm trying to help Wendy out.

7 BY MR. GILLEN:

8 Q. Let's take a look at your second book, Philosophy
9 of Science and Its Discontents. Briefly describe, if
10 you would, the subject matter of that text?

11 A. Yes. This is a book, as the title may suggest to
12 you, it's relatively critical of the current state of
13 the philosophy of science. But one of the -- I guess
14 the key thing, as far as this case is concerned, that is
15 of interest, is that I very strongly identify myself as
16 being a philosophical naturalist.

17 Q. And if you would just briefly explain what that
18 means?

19 A. Well, a naturalist basically is someone who
20 believes that everything that happens in reality, as it
21 were, can be understood as part of the natural world.
22 And more specifically, that can be understood in terms,
23 at least in principle, in terms of the methods of the
24 natural sciences.

25 And that includes human, social, life as well.

1 That's the general perspective that naturalism offers.
2 And I identify specifically with that view in the book,
3 and I haven't retracted it either.

4 Q. Well, let me ask you, does that philosophical
5 disposition you've described relate back to your work
6 with Newton?

7 A. Well, I mean, the issue here -- not in a very
8 direct way actually. But it does relate to the idea of
9 what happens over time regardless of where scientific
10 beliefs come from, that there is a tendency, in fact, to
11 be assimilated into this naturalistic view.

12 Q. Does it speak to science and the nature of
13 science?

14 A. What does?

15 Q. Your text, Philosophy of Sciences --

16 A. Yes, it does. Yes. See, one of the problems
17 that I argue about in the book is that there's a sense
18 in which, if we're going to understand the nature of
19 science, we have so sort of study it naturalistically.
20 One of the consequences of that may be that we find out
21 things about the nature of science that we didn't quite
22 realize were true.

23 And one conclusion that I think is very relevant
24 to this case is that, ironically perhaps, from a
25 naturalistic standpoint, if you study how you actually

1 come about to a culture or a society that thinks
2 seriously about scientific questions and the way that
3 we're used to, you may have had to start off with
4 something like a monotheistic standpoint that, that may,
5 in fact, be a natural fact about the way science
6 develops. And that is a point that I first raise in
7 that book and then subsequently develop.

8 Q. Let's look at your next book, Philosophy,
9 Rhetoric and the End of Knowledge. Would you briefly
10 describe what that text addresses?

11 A. Well, that one has to do again, as the title
12 suggests, with the rhetorical character of science. And
13 here, I think one has to understand rhetoric as kind of
14 the arts and sciences of persuasion. And I'm talking
15 about this here not only in terms of, as it were, how
16 science or organized bodies of knowledge make themselves
17 persuasive to the larger society, but I'm also talking
18 about how scientists amongst themselves persuade each
19 other to be part of a common group or a common paradigm
20 that move together despite perhaps some internal
21 disagreements.

22 And one thing I would say that is relevant to
23 this case from this book is that, some concepts from
24 this book have, in fact, been inspirational for people
25 who have been writing about the rhetoric about how the

1 neo-Darwinian synthesis was forged in the middle third
2 of the 20th century, because that is an example of where
3 there's been a lot of strategic ambiguity and suppressed
4 disagreements among people operating in many various
5 disciplines in order to move forward with this general
6 picture that the neo-Darwinian synthesis puts forward.

7 Q. Does that text speak to the science, non-science
8 boundary?

9 A. Yes, in the sense that this always has to be
10 negotiated. It is, in fact, very easy, as it were, for
11 things to fall out that, in a sense, the boundary
12 between science and non-science isn't something one can
13 ever take for granted. It is actively being negotiated
14 at all times because there are all kinds of people who
15 are trying to make claims that what they're doing is
16 scientific.

17 Insofar as science is the most authoritative body
18 of knowledge in society. So in that respect, there's a
19 kind of policing, you might say, and an occasional
20 negotiation of the boundary that takes place.

21 Q. How about your next book, Science. Give us an
22 idea for the subject matter of that text.

23 A. Well, that book, in a way, really gets, I think,
24 very close to the heart of the issues. This is a book
25 that, in fact, I developed a part -- from my

1 undergraduate teaching in Britain. It's been published
2 both in Britain and the United States.

3 And the idea here is, I basically look at what is
4 the concept of science from a social standpoint. So
5 this is a book in a series called Concepts in the Social
6 Sciences. And one of the points that I make very much
7 up front is that, if you want to identify something as a
8 science, it's going to be very difficult to identify it
9 purely in terms of what the practitioners do, okay,
10 because, in fact, if you look at the various fields that
11 we normally call science, ranging from physics to
12 chemistry to biology and including many of the social
13 sciences and so forth, people are doing vastly different
14 things even within the disciplines themselves.

15 So there's a sense in which one can grant that
16 there's a lot of technical expertise required of people
17 who do science and get trained in science, but that in
18 itself does not explain the thing being science.
19 There's something in addition. Okay. And that has to
20 do with the way in which this body of knowledge called
21 science relates to the larger society.

22 And in a sense, the question then becomes, how
23 does science establish this kind of authority? And it's
24 in this context that issues like testability, some of
25 the issues that have been arising in this trial, are, in

1 fact, quite important and, in fact, then serve as a kind
2 of umbrella notion for understanding the way in which
3 vastly different practices are relating to the larger
4 society.

5 Q. Your next text is the Governance of Science.
6 Give us an idea of the subject matter of that text.

7 A. Well, The Governance of Science again, as the
8 title suggests, addresses sort of the political
9 structure of science, you might say, and the occasion
10 for it. And this is something I think that would be
11 very familiar to people who are in the kinds of fields I
12 operate in.

13 There has been a kind of, you might say, a shift
14 in the burden of proof with regard to the way in which
15 one defends the value of science in the post Cold War
16 era. There's a sense in which the, if you look at the
17 Cold War era, that was the period where science,
18 especially in this country, in the United States, was
19 very much centrally funded, where there were national
20 agendas, where it was seen as very obviously a bowl work
21 of national security.

22 And, in fact, in a sense, the Cold War was being
23 conducted as a race between the U.S. and the Soviet
24 Union, kind of at a surrogate level, as a science race.
25 But now with the end of the Cold War, there's kind of an

1 open question about what the value of science is.

2 So there's been a tendency to devolve funding
3 away from the central authorities, from the Government.
4 And then the question becomes, okay, if we're not
5 worried about science as a bowl work to national
6 security, why should we be supporting science, and
7 should the state be supporting science, or should it
8 just be completely devolved to private authorities? And
9 that's kind of the central problem of the book.

10 Q. Does the text Governance of Science speak to the
11 role of peer review in science?

12 A. Well, yes. And one of the things that it says is
13 that, while the scientific community is nominally
14 governed by a peer review process, as a matter of fact,
15 relatively few scientists ever participate in it.

16 So if one were to look at the structure of
17 science from a sort of, you might say, political science
18 standpoint, and ask, well, what kind of regime governs
19 science, it wouldn't be a democracy in the sense that
20 everyone has an equal say, or even that there are clear
21 representative bodies in terms of which the bulk of the
22 scientific community, as it were, could turn to and who
23 would then, in turn, be held accountable.

24 There is a tendency, in fact, for science to be
25 governed by a kind of, to put it bluntly,

1 self-perpetuating elite.

2 Q. Well, let's skip for a moment to your text
3 Knowledge Management Foundations. Is that a related
4 work?

5 A. Yes, I mean the Knowledge Management
6 Foundations book, the phrase knowledge management,
7 which is probably one of the -- now one of the hottest
8 topics in business school research in a way reflects
9 kind of what's happened to organized knowledge in our
10 time.

11 Namely, it's a kind of -- it's something that's
12 seen as very powerful, very important as a resource, but
13 as it were, doesn't have a kind of natural home anymore.
14 So that when one talks about knowledge management, it
15 could be knowledge produced not only in universities,
16 but in R and D divisions of industrial labs, or think
17 tanks, or all kinds of places.

18 And then the question becomes, is there some kind
19 of, you know, organized uniform way of regulating what's
20 going on, you know, given that the universities no
21 longer seem to have a monopoly over this? So I deal
22 with that. In that context, I actually spend more time
23 talking about the role of peer review and the strengths
24 and weaknesses of it.

25 Q. You've got a text entitled Thomas Kuhn. Would

1 you give us the general idea for that text's subject
2 matter?

3 A. Thomas Kuhn was probably the most influential
4 theorist of science, certainly in the second half the
5 20th century, and maybe the entire 20th century.
6 Certainly one still to this day, he is one of the five
7 most cited people in the humanities and social sciences.

8 And he published this book called The Structure
9 of Scientific Revolutions in 1962, which is probably the
10 most important book that people in my field ever read
11 and very influential outside of it.

12 What I argue in my book called Thomas Kuhn, which
13 is probably the book that's been most highly reviewed,
14 50, 60 reviews, from the New York Times to esoteric
15 academic journals around the world, is that basically
16 his theory is not only false, but also in a way, bad
17 policy, you might say, in terms of the way one thinks
18 about the governance of science, and in a sense, has had
19 a very bad influence in the way we think about science,
20 because the key thing about Kuhn's book, and again, this
21 is quite relevant to the case, is that, Kuhn is very big
22 on the idea that, at any given point in the history of
23 science, there is a dominant paradigm, and that's, in
24 fact, how you know there's a science.

25 So there's always one dominant paradigm, and that

1 the only way in which you can have alternative points of
2 views that have anything any kind of legitimacy is if
3 that paradigm is, in a sense, in a self-destruct mode.

4 So when it has accumulated so many anomalies,
5 that then people start looking for alternatives. But
6 otherwise, there is no incentive within science to be
7 looking for an alternative while the dominant paradigm
8 is still strong. It seems to me, while this may cover
9 about 300 years of the history of physics, that's
10 historically all that it covers.

11 And in any case, it is bad as a kind of policy
12 recommendation in terms of how to organize your science
13 generally.

14 Q. Well, looking at Kuhn versus Popper, does that
15 take up the idea of normal science or paradigm that Kuhn
16 developed?

17 A. Yes. I mean, Karl Popper had a -- Karl Popper is
18 originally a Viennese philosopher of science who, under
19 the Nazi occupation, moved to Britain and spent most of
20 his career at the London School of Economics, had a very
21 famous debate with Kuhn in 1965.

22 Popper was a believer that, of the idea that
23 science was kind of the vanguard of what he called the
24 open society. That is to say, a society where all
25 claims in principle are open to criticism and that, in

1 fact, the way we make progress both socially and
2 scientifically is through mutual criticism and learning
3 collectively through that mutual criticism.

4 But the question then becomes, under what kinds
5 of social arrangements is that possible? And the big
6 debate with Kuhn was basically over this point, because
7 Kuhn basically said you really couldn't have science if,
8 in fact, you allowed free flowing criticism at all
9 times.

10 There's a sense in which science has to close
11 ranks, has to be dogmatic, and, in a sense, has to start
12 excluding people. And that's, in fact, one of the
13 secrets of science's success, is that kind of monolithic
14 structure that goes on as long as possible. And what I
15 do in this book is basically take Popper's side of the
16 issue.

17 Q. And is that -- describe just the thrust of your
18 text as it relates to distinguishing Kuhn's position?

19 A. Okay. Well, it seems to me that one problem that
20 we have nowadays where, you might say, the start-up
21 costs for coming up with alternative theories in science
22 are so high, not only in terms of the academic
23 background that people need to have, but also the amount
24 of material resources one needs to have to mount labs
25 and research teams and stuff of that kind, that it's, in

1 fact, very difficult in the current climate to mount
2 very serious fundamental criticisms, because you really
3 have to do a lot of front loading before you actually
4 get to the point where criticism will be taken seriously
5 at a fundamental level. And this is a relatively recent
6 development, certainly a 20th century development.

7 Q. Is your discussion of Popper in this book linked
8 to ideas of testability, and if so, how?

9 A. Well, Popper is primarily known in philosophy of
10 science for having put forward the criteria of
11 falsification, which is his preferred way of talking
12 about testability, which is -- basically what you do is,
13 you set up a very stiff test where, in a sense, if the
14 theory actually passes it, it's kind of unique in
15 passing it, you wouldn't expect it to pass it, and,
16 therefore, it supposedly says something very significant
17 about the theory's knowledge claims.

18 Popper primarily imagined this kind of in the
19 context of what is known in the trade as a crucial
20 experiment where, in a sense, you have a kind of two
21 theories facing off over some kind of common phenomena
22 where they say radically different things about.

23 And that's -- and the point being, right, how do
24 you get two theories to be sufficiently equalized in
25 status that they will be tested by one case? See,

1 Popper is kind of imagining science is a bit like a
2 game, right, where you go in and match and both sides
3 are imagined to be fundamentally equal, and then they
4 test their wits against themselves.

5 But, of course, in the kind of world we live in,
6 theories don't come in equal. Some theories come in
7 with a lot more resources, a lot more back story that
8 provides a kind of authority and makes it very difficult
9 for these theories to be tested adequately.

10 Q. You mentioned the Open Society. How about the
11 Open University. I note that your CV reveals you've
12 done work there and some work in an area that touches
13 directly on this case. What is the Open University?

14 A. Yes, the Open University is the original -- I
15 believe it's the original, and probably still the
16 largest, or one of the world's largest, distance
17 learning institutions.

18 It was created in the 1960's as part of a labor
19 government initiative in the United Kingdom to enable
20 people in Britain to get higher education more easily;
21 so the idea being that you would purchase these books
22 and study guides and things, there would be television
23 programs that would be shown very early in the morning
24 that would cover the courses, and every week there would
25 be classes taught basically in classrooms that aren't

1 being used, you know.

2 So it would be like evening classes, things of
3 that kind. So 3 to 400,000 people currently are
4 enrolled in this. And it has a very high academic
5 reputation.

6 Q. And you've done a course in the Open University
7 that touches on the subject matter of this litigation,
8 correct?

9 A. That's correct.

10 Q. Describe it, please.

11 A. A few years ago, maybe 10 years ago, the Open
12 University established a Master's of Science in science
13 communication. And within that, there is a module,
14 which I'm the author of it, called Are Science and
15 Religion Compatible? And the way in which this module
16 is set up is basically a text by me where I'm taking the
17 students through a set of readings.

18 And the basic thrust of this is that, science and
19 religion are compatible at an intellectual level, but
20 there have been institutional reasons why there has been
21 conflict -- and actually, it is focused on the United
22 States -- and saying that there is some idiosyncratic
23 features of the way in which the separation of church
24 and state and how these things have developed in this
25 country that have exacerbated differences between

1 science and religion more than is intellectually
2 warranted.

3 Q. There's a course, I believe, or a section
4 entitled Will Science Recreate Creationism? Is that
5 correct?

6 A. Yes. That is toward the end of the module. One
7 thing I should point out, as a sort of back drop to
8 this, the module was originally published in 1998, and
9 so one of the things that comes up toward the end of it,
10 there is a piece from Michael Behe in there, so this is
11 at the beginning of what we now call the intelligent
12 design stuff coming out. And there is a discussion of
13 the significance of that movement.

14 And what I'm talking about in that part of the
15 module is basically that, the kind of design based
16 impulses, the idea of doing science from a design
17 standpoint -- and let me be clear by what I take that to
18 mean. That is to say, imagining yourself in the mind of
19 God.

20 I think that is kind of what we're talking about
21 here. Is something that may, in fact, be recreated
22 within what we call mainstream ordinary science,
23 especially as computer programming and the whole idea
24 having to design programs becomes a more integral part
25 of how science is done.

1 So this sort of idea of design which, you know, a
2 lot of people think of as a purely religious idea is, in
3 fact, an idea that is probably going to be of great
4 significance as a kind of heuristic for doing science in
5 the future as more and more science goes on computers.

6 And I also argue in the module that this will not
7 be, in a sense, a radically new thing that, in fact,
8 there is a lot of precedent for this way of thinking
9 about how science is done throughout the history of
10 science.

11 Q. Let me ask you to just give a little detail
12 about, you mentioned, history of science, philosophy of
13 science, and sociology of science. I just want to get a
14 brief description of how those disciplines are defined
15 and how they relate. Let's look first at history of
16 science. What is the field of inquiry known as history
17 of science?

18 A. Okay. I think the best way to answer that, I
19 mean, other than stating the obvious, it's about the
20 history of science, is that there is a sense in which
21 this field, the question to ask about is, why is this
22 field different from science? The reason is because, in
23 fact, when most scientists learn science, they don't
24 learn very much of their history or the kind of history
25 that they learn is self-serving.

1 That is to say, it is a history that is written
2 from the standpoint of leading up to whatever the
3 current state of research is. Now Thomas Kuhn called
4 this Orwellian, right, thinking about the, you know, the
5 ministry of truth in 1984, right, which is constantly
6 rewriting the history to justify whatever happens to be
7 current government policy.

8 Well, this is, in a sense, the kind of history
9 that scientists normally learn about their own fields,
10 which means that there needs to be this other field,
11 history of science, done by historians, that actually
12 tells you what did happen in the history of science in a
13 not scientifically self-serving way.

14 Typically, that subject, the history of science,
15 turns out to be quite critical of the taken for granted
16 notions that scientists operate with today.

17 Q. You mentioned philosophy of science. What is
18 that field of inquiry?

19 A. Now philosophy of science is a field that, first
20 of all, historically used to be quite co-extensive with
21 science. So if you look at somebody like Sir Isaac
22 Newton, not only does he give you the laws of motion, he
23 gives you the laws of the scientific method as to how he
24 got the laws of motion.

25 That used to be quite common. So that was a

1 sense in which, back in those days, you know, 17th, 18th
2 century, it was all natural philosophy. So it was like
3 science and philosophy of science at the same time. But
4 the field now is an independent field just like history
5 of science is.

6 And it has been that way certainly since the
7 middle third of the 20th century, and it basically tries
8 to come up with criteria of what it is to be scientific,
9 that is specifiable independently of what is the
10 dominant theory in any given scientific discipline.

11 And this is where issues of testability get their
12 legs, because there's a sense in which one can talk
13 about testability in a way that is abstracted from what
14 the dominant sciences are at the moment and provides,
15 you might say, a kind of neutral court of appeal.

16 I mean, that's kind of a -- in fact, it is a kind
17 of quasi-judicial traditional discipline traditionally,
18 which makes judgments about what is science and not
19 science from a punitively neutral standpoint.

20 Q. You mentioned sociology of science. Give us an
21 idea of the subject matter of that inquiry.

22 A. The sociology of science is the most recent of
23 these disciplines, and it is a field that is concerned
24 with the institutional conditions under which science,
25 however one defines it, is made possible, and also kind

1 of the internal arrangements that have to take place.

2 So, for example, you know, a philosopher of
3 science might say, well, you know, what makes a science
4 scientific is that it's testable. A sociologist might
5 come back and say, yeah, but what if it's impossible for
6 anybody to pay attention to your tests?

7 There has to be some kind of social conditions,
8 as it were, before, in fact, a lot of this science can
9 get off the ground and be maintained. And sociologists
10 are very sensitive to that. And very much like the
11 historians, they tend to look at the ways in which
12 things have been excluded or marginalized over the
13 course of the history of science.

14 Q. You're identified with a journal Social
15 Epistemology. What is social epistemology?

16 A. Social epistemology, in a way, is designed to be
17 a kind of synthesis of these three fields that we were
18 talking about -- history, philosophy, and sociology of
19 science -- and basically take the incites from these
20 fields, and with a kind of normative orientation -- now
21 normative, the word normative in philosophy basically
22 has to do with what ought to be the case, right, policy,
23 right, to put it in a kind of practical way.

24 And so, in other words, given what we know about
25 the way in which science has been organized in the past

1 and many different cultures and so forth, how should it
2 be organized now, and are there problems, and how might
3 they be remedied, and all of that kind of stuff. And
4 that's what social epistemology is concerned with.

5 Q. Well, the Plaintiffs have had an expert here in
6 history and philosophy of science also, and he has
7 addressed some of the issues that you've sketched out in
8 connection with your work.

9 But in connection with that, I'd like to ask you,
10 how is it then that your training, your area of academic
11 expertise qualifies you to address the issues in this
12 case that relate to science? You're not a scientist.

13 A. Well, I think the key thing is that, if you have
14 noticed from what I said about the history, philosophy,
15 and sociology of science, the kinds of things that are,
16 as it were, relevant to know about science aren't
17 necessarily the things that would be in a science
18 curriculum, especially if we're talking about people who
19 are being professionally trained to be scientists.

20 Nowadays, to be professionally trained to be a
21 scientist, is, in effect, to be a technical specialist
22 in a very small area, a small branch even of your own
23 science. And very often, these technical specialists
24 have to take largely on faith what people from other
25 branches of their own field are doing because they have

1 only the most cursory understanding of it.

2 Now if what we're doing here in this case is
3 making judgments about what is science and not science,
4 we're making very general global kinds of judgments,
5 right, the kinds of information and knowledge and forms
6 of reasoning that one needs to have would not normally
7 be part of an ordinary scientific education, but would,
8 in fact, require this additional kind of knowledge, the
9 kind of knowledge that one gets from studying the
10 history, philosophy, and sociology of science.

11 Q. So is it true then that the training you have
12 actually makes you better equipped to answer that issue
13 than a scientist that's practicing?

14 A. Yes.

15 MR. GILLEN: Your Honor, at this time I
16 would proffer Dr. Fuller as an expert in the history of
17 science, the philosophy of science, and the sociology of
18 science.

19 THE COURT: All right. Is there a
20 stipulation with respect to his testimony?

21 MR. WALCZAK: There is, Your Honor.

22 THE COURT: All right. Then he's admitted
23 for that purpose, and you may proceed with your direct
24 examination.

25 MR. GILLEN: Thank you, Your Honor.

DIRECT EXAMINATION

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BY MR. GILLEN:

Q. Dr. Fuller, as we begin, I'd like to-

THE COURT: Keep the --

THE WITNESS: I'm sorry, Your Honor.

THE COURT: That's all right. It's the
afternoon in the UK.

THE WITNESS: I'm just kind of wound up.

THE COURT: We're not quite as awake as you
are perhaps, but if you just keep it at a modest pace,
then we'll have no problem. You may proceed.

MR. GILLEN: Thank you, Your Honor.

BY MR. GILLEN:

Q. Dr. Fuller, as we begin your direct examination,
which is my opportunity to elicit your opinions, I want
to ask you a few questions, which we'll go back and
explain. Do you have an opinion concerning whether
intelligent design is science?

A. Yes.

Q. What is that opinion?

A. It is.

Q. Do you have an opinion concerning whether
intelligent design is religion?

A. It is not.

Q. Do you have an opinion concerning whether

1 intelligent design is inherently religious?

2 A. It is not.

3 Q. Do you have an opinion concerning whether
4 intelligent design is creation-science?

5 A. Nope, it is not.

6 Q. Do you have an opinion --

7 A. I do have an opinion. The opinion is, it is not.

8 Q. Thank you. Do you have an opinion concerning
9 whether intelligent design is creationism?

10 A. I do, and it is not.

11 Q. Do you have an opinion concerning whether
12 methodological naturalism is an essential element of
13 science?

14 A. It is not an essential element of science.

15 Q. Do you have an opinion concerning whether any
16 testability criteria, if applied evenhandedly, makes
17 intelligent design as much a testable scientific theory
18 as evolutionary theory?

19 A. Yes, it does.

20 Q. What is it your opinion?

21 A. It is. Yes, it does.

22 Q. The remainder of your testimony will be our
23 opportunity to explain the basis for your opinions. And
24 I'd like to start at the outset by explaining the basis
25 for your opinion that intelligent design is science.

1 Explain why you believe intelligent design qualifies as
2 science.

3 A. Okay. Having looked at some of the materials in
4 intelligent design, and I guess I'm most familiar with
5 the work of Dembski and Behe, that, first of all, there
6 are some salient phenomena. One of the things that you
7 want, a science needs to be grounded in something, needs
8 to have a kind of subject matter.

9 And Dembski and Behe have identified something.
10 They identify it in quite different ways. And here I'm
11 referring to the sort of irreducible complexity complex
12 specified information kind of notion. Dembski comes at
13 it from a kind of, you might take, top down standpoint,
14 where in a sense he's trying to define a sort of domain
15 of design that is separable from necessity and chance.

16 And his most motivation, intellectual motivation
17 for it has to do with the difficulty, if not
18 impossibility, of coming up with a random number
19 generator.

20 The elusiveness of the idea of chance which, in
21 other words, whenever you try to come up with a random
22 number generator, it seems as though you can always
23 figure out what the program is, which means it's really
24 designed. Okay.

25 And that's kind of what motivates him to think,

1 well, you know, why is it so hard to come up with a kind
2 of formula for randomness? Okay. And that kind, you
3 know, led him in that direction.

4 There is a problem and a problem that is
5 generally recognized by mathematicians and
6 statisticians, regardless of what they think of Dembski,
7 there is an issue there that deserves attention.

8 In the case of Behe, he's a bottom up guy. He's
9 a more inductive guy. And he sees phenomena,
10 biochemical systems in particular, the structure of the
11 cell, that natural selection historically at least has
12 had difficulty trying to explain. And he thinks, well,
13 you know, that might indicate that there is something
14 quite special in terms of its status as a biological
15 entity.

16 And design would enter there. So there is this
17 issue of salient phenomena that aren't readily being
18 explained by the already existing theories that then
19 create a kind of pretext for thinking that one then can
20 perhaps, you know, have an extended field of research.
21 Moreover -- oh, sorry.

22 Q. I'm sorry. I didn't mean to cut you off. Go
23 ahead.

24 A. The other point I just want to raise is that,
25 design isn't just the name of particular phenomena that

1 other theories can't explain. But also it is, as I
2 mentioned with regard to Dembski, meant to be a kind of
3 general explanatory framework for a research program
4 that covers basically anything that could be regarded as
5 design.

6 I mean, so, for example, in evolution, there is a
7 tendency to kind of use design sometimes literally and
8 sometimes metaphorically, and there's a kind of
9 ambiguity that's there in the discussion in the
10 evolution literature.

11 But I think, with these guys who do intelligent
12 design, design is meant to be literal. That is to say,
13 you're going to have one science at the end of the day
14 that is going to explain how artifacts are, and is going
15 to explain how the biological systems are, and social
16 systems perhaps, all under a common science of design.
17 So there is, in a sense, a kind of general explanatory
18 framework here that is also at play.

19 Q. You contrasted the approaches taken by Dembski
20 and Behe. What did you mean by that?

21 A. Well, in science, you might say that some
22 scientists work deductively, other scientists work
23 inductively. With intelligent design, you've got a bit
24 of both. Okay. So that Dembski, who is a mathematician
25 by training, and in many respects, has a kind of

1 intellectual background that one, let's say Sir Isaac
2 Newton, had, right, tends to think about these things
3 very much from the top down, Right.

4 So he's thinking in terms of, where do the
5 fundamental -- what is designed in the most fundamental
6 abstract mathematically specifiable way? Now Behe,
7 right, is a lab scientist, and so he's used to looking
8 at phenomena, and he sees phenomena that don't lend
9 themselves to very easy explanations. And so then he
10 tries to then induce the kind of explanation for it.

11 Q. If part of what has been said in the courtroom is
12 that intelligent design is not science because it would
13 be necessary to revolutionize science for intelligent
14 design to be considered science, does the aim of
15 revolution disqualify intelligent design from the realm
16 of scientific theory?

17 A. No, not at all. And I think -- I mean, this word
18 scientific revolution, as I mentioned earlier, is
19 largely associated with Thomas Kuhn, who I wrote these
20 books about. And I think there are two things I would
21 draw your attention to with regard to the concept of
22 scientific revolution.

23 One is, first of all, we should -- you know, it's
24 a dramatic term. That's the first point. It's not a
25 political revolution, a scientific revolution, and I do

1 think that sometimes some of the rhetoric of that
2 expression, of the term revolution leaks out, and one
3 thinks, oh, my God, if we have a scientific revolution,
4 there goes civilization or something.

5 Okay. So a scientific revolution isn't meant to
6 be quite like a political revolution. But one thing it
7 does draw attention to, it seems to me, is, you don't
8 have revolutions unless you have a clear sense of what
9 is currently dominant, because what are you revolting
10 against after all?

11 In other words, if we lived in a world, a
12 scientific world where there were multiple theories
13 around, all roughly equal, all pursuing their own lines
14 of research, and doing things, you know, wherever the
15 truth may lead these respective research programs, there
16 would never be a clear enough sense of a dominant theory
17 to then have to say, we've got to revolt against it.

18 The idea of revolution presupposes a dominant
19 paradigm, that there is, in fact, a dominant power base
20 in the science at the moment. And that's, in a sense,
21 the most powerful kind of background conception to a
22 scientific revolution. And I do think, in the kind of
23 environment in which we live for science, where
24 resources are so highly concentrated, that, in effect,
25 if you want to make a fundamental intellectual or

1 conceptual change, it's going to -- you're going to have
2 to do something like a revolution.

3 Q. There's been some discussion in the courtroom
4 thus far about the historical dimensions of this, the
5 issue that's being litigated. I want to ask you, in
6 light of that, are scientific revolutionists
7 unprecedented?

8 A. No. I mean, in fact, Thomas Kuhn thought that
9 they were a normal part of how science operates. His
10 theory, which is based on the idea that a science can be
11 identified by the fact that it has a dominant theory or
12 paradigm at any given time, his view was that, these
13 theories do their research, eventually accumulate
14 anomalies, that is to say unsolved problems, both at an
15 empirical and conceptual level, and then over time
16 eventually, they get so many of these problems, that
17 people begin to start looking for alternatives.

18 But Kuhn's point is that, it only happens at that
19 point. It doesn't happen while the theory is still
20 doing well. And this is where he and Popper disagreed
21 substantially. But point is that, yes, one can talk
22 about scientific revolutions. Some of them have even
23 been planned.

24 I guess that's kind of the point that's relevant
25 to this case, because a lot of revolutions in science

1 are revolutions that are sort of seen in retrospect,
2 okay, that in retrospect, we see that there was a
3 scientific revolution in the 17th century.

4 That phrase, scientific revolution, was not
5 coined until the 1940's, okay. But there are
6 revolutions that have been planned.

7 Q. Give us a sense, just sketch out a few, to give
8 us an idea of how the phenomena manifests itself?

9 A. The most self-conscious scientific revolution in
10 the sense that the guy says, I'm doing a revolution,
11 watch out, okay, and succeeds, is Antoine Lavoisier, who
12 is associated with the chemical revolution in the late
13 18th century.

14 And in the history of science, Lavoisier is
15 primarily known as the discoverer of oxygen. And the
16 way he did this, and this is quite symptomatic of the
17 way he did science generally, was, he was in
18 correspondence with Joseph Priestly in the United
19 Kingdom, who was actually a very good experimentalist
20 and who discovered this thing that he called
21 dephlogisticated air.

22 The thing to keep in mind is that, before
23 Lavoisier, chemistry was a very practical kind of
24 subject, not very mathematical, kind of a thing that,
25 you know, a bit like pharmacy, you know. It had this

1 kind of element, practical applied kind of element to
2 it.

3 And people were trying to come together with some
4 fundamental notions. And Priestly came up with this
5 idea of dephlogisticated air, that is air without
6 phlogiston, which was regarded as the fundamental
7 element of chemistry at the time. But this element was
8 very strange because, basically, when it was around,
9 things lost weight. When you added phlogiston, it would
10 lose weight. Very strange element.

11 Lavoisier reinterpreted all of Priestly's
12 experiments and a load of other experiments that
13 chemists had been doing in the 18th century and
14 basically said, look, these guys are misrepresenting
15 what they're actually discovering. In a sense, we need
16 a new kind of classifications system for chemistry so we
17 can make sense of all of these very weird results.

18 See, because the issue here is, you can have a
19 lot of weird results in science and do a lot of very
20 good practical work, and what you need is a kind of
21 incentive to unify stuff in a way that hadn't been
22 unified before in order to get a real science off the
23 ground.

24 And that's what Lavoisier did. He wasn't that
25 great an experimentalist. He did some experiments, but

1 for the most part, what would launch the chemical
2 revolution was a systematic reinterpretation of a lot of
3 stuff that other chemists had been doing for centuries.

4 Q. Well, there's been, you know, the subject here is
5 the neo-Darwinian synthesis. And there's been talk of
6 genetics. And I know you and I have discussed Mendel
7 and his role, which seems to bear directly on the
8 neo-Darwinian synthesis. So please describe -- let me
9 ask you are first. Do you regard Mendel's work as a
10 scientific revolution?

11 A. Well, it's one of those cases of revolution in
12 retrospect in the sense that Mendel's work -- maybe I
13 should say something about who Mendel is?

14 Q. Certainly.

15 A. You know. Well, Mendel, who's regarded normally
16 as the Father of Genetics, was a monk, a Catholic monk
17 in Moravia, which is now part of the Czech Republic,
18 whose writing in the mid 19th century, and did these
19 very famous experiments with peas where he basically
20 came out with a kind of a prototype for the fundamental
21 laws of heredity.

22 And one problem that he had was trying to get the
23 stuff published. It was a very difficult sort of idea
24 to get across to people, because he was writing in a
25 period where, even though Darwin's work wasn't

1 completely accepted, nevertheless there was a view that
2 evolution was more or less right.

3 And what that suggested to botanists at the time
4 was that, through heredity, there would be over time a
5 kind of blending of characteristics, right, that that
6 would be kind of the incremental change, the evolution
7 over time, as plants with different traits, right, sort
8 of bred together.

9 But what Mendel showed, or claimed to have shown,
10 was that, in fact, there are some fixed ratios between
11 what we now called dominant and recessive traits, right,
12 that are reproduced each generation, right, because they
13 are intrinsic to the peas regardless of what the
14 individual peas, what they looked like, okay.

15 Now the head of the leading botany journal just
16 couldn't buy this, and, in fact, Mendel was a special
17 creationist. I mean, he believed that these were like
18 inherent in the peas and they were kind of created that
19 way. And so it was only much later on when -- that
20 Mendel's work got accepted, basically when you got to a
21 point where people could come up with some kind of
22 naturalistic interpretation, you know, understood in
23 that methodological naturalistic way, of what he was
24 doing.

25 Q. Well, carrying that forward in terms of the

1 neo-Darwinian synthesis, let me ask you, was that
2 synthesis regarded or described as a revolution in time?

3 A. Well, this is the -- you're raising a very
4 interesting point here, because obviously, in this talk
5 of scientific revolutions, you know, one thinks of
6 Newton, one thinks of Einstein, and I mentioned
7 Lavoisier with the chemical revolution, and, of course,
8 one thing there's a Darwinian revolution.

9 And Michael Ruse wrote a book in 1979 called The
10 Darwinian Revolution. So when did it happen? And this
11 is an interesting question. If you read Michael Ruse's
12 book, and this is the first time -- I mean, this is the
13 first time where in print people talk about Darwinian
14 revolution, he thinks it actually happened shortly after
15 Darwin published Origin of the Species, 1859.

16 But in fact, for reasons, you know, that I'm not
17 going to go into here, it's not until you get to the
18 neo-Darwinian synthesis, which is being forged in the
19 1930's and 40's, that you actually have something that
20 does look like a scientific revolution in the sense that
21 you get biology in a state that looks something like the
22 way Newton brought physics into in the late 18th
23 century.

24 And what the neo-Darwinian synthesis is, what it
25 synthesizes is genetics with the kind of natural

1 historical framework that Darwinians already have. So
2 basically, to go back to the example of Mendel, you
3 know, you basically bring the two sides together.

4 You bring together Mendel and the genetic
5 viewpoint, which, in a sense, is very much looking at
6 life from a design standpoint or the fundamental bits of
7 life, how do they combine to produce the things of
8 things we see in the world, and you combine that with
9 the natural history standpoint of Darwin, which is one
10 that kind of looks at nature as it's already out there
11 in nature, and then tries to make inferences about
12 what's the source of that variety that we see.

13 It's only in the 1930's and 40's that you
14 actually get those two parts of the puzzle put together
15 that enables the kind of people, you know, who have been
16 testifying for the Plaintiffs to all say, they're part
17 of the same science.

18 Q. You mentioned Einstein. Just give us a brief
19 discussion of the way in which his theory might be
20 regarded as revolutionary?

21 A. Now Einstein is a kind of case that Thomas Kuhn
22 talks about and people normally talk about as a
23 scientific revolution. And there are lots of aspects of
24 it that are quite interesting, I think, from, you know,
25 in terms of bench marks for thinking about what's going

1 on in this case.

2 One is that, when Einstein published his famous
3 papers in 1905, you know, in relativity theory, in
4 Brownian motion. He was, in fact, a patent clerk in
5 Baron, Switzerland, having failed his entrance
6 examinations in science -- by the way, Mendel also
7 failed his entrance examinations in science.

8 There's a long history of revolutionaries being
9 academic failures. I don't know if that's so easy
10 anymore, but it certainly historically has been the
11 case. And so he writes -- but he was someone who, you
12 know, was following developments in physics. And this
13 was during a period in physics where still you could
14 make major breakthroughs just by doing, you know, chalk
15 on blackboard stuff, you know, mathematics and
16 relatively simple experiments.

17 And, in fact, there were several experiments, the
18 most famous of which being a Michaelson-Morley
19 experiment, which seemed to suggest that light could
20 bend, that light would slow down if it's moving against
21 the motion of the Earth, that needed to be explained.
22 It was an anomaly within Newtonian mechanics. These
23 were generally well-known.

24 Anyone who was following physics would know that
25 Newtonian mechanics had some serious problems that

1 physicists themselves couldn't quite get.

2 So Einstein writes up these equations, which
3 basically end up saying, well, you got to drop absolute
4 space in time, which is what all the Newtonians were
5 presupposing, and say instead that, light is constant,
6 and then that would make sense out of everything. He
7 submits this paper.

8 It's a very -- it's a very clever kind of move,
9 but it's very radical as well. And he submits it to the
10 leading physics journal. And Max Planck, Father of
11 Quantum Mechanics, is the editor. And he sees that the
12 mathematics in Einstein's paper is a little goofy, but
13 he fixes it up and makes it publishable. And then, of
14 course, people really start to take it seriously.

15 Some interesting things about this is, Einstein
16 was inspired to actually think along these lines that,
17 in fact, there may be some fundamental problem with
18 Newtonian mechanics, and that was the reason why it
19 couldn't explain these experiments I just mentioned.

20 By reading a book by Aernst Mach, M-a-c-h, called
21 The Science of Mechanics, which is largely a historical
22 work kind of putting together in a nice summary package
23 all of the objections that people had been maintaining
24 about Newtonian mechanics for the previous 200 years.

25 You see, Newtonian mechanics had some unresolved

1 conceptual problems from its very outset, including how
2 do you justify absolute space in time. That's just
3 taken on faith by Newton. And the Newtonians did as
4 well, because it was able to solve a lot of empirical
5 problems for many years.

6 However, by the late 19th century, problems are
7 starting to accumulate empirically, so people are
8 beginning to question the conceptual basis. And Mach,
9 as kind of this historian of all of this, said, you
10 know, Einstein reads this to say, wow, so there were
11 objections there for a long time, it was just, you know,
12 that there was no incentive, as it were, to actually try
13 to put these objections together and think if we can
14 come up with some kind of positive alternative.

15 But now at this stage in the history of physics,
16 there seem to be. And that's kind of what Einstein did.
17 And he mentions this, that he was inspired this way.

18 Q. Well, you've mentioned this accumulated set of
19 problems for Newtonian physics. Let me ask you, looking
20 at this state of affairs today with respect to
21 evolutionary theory, do you, in your opinion, think
22 there's reason to believe that there are an accumulating
23 set of problems that may be a pre-cursor to a similar
24 development in biology?

25 A. Well, there are certainly some longstanding

1 conceptual issues that just don't seem to go away. And
2 some of them are quite -- and some of them reflect kind
3 of the fault lines of the neo-Darwinian synthesis. As I
4 mentioned earlier, right, it has to do with the
5 relationship between genetics and natural history being
6 brought together.

7 But these two disciplines are really quite
8 fundamentally different in how they think about life.
9 So, for example, one way, one area where this is coming
10 to a head has to do with exactly how one defines the
11 idea of common descent; that is to say, the idea that
12 there are common ancestors for all organisms, which is
13 very much a key, a corner stone of the evolutionary
14 synthesis.

15 Traditionally, common descent was identified
16 morphologically, which is to say, you sort of, as it
17 were, give the precedence the natural historians looking
18 at the way the animals, how they appear to you in the
19 field, what their physiologies are like, and so forth,
20 what they're shaped like, all that kind of thing.

21 But with the advent of genetics, one then comes
22 up with a kind of alternative way of doing this, right,
23 which actually looks at genetic similarity between
24 organisms, and then one comes up with a somewhat
25 different tree of life, as it were.

1 This is kind of an ongoing debate. And you end
2 up getting somewhat different trees of life often with
3 some surprising consequences and surprising divergences.
4 In a sense, that's a residue of the fact that the two
5 main bodies of disciplines that were brought together in
6 the neo-Darwinian synthesis are really, you know, sort
7 of approach the nature of life in fundamentally
8 different ways.

9 And so that issue kind of revives itself in the
10 debates over what common descent means. Now there are
11 other issues as well. So, for example, how much does
12 natural selection explain survival of the species?
13 Different biologists have different angles on this.
14 Some, like Richard Dawkins, takes what's called a very
15 strong adaptationist approach where everything is the
16 product of natural selection.

17 Others say, well, there's sexual selection,
18 there's random genetic drift, there's maybe punctuated
19 equilibrium. You know, there may even be some version
20 of the inheritance of acquired traits in some aspects of
21 things. And different biologists, you might say, would
22 apportion the explanatory merit of these mechanisms
23 differently.

24 And there is no consensus on this, though most
25 agree that natural selection, in some sense, is

1 dominant. But then that raises the question of, at what
2 level of organic reality does natural selection operate?
3 So there's a very -- especially in the philosophy of
4 biology, but it definitely affects biology itself, an
5 issue over units of selection. What exactly is
6 selected?

7 Are we talking -- Richard Dawkins thinks
8 selection occurs at the gene level, right. When he
9 says, selfish genes, what he means is, that, as it were,
10 evolution is written from the standpoint of the gene.
11 The genes are what is being selected, and everything
12 else, like the organisms that contain the genes, they
13 are mere vehicles for genes, that genes are really where
14 the selection is.

15 Darwin himself believed selection occurred at the
16 level of the organism, that you guys see natural
17 selection in principle happening if you were actually
18 there whatever billions of years ago, because it's
19 happening on organisms. They live or die. That was
20 kind of how he saw it.

21 Then you can think about, well, maybe there's
22 group selection or kin selection. So that's to say,
23 larger and larger units where selection is occurring.
24 And throughout the history of evolution, you've got
25 people pitching the claim at all these different levels,

1 and then again, lots of disagreements.

2 And again, these things are not being resolved.
3 They're just kind of continuing. They're rumbling
4 along, you might say.

5 Q. Well, do you see reason to believe that, how
6 should I say this, that there are, there's a way in
7 which the theory at the level you've described it, is
8 not actually shaping science as practice?

9 A. Well, this is the issue, right, because if, you
10 know, what I've just been sort of laying out for you in
11 terms of these theoretical disputes that exist within
12 evolution, in a sense, what I'm talking about there is
13 what is most directly identified with evolution. If one
14 wants to -- and when people have been testifying in this
15 case, whenever they've talked about evolution, they've
16 used the kinds of concepts I've just been talking about,
17 all of which are essentially contested by people in the
18 biological community.

19 I'm not saying they don't believe these concepts.
20 But exactly their definition and how they apply and
21 their explanatory scope, all of this is being contested.
22 So you wonder, how is it possible for biology to be
23 conducted on a day-to-day basis, given all of this kind
24 of conflict at this supposedly fundamental level of
25 biology?

1 Well, the answer is, it isn't fundamental for
2 doing biology. In other words, these debates over
3 evolutionary theory, that, in fact, define what
4 evolutionary theory is, kind of continue in the kind of
5 parallel universe to the rest of biology.

6 And in a sense, one way you can see this is that,
7 if you look at the Nobel prizes that have been awarded
8 for physiology in medicine, which is the field, the
9 biological field, essentially, you don't find anyone
10 ever getting the prize specifically for evolution.
11 Okay.

12 What they get prizes for are genetics, for
13 ethology, for various branches of medicine, for
14 physiology, animal behavior, right. In other words,
15 they get the prizes for areas of research that are much
16 closer to the phenomena than the sort of generalizing,
17 universalizing level in which evolution operates.

18 This is not to say that these different
19 disciplines cannot be explained or cannot be illuminated
20 by evolution. But the point is, one doesn't need to be
21 an evolutionist in order to do the work in these
22 respective fields, at least sufficiently to be able to
23 be recognized as important practitioners of those
24 fields.

25 Q. Well, in light of what you're saying, do you see

1 a meaningful connection between the work of the
2 scientists winning the Nobel Prize or working the lab
3 day-to-day and the theory? Is there evidence that the
4 theory exerts a powerful influence over their work?

5 A. I mean, this is the thing that's very difficult,
6 it's a very difficult thing to document. I mean, of
7 course, we certainly had enormous numbers of
8 pronouncements telling us that evolutionary theory is
9 the foundation or the corner stone of biology.

10 The National Academy of Sciences, I believe, says
11 this. But you see, is this literally true? Because at
12 least from the standpoint of someone like myself, who's
13 looking at this as a historian philosopher or
14 sociologist of science, when we think about foundation
15 or corner stone of a science, we're always thinking
16 about Newtonian mechanics.

17 There's a sense in which physics is kind of
18 always the bench mark for us, because there you have a
19 very clear sense of a science where you have fundamental
20 laws, right, and where you can deduce conclusions, and
21 where different aspects of reality, in a sense, can be
22 sort of figured into it in various ways.

23 There's a kind of tight theoretical deductive
24 connection that leads to predictions that can be
25 validated or not, as the case may be. And now, of

1 course, after Newton, we've got Einstein, and we see
2 physicists struggling very hard to come up with a sort
3 of grand unified theory.

4 And what they mean by that is, something that's
5 very deductively tight in that kind of way. And they
6 recognize that there is a sense in which there is a
7 crisis in physics. Now evolutionary theory isn't
8 structured this way. Biology isn't structured this way
9 as a discipline where there's any sense in which one is
10 talking about unification in that very tight kind of
11 sense.

12 Rather, what you have is lots of different
13 disciplines within the biological sciences -- and, you
14 know, I've rattled off a few already -- kind of doing
15 their own work, you know, with their own theories and
16 methods that pertain to the branches of life that
17 they're concerned with, right, and then every now and
18 then, paying lip service to some concept in evolutionary
19 theory.

20 And one way in which I try to show this in the
21 expert witness statement that I provided for this trial
22 is this testimony of the guy, Nicholas Rasmussen, who is
23 a historian of biology at the University of New South
24 Wales, who basically makes the point that it's a mistake
25 to treat evolutionary theory as if it were the same

1 thing as contemporary biology, that, in fact, biology is
2 all of these different fields.

3 They have radically different histories. They
4 come from many different directions, some of which are
5 more or less related to developments in evolutionary
6 theory. The problem, however, is that evolutionary
7 theory is, in a sense, a kind of universal rhetoric of
8 biology; that is to say, a repository for terms and
9 concepts that people from all these different biological
10 fields can regularly use to explain and illuminate what
11 they're talking about.

12 Q. How did Rasmussen go about substantiating his
13 point concerning the relative --

14 A. Well, Rasmussen was someone who was himself
15 initially trained as a biologist. I mean, a lot of
16 people in my field, though not myself, but a lot of
17 people in my field originally have a kind of science
18 training, and for various reasons of disinterest,
19 disenchantment, or disillusionment move into history,
20 philosophy, and sociology, instead of staying with the
21 original science.

22 So Rasmussen had some sense that, if you look at
23 day-to-day work of biologists in the lab or in the
24 field, all of this evolutionary stuff doesn't really
25 happen. It happens somewhere else. So what he did was,

1 he did a data base search of all of the -- of all the
2 journals that are listed, biology journals that are
3 listed for the year. The year he looked at was 1989.

4 And he found that, in a generous estimation, that
5 is to say, if you look at the key words and abstracts of
6 articles -- and abstracts of articles are the things
7 that typically have what are the main points and the
8 main things that the author wants to get across to the
9 scientific community -- if you look at those things for
10 the year 1989, and you look for the occurrence of the
11 word evolution and the word -- and the phrase natural
12 selection, you will find no more than 10 percent of
13 articles include this in 1989. No more than 10 percent.

14 Q. Is it in 1989 or was there a period of inquiry?

15 A. Well, it was 1989. But then I checked this. I
16 was very, you know, concerned, is this right? I mean --
17 and is it the same today, because we're now 15 years
18 later? And what does this look like as a kind of
19 historical phenomenon?

20 I mean, I think one thing to keep in mind here
21 is, this is against the back drop of everybody saying,
22 you know, evolutionary theory is taken for granted. And
23 so you wonder, okay, maybe that's why it's not being
24 talked about very much.

25 So what I did was, I looked at the data bases --

1 and now it's a lot easier to do it because we've got
2 computer search programs -- for the biological sciences
3 and biology, all of the articles, books, websites,
4 whatever, from 1960 to the present. And here we're
5 talking about 1.3 million items. And --

6 MR. WALCZAK: Your Honor, I'm sorry. I'm
7 just going to object. This is nowhere in his expert
8 report.

9 MR. GILLEN: I mean, he's referenced the
10 Rasmussen article in his --

11 MR. WALCZAK: But we're now talking about a
12 study that is not part of his expert report. I
13 certainly don't find it. And I could be mistaken, but I
14 don't think so.

15 THE COURT: Well, let's use this as an
16 appropriate time to take a break. I have something else
17 I must attend to at this point. I was going to break at
18 10:20 anyway. Why don't you look and see if you can
19 find it either directly or in the context of the expert
20 report, and I'll hear your objection or renewed
21 objection after the break. Why don't we take about a 20
22 minute break. Water or decaff only.

23 THE WITNESS: My apologies, again, Your
24 Honor.

25 MR. GILLEN: I understand.

1 THE COURT: And we'll return in 20 minutes.

2 MR. GILLEN: I got a paddle back there.

3 THE COURT: We'll be in recess.

4 (Whereupon, a recess was taken at 10:20 a.m.
5 and proceedings reconvened at 10:44 a.m.)

6 THE COURT: All right. We resume with
7 direct examination of Dr. Fuller.

8 MR. GILLEN: Thank you, Your Honor.

9 THE COURT: And do we have an objection? Do
10 you want to restate the objection?

11 MR. WALCZAK: I would just object to Dr.
12 Fuller testifying about some study that he apparently
13 did on periodicals and publications, because that's
14 nowhere in his expert report.

15 MR. GILLEN: And I acknowledge the
16 objection, Judge, and withdraw the question. The
17 article is in his report, but his curiosity and what he
18 was getting into is not.

19 THE COURT: Then there's no reason to rule
20 on the objection. The question is withdrawn, and you
21 may move on.

22 MR. GILLEN: Thank you, Your Honor.

23 **DIRECT EXAMINATION (CONTINUED)**

24 BY MR. GILLEN:

25 Q. Dr. Fuller, there's been some discussion of a

1 notion of the relationship between a given theory and
2 its service as a big tent. And so I'd like to briefly
3 get your opinion on that sort of the sub issue in this
4 case.

5 ID has been described as a big tent. Do you see
6 this as distinguishing intelligent design, ID, from
7 evolutionary theory?

8 A. Well, I was actually quite surprised of the use
9 of the term big tent, which I had not run across
10 previously to describe intelligent design, especially by
11 people supporting evolutionary theory, because, for me,
12 evolutionary theory is the biggest of big tents.

13 Q. What do you mean by that?

14 A. Well, in a sense, it's not an unusual thing. And
15 I don't want my remarks to be taken in some way I'm
16 demeaning evolutionary theory or scientific theory in
17 general, because there is a sense in which all
18 scientific theories that attempt to be very universal in
19 general do end up becoming big tent theories, at least
20 in the beginning.

21 But the specific thing I have in mind here with
22 regard to evolutionary theory, and I've mentioned this a
23 little bit already, is that, really the people who are
24 brought under this tent of the neo-Darwinian synthesis
25 come from really quite different, radically different

1 research cultures historically.

2 And one reason why this particularly interests
3 me, and I think is of significance is, it's -- the range
4 of fields that you find under the neo-Darwinian
5 synthesis ranging from laboratory based genetics, and
6 now more recently, computer based simulations, all the
7 way over to the paleontologists and the natural
8 historians who study animals and plants in the field.

9 That kind of range methodologically is very
10 similar to what you find in the social sciences, which
11 are my own fields, where we range from anthropology,
12 which studies natives and their habitats, and then moves
13 along, and we have political scientists doing surveys,
14 and we have economists doing modeling themselves, and
15 psychologists doing laboratory based experiments.

16 So the range of methods are just as broad as in
17 biology, and arguably, the subject matter of the social
18 sciences is narrower than biology given the species as
19 contained in just one species, as in the case of social
20 science.

21 Yet neo-Darwinism was able to bring together all
22 of these vastly different fields under one umbrella
23 theoretical framework in a way which never happened in
24 the social sciences, even though there was attempts at
25 roughly the same time in the 1930's and 40's to do so.

1 So there's a kind of interesting question there from the
2 standpoint of the history, philosophy, and sociology of
3 science about, how did this thing work, because you
4 would think it didn't really have a chance to work.

5 Q. Has that phenomena you described been the subject
6 of study?

7 A. Yes. And I was eluding earlier when I was
8 talking about the uptake of one of my books, Philosophy,
9 Rhetoric, and the End of Knowledge, the people who study
10 the rhetoric of science have paid particular attention
11 to this business of the forging of neo-Darwinian
12 synthesis.

13 And the key thing that they focus on is the -- is
14 certain key texts. And the one text I think is the most
15 important text for launching the synthesis is the book
16 Genetics and the Origin of Species by Theodosius
17 Dobzhansky. Should I spell now?

18 Q. Please spell that.

19 A. Okay. Theodosius, T-H-E-O-D-O-S-I-U-S.
20 Dobzhansky, D-O-B-Z-H-A-N-S-K-Y.

21 Q. Thank you.

22 A. And Dobzhansky was a very unique figure in the
23 history -- and for me, I would say, personally, this is
24 the man who I would identify as the Newton of the
25 Darwinian revolution. If we were imagining, you know,

1 Newton as having set a paradigm for physics that
2 physicists, for 200 years, worked under, okay, the
3 comparable thing in the history of biology was provided
4 by this guy, Dobzhansky, in 1937, with genetics and the
5 origin of species.

6 Because Darwin himself was more like a Copernicus
7 figure in the sense he kind of makes the big
8 intellectual change, but he doesn't really provide a
9 basis for research so people from a lot of different
10 fields can work under. But Dobzhansky did this.

11 But he didn't do it the way Newton did it,
12 because Newton, in fact, had some very specific methods
13 and very specific kind of mathematics that was very much
14 a part of how he would -- how his program would develop.

15 Whereas Dobzhansky was a big tent guy. He was a
16 guy who, when he was still in Russia, was a natural
17 historian. He migrated to the United States in the
18 early 20th century and worked in the major genetics
19 laboratory in Columbia university under Thomas Hunt
20 Morgan.

21 So he had like a bit of both worlds in him, and
22 so he was able to communicate across this great divide
23 that had existed in biology in the beginning of the 20th
24 century.

25 And I think the key thing to point out in this

1 respect is that, at that time, so we're talking like the
2 first third of the 20th century, genetics is the
3 ascendend biological science, and it's doing perfectly
4 well without Darwinism.

5 And Darwinism is, generally speaking, in decline
6 and seen as a kind of, you know, old fashioned natural
7 history, guys who like to look at animals and plants and
8 give just-so stories about how they managed to survive
9 but with no clear sense of causally how it happens.

10 And this is where Dobzhansky comes in, because
11 he's the man who introduces the language of mechanism.
12 And you've heard a lot in this trial, and we've always
13 hearing about mechanisms of natural selection.

14 Well, this concept of mechanism was not one that
15 comes from, as it were, the natural history, the Darwin
16 side, because the Darwinists tended to think of natural
17 history as a kind of emerging process, you might say,
18 that, in a sense, you couldn't actually break down into
19 analytically discernable parts saying, this part is
20 caused by genes, and this part is caused by environment.

21 Whereas nowadays, in scientific biology, that's
22 exactly how we think about it. We think about there
23 being mechanisms of natural selection, which work by
24 some kind of combination of genes and organisms
25 operating in environments. And it's easy to get this

1 impression that, in a sense, if you took apart animals
2 and environments, you could figure out how it all
3 worked.

4 Well, Dobzhansky is responsible for getting that
5 mind set into Darwinism, because Darwinism itself did
6 not have it naturally. It was more a science of just
7 sitting around watches animals and birds and collecting
8 artifacts like fossils and things like that. So this
9 was very important.

10 But what they have figured out, looking at this
11 book very closely and looking at the reviews of it and
12 the way it was taken up by various branches of biology,
13 was that, you know, mechanism is a word that has a lot
14 of resonance in lots of different ways.

15 So as it were, one can talk about mechanism as a
16 force. One can talk about mechanism as an actual part
17 of a machine. In other words, there was a lot of
18 strategic ambiguity that was located in this book that
19 enabled to bring everybody on board without having to
20 challenge their fundamental assumptions about, that they
21 brought in. Whereas, you know, so geneticists would
22 normally think, all of science is done in labs under
23 artificial conditions.

24 Whereas the natural historians thought, no, the
25 way you do life science is by looking at animals in

1 their native habitats. Well, Dobzhansky squared the
2 circle rhetorically by making both sides feel
3 comfortable with this kind of arrangement.

4 But he didn't do it because -- by, in some way,
5 logically and mathematically synthesizing things the way
6 Newton did.

7 Q. Well, if he didn't do it that way, what is the
8 purpose of the synthesis? What makes it hang together?

9 A. Well, it is a common rhetoric. I just mentioned
10 the issue of mechanism here. If you look at the
11 Plaintiffs' experts in this trial, and I'll give three,
12 because, in a sense, three of them represent a kind of
13 range that exists today in biology.

14 And you think to yourself, what do these people
15 have in common? And so let's think for a moment of
16 Padian, Kevin Padian, who is a paleontologist who spends
17 his time looking at fossils and classifying them. And
18 then we've got Kenneth Miller, who's a cell biologist
19 who spends his time in laboratories looking at very
20 small things in peatry dishes and so forth.

21 And then you've got Pennock, who is basically
22 doing a kind of computer modeling, artificial life
23 research, as it's normally called. And all these three
24 guys think they're part of neo-Darwinian synthesis. And
25 the way you see is, of course, when they come to having

1 to make ultimate explanations of what they're doing,
2 that goes beyond the actual research environment and
3 actual organism or actual work setting, they will appeal
4 to these various notions of natural selection and
5 mechanism and so forth.

6 So there is, where this kind of multi-purpose
7 rhetoric that is equally available to all of these
8 people who otherwise are doing research that really has
9 very little to do with each other. And, in fact, I
10 would even go further. I would -- it's interesting that
11 none of these three guys, and it could be actually any
12 such people who represent this diversity of the field of
13 biology, were asked really to comment on the work of the
14 others.

15 So, for example, would Padian or -- and Miller
16 think that Pennock was doing biology? You see. And if
17 so, to what extent is the biology he's doing really
18 contributing to some kind of validation of the
19 evolutionary synthesis? It seems to me, there would be
20 a variety of views that would be on this issue here.

21 But nevertheless, they're all talking the same
22 language at the most general level of explanation, and
23 that is largely due to Dobzhansky's work.

24 Q. Would status as a big tent theory disqualify a
25 theory from science?

1 A. No. I mean, I think that's an important point to
2 bring to bear here, because what basically I am trying
3 to challenge is not that one shouldn't have big tent
4 theories. Big tent theories are, in fact, part of what
5 it takes to unify fields that do start off very
6 different. That's not surprising.

7 One is always looking for higher levels of
8 abstraction and stuff like that. But the value of it at
9 the end of the day comes as a kind of, you might say,
10 what we say in philosophy of science as a metaphysical
11 research program, and that is, in fact, how I would
12 describe the neo-Darwinian synthesis, a metaphysical
13 research program in biology that suggests some very
14 interesting ways of understanding and interpreting
15 phenomena in many different disciplines that otherwise
16 would have very little to do with each other.

17 Q. If you look at evolutionary theory in that light,
18 are there key terms that are hallmarks of the synthesis?

19 A. Well, I mean, natural selection, obviously,
20 common descent. The issue about origins, exactly what
21 we mean by that, because if you think about it for a
22 moment, there are some interesting kinds of, you might
23 say, strategic confluences when one thinks about
24 origins, because what do we mean by origins?

25 Do we mean what was actually there at the

1 beginning of natural history, whatever, 4 billion years
2 ago or whatever the paleontologists tells us it is? Or
3 do we mean, what is from a biochemical standpoint the
4 most primitive form that can sort of self-reproduce or
5 self-change itself in a way that we would recognize as
6 life?

7 Now, obviously, one would be the sort of thing a
8 paleontologist would study, and the other would be the
9 sort of thing a biochemist or someone like that would
10 study. And there's a presumption that somehow there
11 would be the same answer, that, in some sense, that the
12 historically earliest form of life, origin in that
13 sense, would also be the most biochemically primitive
14 form of life.

15 And it seems to me, this is kind of part of what
16 the neo-Darwinian synthesis does. Namely, it makes you
17 suppose these things are going to be the same. But
18 unless you actually thought these two disciplines had to
19 speak to each other, it's not at all obvious that there
20 would be a convergence.

21 Q. In terms of the -- of this evolutionary
22 synthesis, the neo-Darwinian synthesis, does any one
23 person speak for -- can anyone one person speak for
24 that?

25 A. No. I mean, you know, there's a sense in which

1 -- that's the whole idea of the big tent, after all,
2 right. Dobzhansky gives you a kind of protective cover,
3 you might say, linguistic protective cover under which
4 all kinds of research can be conducted as long as, you
5 know, as they are being discussed ultimately in this
6 common rubric.

7 So, for example, Richard Dawkins, right,
8 emphasizes very much almost exclusively natural
9 selection. He's an adaptationist. He thinks it's at
10 the level of genes. There's massive disagreement with
11 him across all of evolutionary biology. Yet he's
12 probably the best selling author at the popular level
13 and the person through whom most people find out about
14 evolutionary biology today.

15 But his view is, by no means, the dominant one in
16 any kind of statistical sense within the field. So in
17 that sense, no one person does it. And if you look at
18 textbooks, because textbooks might be the place where
19 you think you get some kind of consensual view, I think
20 we see this in this trial, and this is again not unique
21 to this trial, but textbooks are things that are, in a
22 way, cobbled up by committee, right.

23 There's a sense in which you got a lot of
24 interest that needs to be satisfied to give a kind of
25 common story. And so as a result, you're not actually

1 going to tell the story of various aspects of life
2 exactly as those people who are the experts would think
3 would be the best way to tell it, but rather in a way
4 that will enable all those different bodies of knowledge
5 to be brought together in some coherent fashion so the
6 students think, ah, this is biology and not just some
7 collection of specialized disciplines.

8 So there isn't going to be one person or even one
9 book that is going to adequately capture what this, what
10 this synthesis is.

11 Q. Well, given what you said about the situation
12 with respect to the neo-Darwinian synthesis, would you
13 expect the situation to be any different for intelligent
14 design theory?

15 A. No, not at all. And, in fact, I think, you know,
16 the main problem intelligent design theory suffers from
17 at the moment is a paucity of developers, right. There
18 are basically a handful of people doing it. And so what
19 you don't have is really a lot of room for theory
20 development, for developing the terms of the argument,
21 and for developing research programs in the area.

22 And that is the -- that would be the main
23 problem. But the fact that there are people coming at
24 it from different angles, you know, from different
25 perspectives, and thinking of different phenomena as

1 salient to design, that itself is not a problem.

2 Q. Well, you described that the thin ranks is a
3 problem. Is that -- how would you explain that in light
4 of your discipline?

5 A. Well, I mean, this is the issue here. We go back
6 to this issue of there being a dominant paradigm. As I
7 mentioned, you know, if we want to talk about biology as
8 having achieved the status of a paradigm where there is
9 a dominant theory that basically becomes the covering
10 term of research, this is the neo-Darwin synthesis since
11 the 1930's and 40's in biology.

12 And one of the consequences of that is, that
13 becomes sort of the lingua franka in which all kind of
14 biological knowledge claims need to be transacted. So
15 that if you actually start to come in with predices that
16 are fundamentally different, or maybe even challenged,
17 fundamental assumptions of the dominant paradigm, it's
18 not exactly clear how you get in given this situation,
19 because you have this massive amount of resources that
20 have accumulated that, in a sense, control the show.

21 Q. You've mentioned the terms or concepts of
22 Darwinian synthesis as providing a lingua franka. Do
23 you see signs that that may be changing?

24 A. Well, I mean, I think that -- I mean the issue --
25 the thing I raised earlier about there being all of

1 these kind of conceptual problems that don't get
2 resolved and just kind of rumble along is indicative
3 that it's not clear what's going to happen in the
4 long-term.

5 I think here, intelligent design, in a way, could
6 be making some inroads. If one -- if -- I think there's
7 certain constituencies within the neo-Darwinian
8 synthesis that, in a sense, could pull apart from the
9 synthesis more easily than others. And in particular,
10 I'm thinking of the people who work on computer
11 modeling, who work, as one might say, the design side of
12 evolution, the genetic side, the biochemical side, where
13 people are very much thinking in terms of mechanisms
14 normally.

15 It seems to me that, there, it is possible for
16 that to pull away from the more natural history
17 paleontological side. So there's no natural necessity
18 that all these fields have to be together. And there's
19 a sense in which some of the stuff in intelligent design
20 is naturally better suited for some of this other stuff
21 going on in biology.

22 Q. Well, that points to another way in which people
23 have linked intelligent design with religion or natural
24 theology, which you've just mentioned. There's a sense
25 that its historical roots are religious in nature. How

1 do you approach that claim?

2 A. Well, I mean, I think the first point always to
3 put on the table about this is, just about, you know,
4 all of modern science has religious roots. And this is
5 where this idea of methodological naturalism as being
6 the nature of science is just complete rubbish from a
7 historical standpoint.

8 If you look at all of the people who are most
9 responsible for the scientific revolution, which is,
10 after all, the benchmark of what we call natural science
11 today, they were all people with very strong religious
12 beliefs, typically non-conformist beliefs, and typically
13 people who, in a sense, had to hide their beliefs from
14 public inspection for fear of persecution.

15 And I'm talking here, Renee Decaur, Sir Isaac
16 Newton, you name them, Robert Boyle. And so in that
17 respect, the religious origins of science doesn't really
18 speak badly to it at all per se, because, in fact,
19 that's the normal thing in the history of science.

20 Q. Well, let me ask you. Do you see that
21 intelligent design is necessarily linked to natural
22 theology and its origins, such as the worth of Paley?

23 A. Here's, I think, a real problem that intelligent
24 design has. It doesn't know its own history. It's not
25 really properly acquainted with its own history. And so

1 as a result, it really can't recover -- it hasn't yet
2 recovered all of the intellectual roots that, in a
3 sense, could provide sustenance for it.

4 And the first person who I, you know, if I were
5 offering advice to intelligent design people, I would
6 say, Sir Isaac Newton. He is the 400 pound gorilla of
7 intelligent design theory, because this is a man who
8 quite clearly thought he got into God's mind and figured
9 out the basic principles by which all of physical
10 reality was governed both in the heavens and on Earth.

11 And in fact, and the work, some of the work of my
12 dissertation advisor was relevant to this, you know, he
13 has all this you unpublished stuff where he's going
14 through, you know, Biblical exegesis and alchemy and all
15 this stuff, and it's quite clear that all of the
16 published work, the prekibia (phonetic) mathematica and
17 all the physics that he did was in service of trying to
18 figure out, right, in the coin of science, right, how
19 the creator's mind worked.

20 So he took -- this is what I mean when I say,
21 taking a design standpoint. You put yourself in the
22 position of the creator, and you think, how would I
23 create the world given what we know about it? And this
24 is what Newton did. And in that respect, he is the
25 greatest of all the intelligent designers, okay.

1 Now when we get to Paley, who was kind of the
2 poster boy for intelligent design theory these days,
3 we're basically talking about a guy who's writing at a
4 point where he's responding to skeptics of design. So
5 all of this stuff about the Watchmaker from 1802, all
6 this kind of stuff, is already written in the context
7 that there are people challenging design and he has to
8 defend it. Okay.

9 And so there's a sense in which the whole Paley,
10 the framing of the Paley situation is kind of wrong
11 footed from the standpoint of intelligent design,
12 because he introduces the issue of design from the
13 standpoint of someone who discovers design, discovers
14 the watch on the beach, rather than from the standpoint
15 of someone who could do the designing, which is what
16 Newton did.

17 So from that standpoint, the intelligent design
18 people do themselves a disservice by falling back on
19 Paley.

20 Q. Well, you mentioned computer modeling and the way
21 in which some people self-consciously try to put
22 themselves in the mind of someone creating to grasp
23 natural laws. How about someone who looks at it from a
24 more, what shall I say, a more computer oriented
25 standpoint historically?

1 A. Well, okay. And here, another hidden presence in
2 the history of intelligent design, who is very relevant
3 to -- because, you know, nowadays, if we think about
4 getting into the mind of the creator, and we don't want
5 to be explicitly theistic about it, the most natural way
6 is to think in terms of computer programming where you
7 are designing virtual realities and worlds and things
8 like this, like Pennock is doing.

9 The person who is the benchmark for that, and the
10 man who we normally credit with having invented the idea
11 of the programmable computer, is the guy by the name of
12 Charles Babbage, B-A-double B-A-G-E, who was one of the
13 successors to Newton's chair at Cambridge. So he held
14 Newton's chair. And he was writing in the 1830's and
15 40's, and he called the computer the analytic engine.

16 And what he wrote, he wrote one -- a series of
17 treatises that came out in the 1830's and 40's,
18 basically trying to square science and religion, called
19 The Bridgewater Treatises. And the one that he wrote
20 was one where he sort of imagines God, we would say by
21 our terms, as a big computer programmer; and indeed, a
22 computer programmer who, as it were, programs free will
23 by including not just natural laws a la Newton, which
24 are deterministic, but actually sticks in some, what
25 would be called, stochastic variables, that is to say,

1 randomizing elements. Get stuck into the program.

2 I mean, I think the interesting thing here is,
3 probability theory was only in its infancy when Newton
4 was writing, but by the time Babbage is writing, it's
5 pretty well developed. And Babbage is thinking that God
6 might have been the kind of guy who designed the world
7 such as there are these deterministic laws, but every
8 now and then, you throw in a random variable.

9 So God knows the program, but he doesn't actually
10 know what the creatures are going to do, because what
11 the creatures are going to do is going to be determined
12 by how this random variable plays itself out. And so
13 for Babbage, that would be a kind of operationalization
14 of free will. That's what he thought. That was how you
15 square the determinism free will problem.

16 You can imagine -- in fact, this is not a million
17 miles from what Pennock is doing, it seems to me, and in
18 that artificial life thing that he was talking about.
19 And for Babbage, this would be an example of intelligent
20 design, because, after all -- Babbage's point would be,
21 God just needs to know the program, but the program can
22 include variables, the outcomes of which he doesn't
23 know.

24 Q. Well, at several points in this discussion, you
25 mentioned the notion that the scientists, in approaching

1 a given problem, has adopted a mind set, which assumes
2 creating rules. And you've used the term creator.
3 You've opined intelligent design is not creationism.
4 How do you see the relationship between this mind set
5 you're describing, which assumes a creator, and the
6 nature of the work of these individuals you've mentioned
7 as scientific nonetheless?

8 A. Well, I mean, the issue here -- and here, I think
9 it's important one introduces a distinction that's very
10 important in the philosophy of science that I think, in
11 a way, gets blurred in the discussions we've been having
12 in the courtroom, and that is between the context of
13 discovery and the context of justification.

14 And this is a very classic kind of, you know,
15 even somewhat old fashioned philosophy of science
16 distinction that nevertheless is worth bringing up here;
17 the idea being, right, that there is a context of
18 discovery for science.

19 And that is to say, the kind of mind sets, the
20 kind of ways of looking at the world that are, in fact,
21 useful for coming up with scientific ideas and
22 hypotheses. And here I would include the design
23 standpoint, the creator's standpoint, putting yourself
24 in the mind of God, thinking how would God do this.
25 That's, in fact, a very useful way of coming up with

1 theories and hypotheses and so forth.

2 However, that's the context of discovery. That
3 doesn't show its truth. What that shows is, it's a
4 fruitful way of coming up with ideas, but at the end of
5 the day, what makes the thing science is whether it's
6 testable, and that is the context of justification.

7 Okay.

8 And the key thing there that's very important is
9 that, that has got to be testable in a way that you
10 don't have to actually share the mind set of the people.
11 Babbage, Newton, Paley, all these people are theists.
12 No doubt about it. But you don't have to be a theist in
13 order to test the theories they're putting forward.

14 That is the key thing about science, that there
15 is the context of discovery and the context of
16 justification. And they're both vital, but they're
17 both -- but they're separate.

18 Q. Well, we'll talk some about that later. But as
19 we go forward, I want to ask you, in terms of these
20 theories that you're describing as they develop
21 historically, and then again in terms of intelligent
22 design, is new research, new experimentation a necessary
23 ingredient of scientific progress?

24 A. Well, eventually it is. But, I mean, the thing
25 is that, you actually do need a kind of critical mass of

1 theory and interpretation of data before it happens. I
2 mean, one of the things that's always worth pointing out
3 in this context is that, all new theories are born
4 refuted. Okay.

5 I mean, especially if you have this view that
6 there is always a dominant paradigm in science, right,
7 because, in a sense, the deck is stacked against you,
8 because the dominant paradigm sets the terms under
9 which, you know, the domain is conceptualized, the terms
10 under which tests are to take place, and so forth.

11 So there's an uphill struggle from the outset.
12 So it then becomes very important for people who want to
13 put forward a new theory to actually engage in what we
14 call would theory construction, namely elaborating the
15 consequences of the theory in many different settings,
16 kind of develop the theoretical imagination, you might
17 say, and also to reinterpret a lot of the data that
18 other people have already been studying.

19 And those two things are very crucial to lay the
20 groundwork. Now I say, in saying all this, what I have
21 in the back of my mind as a precedent is actually
22 Newtonian mechanics, because, of course, Newton -- I
23 mean, I'm not going to deny this. Newton -- the big
24 thing is, Newton had a very important achievement to
25 begin with. But where to take that, where to go

1 forward, how to go forward with that into domain's
2 Newton himself did not study was not at all clear.

3 And so it took quite a while, several decades,
4 for people, in a sense, to play around with the theory,
5 to work with it, to reinterpret things in light of his
6 theory that previously weren't thought about as
7 thinkable in those terms before you actually can come up
8 with some serious experiments that could then test the
9 merits of the theory. So this does take a certain
10 amount of time to do.

11 Q. Well, just, if you would, give us an example of
12 this either the reinterpretation and then the
13 testability based on some sort of agreed upon test in
14 this area, how a scientific theory that initially means
15 doesn't have a strong experimental showing comes to
16 enter into that feature of scientific progress?

17 A. Well, I think within Newtonian mechanics, you got
18 a clear case in terms of optics. Newton did some
19 experiments with optics in the 1670's. Results were
20 very inconclusive. At least, the Royal Society didn't
21 believe him. And he always believed that light was a
22 particle, right.

23 And, of course, the natural way of thinking about
24 light is kind of an as a wave. It's only in the 19th
25 century, once people start to really kind of play around

1 with how do you test the difference between these two
2 things, because at a certain level, given the
3 invisibility of light, right, that it seems that this is
4 just a different difference in metaphors here, right.

5 I mean, how are you ever going to test this? But
6 indeed, after people start to develop these ideas, you
7 know, in more details, then clever experiments are come
8 up with, and you are, you know, and you get kind of,
9 throughout the 19th century, you might say, tit for tat.
10 Some people supporting waves. Some people supporting
11 particle.

12 And they go back and forth, back and forth with
13 clever experiments, and then eventually you get to --
14 sorry. Am I interrupting you?

15 MR. WALCZAK: I'm sorry. I was trying to be
16 polite here, but, Your Honor, I think this is outside
17 the scope of his expert report. There's no reference to
18 optics. There's no reference to the wave particle
19 theory.

20 MR. GILLEN: The report sketches the general
21 subject matter of the expert's approach. These are
22 specific examples of the point that he made throughout
23 the report. No expert here has been held chapter and
24 versus, if I day dare say, to the words uttered in the
25 report. These are just examples.

1 THE COURT: We could go into the report, and
2 I'm reluctant to do that. I think what I'll do is, I'll
3 overrule the objection and ask you to sort of lead it
4 back into the report. I'll give some latitude. So the
5 objection is overruled.

6 THE WITNESS: I think I finished. I made
7 the point I wanted to make with that example. So I
8 don't want to --

9 BY MR. GILLEN:

10 Q. Okay. Well, let's see. Where were we then? Do
11 you regard the, which some asserts to be, the failure of
12 intelligent design at this point in time to produce
13 experiments along those lines to disqualify it from
14 science?

15 A. No.

16 Q. Why is that?

17 A. Well, I mean, it's too young basically at this
18 point. And it hasn't really done all of the theoretical
19 elaboration or the recovery of the appropriate history
20 to set itself in a proper tradition that then would kind
21 of field the imagination to come up with the right kinds
22 of experiments.

23 Q. Well, in terms of the claim for design and the
24 way it relates to some of the mechanisms that have been
25 testified here, adaptation or natural selection, do you

1 see a way in which intelligent design claims can involve
2 a reinterpretation of currently existing data?

3 A. Yes. In fact, one of the things that's very
4 striking, if you look at the philosophical literature
5 that ponders this debate, is the degree to which there's
6 a kind of interchange between the word adaptation and
7 the word design. In a sense, what the evolutionists
8 call adaptation could be easily reinterpreted as design.

9 And, in fact, this is one thing that, in fact,
10 leads a lot of evolutionists to be very skeptical about
11 the kind of omnipresence of the word adaptation in
12 evolutionary theory because it looks like a kind of
13 surrogate word for design.

14 In fact, I believe Padian talked about, well, you
15 know, irreducible complexity is what we call
16 adaptational packages. You know, there was this kind of
17 equation made here in the testimony, that the kinds of
18 things, you know -- so there is a sense in which, there
19 is the -- there is at least the possibility of doing
20 some very direct translations across these two
21 paradigms.

22 Q. If the neo-Darwinian synthesis hasn't served at a
23 functional level as uniting scientific and creating the
24 biological area, what do you see as historically doing
25 that?

1 A. Excuse me. Can you repeat that?

2 Q. Yeah. If you're saying that the neo-Darwinian
3 synthesis hasn't really served in a functional operative
4 way to guide much of the work that's being done, what
5 are the premises, the implicit premises that seem to be
6 driving?

7 A. Well, I do think it does provide a kind of
8 metaphysical basis for research, but I also do think
9 there's a lot of, kind of, policing of boundaries going
10 on. In other words, the neo-Darwinian synthesis -- and
11 this is true, I think, of many general scientific
12 theories -- they're doing two things at once.

13 They're sort of trying to guide research inside,
14 but in the case of the neo-Darwinian synthesis and in a
15 kind of rather loose way among the different biological
16 disciplines, there is also a kind of a gate keeping
17 function that it plays in terms of trying to keep out
18 certain things from being discussed.

19 And in the origin of the neo-Darwinian synthesis,
20 going back to Dobzhansky's work, there was this concern
21 about eugenics, and that if genetics was made the
22 foundational discipline of biology, full stock, without
23 any consideration of natural history or anything like
24 that, that this would lead down the road of eugenics.

25 I think in more recent times, there has been this

1 concern about trying to keep religion out. That's been,
2 in a way, kind of perennial, and that's kind of come
3 back again. So there's a sense of which it's a policing
4 function going on with the synthesis.

5 Q. Well, in terms of that function, many people,
6 scientists have come in here and testified, it's this
7 methodological mechanism which is the hallmark of modern
8 science. And I want to ask you to explain your opinion
9 that methodological naturalism is not an essential
10 ingredient of scientific inquiry

11 A. Well, to my ears, as a philosopher, I find
12 methodological naturalism kind of strange. As I said
13 earlier, I am a naturalist. But naturalism is primarily
14 a metaphysical position. It is not a methodological
15 position.

16 And, in fact, it seems to me, and I have not
17 found precedent elsewhere, that this is, this phrase,
18 especially when regarded as the hallmark of the
19 scientific method, is kind of a creature of the cottage
20 industry that's developed around this particular debate.

21 In other words, you might say, there's a kind of
22 parallel universe of philosophy of science in which this
23 debate is conducted that bears some, but not complete
24 relationship to the real philosophy of science, or real
25 philosophy, for that matter.

1 And so methodological naturalism seems to be a
2 way of building in a kind of metaphysical commitment
3 without having to say so. So in other words, in order
4 to be able to do science, you have to have a certain --

5 COURT REPORTER: Could you please slow down?

6 THE WITNESS: Sorry. So in order to be able
7 to do science, one has to come in with a certain way of
8 seeing the world. It's not enough just to be able to
9 test theories and test them fairly, but one has to think
10 about the world in a certain way first to be able to do
11 science. That is to say that, you know, there is this
12 kind of nature that it's all happening in this one
13 natural world, whatever that may be.

14 And the implicit contrast is with the
15 supernatural. And if one looks at the history of
16 testability, which is indeed a proper criteria for
17 scientific method, one sees that its relationship with
18 naturalism is incredibly checkered and vexed. It is not
19 any straight -- you cannot read off not naturalism from
20 testability as the criterion for science.

21 Q. Well, explain that. What do you mean by that?

22 A. Okay. The key thing about testability that --
23 because it is the hallmark of the scientific method, no
24 disputing that -- is that it has to be able to -- the
25 theories have to be able to be tested fairly; that is to

1 say, without stacking the deck in favor of one or the
2 other theory and especially not in terms of one of the
3 other theory's assumptions.

4 So this is turned out to actually be a very
5 difficult thing to kind of make clear and practice, what
6 exactly constitutes a fair test in science. And I think
7 the tendency nowadays in methodological naturalism, as
8 it's being used in this trial and elsewhere, is trying
9 to give you the impression that the way you test a
10 scientific theory is by the terms of the dominant
11 theory, right.

12 So if you're intelligent design, the test gets
13 conducted by the evolutionists on the evolutionists'
14 terms, and you got to pass those first. But that's not
15 the spirit in which the criteria of testability was
16 meant. Here the benchmark for it, to go back to it, is
17 to Francis Bacon, okay. He talks about the Baconian
18 method in philosophy, 17th century, the lord chancellor
19 of England, a lawyer.

20 Testability, as the criteria of the scientific
21 method, was essentially an invention of a lawyer. And a
22 lawyer who was very interested in the development of
23 science saw it as, in fact, producing a lot of potential
24 good in the world, but also realizing that scientists
25 come with a lot of religious and political baggage

1 that's very controversial, very hard to see through
2 because they're talking all these different languages
3 and making all these different claims, most of which you
4 cannot verify or validate and so forth.

5 So we're going to have to figure out some way of
6 figuring out what exactly is true and false and what
7 these guys are saying, because we know they're saying
8 something that's valuable. But how are we going to do
9 it? And so Bacon introduced the idea of setting up a
10 crucial experiment, which is like a trial, right.
11 That's his idea. It was like a trial.

12 And the idea would be that the judge, who was
13 this independent party, would decide between the two
14 theories that are contesting some point. That's the
15 original image that you're supposed to get. Now as this
16 idea develops through the history of philosophy, the
17 real kind of, you know, modern day benchmark is through
18 logical positivism.

19 And there the word testability gets used a lot
20 and falsifiability and verifiability and all of these
21 terms that we associate with the logic of theory testing
22 comes from that tradition. Those guys wanted to find a
23 neutral language of science. And they were very
24 preoccupied with figuring out, how can you strip any
25 scientific theory down to its bare logical structure --

1 so in a sense, we don't need to know the jargon, right.

2 We don't need to know all the tricky things about
3 it. We just need to know what follows from what and how
4 can you prove it in some empirical way. That's what
5 they wanted. And that's testability. Testability does
6 not commit you to the big assumptions of a particular
7 theoretical framework.

8 Rather, it strips them down and gets them to a
9 point where you can see what really matters here on the
10 ground level. That was their idea.

11 Q. Were the positivists working out testability
12 criteria in contrast or with reference to an alternative
13 approach to science and nature?

14 A. Well the positivists initially had a flirtation
15 with naturalism, but in the end, they believed that it,
16 too, was kind of metaphysical. So they took a very
17 agnostic stance on this. In fact, they thought, well,
18 look, given the developments that were taking place in
19 physics, which were creating rather weird conceptions of
20 reality which really hadn't been worked out, they
21 weren't like the kinds of conceptions of reality
22 associated with traditional naturalism.

23 If we think about naturalism as Aristotle or
24 Newton, the way objects move causally in some sort of an
25 observable space, these things of things. These very

1 fundamental assumptions, which are associated with
2 naturalism historically, were being challenged by
3 science.

4 So one couldn't really assume even that bare
5 metaphysics in the sense that one would even have to
6 strip that off if one wanted to be able to test
7 scientific theories appropriately. So this is the whole
8 idea of getting rid of the metaphysics.

9 Q. Well, in light of that, do you see a meaningful
10 distinction between the claims made here for
11 methodological naturalism and philosophical naturalism?

12 A. I think -- I mean, I really think methodological
13 naturalism is just a fig leaf for metaphysical
14 naturalism when it gets right down to it, especially
15 when you see how it's elaborated by its defenders and
16 the kinds of things they want to include and exclude and
17 also the kind of rather sort of tenuous history of
18 science that provides the back story for it.

19 Q. What is that? Just give us a brief sketch.

20 A. Well, okay. A couple of the people who have
21 testified here, and I've seen this before in the
22 writings of these guys, these methodological
23 naturalists, have talked about Hippocrates as the
24 founder of medicine, the great founder of scientific
25 medicine.

1 And the way methodological naturalists spins the
2 story is, okay, before Hippocrates hit the scene, the
3 Greeks believed that, in fact, the Gods were causing all
4 kinds of illnesses, right. And here's Hippocrates
5 actually looking at natural causes and looking at the
6 sources inside the body and so forth.

7 And he collected evidence, you know, and he did
8 things that one might consider rudiments of experiments,
9 and he was a methodological naturalist. Well, it's not
10 so straight forward, because basically, if you were back
11 there in Ancient Greece -- I mean, this is what the
12 historians would say -- that there were basically two
13 approaches to medicine there.

14 And there are two approaches that, in fact, are
15 very much part of the tradition of scientific medicine;
16 one being a kind of patient centered medicine, which is
17 what Hippocrates was about. What Hippocrates did wasn't
18 just collect evidence from patients, he talked to them.
19 He actually thought that the patients had some knowledge
20 that might be useful in trying to cure them. And that
21 was a very important part of what he was doing.

22 Whereas all these guys who thought that the Gods
23 were descending upon people were, in fact, disease
24 based, the disease based approach to medicine. You
25 know, what were they talking about?

1 Well, they had something like the rudiments of
2 what we would now call the germ theory of disease where
3 external agents are, in fact, the causes, right, rather
4 than some sort of disequilibrium in the body. Some
5 external agents are, in fact, the causes of what make
6 people ill and so forth.

7 Now that's naturalistic, too, of course, right,
8 under a certain description. And similarly, you know,
9 you could turn the tables around and say, well,
10 Hippocrates is asking people for information about their
11 illness, why does he think people would have good
12 information? Well, Hippocrates thinks they've got a
13 soul, that they've got something inside of them that
14 provides privileged access.

15 Well, that sounds a little supernatural to me,
16 you know. In other words, you can play this game either
17 way. You can run the supernatural as the natural or the
18 natural as a supernatural. So there's a sense in which
19 this distinction is useless for understanding the
20 history of science.

21 Q. Well, if we take it forward to the present date,
22 do you see areas in which -- areas of science in which
23 there's a sense that methodological naturalism is a
24 deficient analytical framework for inquiry?

25 A. Well, first of all, I don't think methodological

1 naturalism is used. I mean, I think testability is
2 used. But I think that, in a sense, these
3 metaphysicals, this metaphysical issue of naturalism, I
4 don't think matters one way or another, I mean, as far
5 as scientists are concerned.

6 They're concerned about testing hypotheses, and
7 they're quite willing to entertain hypotheses from
8 almost anywhere if they end up actually bearing some
9 kind of fruit in research. So the issue of naturalism
10 is, in a way, a kind of way of setting up a kind of
11 metaphysical barrier as it were to only let in certain
12 people who think the right way to do science.

13 Q. Well, how about in areas like mind, you mentioned
14 to me. Is that an area where some people have
15 reservations about whether this approach is even going
16 to be adequate?

17 A. Well, it's true that, if you look within the
18 discipline of philosophy, you might get the impression
19 from hearing some of the things here that, in fact,
20 naturalism is the dominant view as a metaphysical view.
21 And it isn't.

22 I mean, it is quite -- I mean, it is quite
23 dominant among people who do philosophy of biology and
24 certain other areas of the philosophy of science, but in
25 the philosophy of mind, there is a strong resistance to

1 some of the more radical forms of naturalism, you know,
2 largely because it's very difficult in practice, and
3 even conceptually, to reduce, you know, all the
4 properties of the mind to matter.

5 I mean, so there is a sort of lingering kind of
6 problem there. It hasn't quite gone away.

7 Q. Is just the fact that intelligent design, at
8 least in light of some proponents, takes issue with that
9 claim to methodological naturalism, does that, in your
10 opinion, rule it out of science?

11 A. No, not at all. In fact, I think anyone in their
12 right mind who knows something about the history of
13 science or the history of philosophy ought to be
14 contesting methodological naturalism.

15 Q. Do you see evidence that scientists, practicing
16 scientists today see a commitment to methodological
17 naturalism as integral to their actual scientific work?

18 A. No. Only the philosophical defenders of a
19 certain kind see this.

20 Q. You've discussed dichotomy between natural and
21 supernatural in your testimony as we've discussed
22 methodological naturalism. Let me ask you about that.
23 Do you think that the openness of intelligent design to
24 the possibility of causation deemed supernatural, at
25 least by current knowledge, disqualifies intelligent

1 design from science?

2 A. No. And I think -- what forms my answer is here
3 is, if you look at the history of science, the kinds of
4 things that in the past had been considered supernatural
5 before they were subject to proper tests and empirical
6 evidence and so forth.

7 One shouldn't think about supernatural as
8 necessarily referring to God, because supernatural also
9 applies to the level that is below observation, because
10 you might say God is above observation. He's sort of up
11 there infinitely.

12 But, of course, a lot of the things that were
13 called supernatural include things like, well, Mendel's
14 genes or atoms, right. Before it was possible to
15 actually detect empirically the motion of atoms and so
16 forth, Atoms were regarded as cult entities.

17 Robert Boyle believed in them. Newton believed
18 in them. But those guys had non-confirmist religious
19 views that justified them. But there was a lot of
20 skepticism about atoms, okay, because they weren't
21 observable. They weren't part of the observable level
22 of reality, which was, you know, typically the kind of
23 coin of the realm for naturalism.

24 Q. Well, let's look at that and what you've just
25 said in light of the testability which has been

1 discussed. Do you think that intelligent design is not
2 science because it's not testable in the sense that
3 evolutionary theory is testable?

4 A. Well, no. It does not make it science because
5 it's not that, that's true.

6 Q. Okay. Well, what is your response to the notion
7 that intelligent design is not testable?

8 A. Well, I think, here we have to think about the
9 ways in which disciplines are testable, okay. And as I
10 was saying earlier about logical positivism, they were
11 very concerned about metaphysical assumptions being
12 built into the conditions of testing, which would, in
13 effect, bias the outcome of the test.

14 And so there is a sense in which, when we see say
15 that evolutionary theory is testable, and I'm quite
16 willing to accept that locution, we don't actually mean
17 that the most general propositions of evolutionary
18 theory are directly testable. What we mean is that,
19 the constitutive disciplines that they, that
20 evolutionary theory explains, the claims coming from
21 them are testable.

22 So we have testable claims in genetics, right,
23 that can be explained in terms of evolutionary theory.
24 We have testable claims in natural history that perhaps
25 could be explained in terms of evolutionary theory. But

1 the testing is of the claims in the particular
2 biological disciplines.

3 So when Miller, for example, was here with the
4 bacterium, okay, what's -- this is a test of the
5 bacterium and about whether the bacterium flagellum can
6 survive and function under certain kinds of conditions.
7 What is this a test of? Whether that thing can happen.
8 Does this vindicate natural selection in some general
9 kind of way?

10 Well, only if you add in a whole lot of other
11 assumptions; otherwise, it's making a very specific
12 point about the survivability of the flagellum in a
13 particular kind of environment.

14 Q. Are those other assumptions you're talking about
15 testable in the sense of the claim with respect to the
16 flagellum?

17 A. Not at the moment certainly, no.

18 Q. Well, let me ask you. If you contrast the higher
19 order claims made by evolutionary theorists with the
20 claims made by intelligent design, do you see a
21 comparative or a different situation with respect to
22 testability?

23 A. Well, frankly, I don't think you can do any --
24 both -- the theoretical frameworks in which both
25 evolutionary theory and intelligent design operate are

1 largely both metaphysical.

2 And in that sense, they cannot either be directly
3 tested. The difference is, evolutionary theory is much
4 more developed, much more elaborate, and in that way,
5 much more suggestive of forms of research to do, which
6 then, in turn, can be tested. So it's got that
7 advantage.

8 So I'm not taking that away from it at all. But
9 I think it is very loose to say, oh, evolutionary theory
10 is being tested directly every time we do an experiment
11 in a cell biology lab, because that is not the case at
12 all. One has to build in a lot of other assumptions in
13 order to reach that sort of conclusion, each of which
14 could be contested.

15 Q. And that's what I'm trying to get at. Do you see
16 the situation with respect to evolutionary theory as
17 different, marketedly different in principle from --

18 A. Not in principle, not in principle.

19 Q. Okay. But you see a difference between --

20 A. In fact --

21 Q. Based on what?

22 A. Based on the stage of the history that they're
23 in. There are two different stages in their respective
24 histories.

25 Q. Which are significant with respect to the

1 criteria of testability how?

2 A. Well, because you actually need a certain amount
3 of time for the theory to develop, to construct its
4 implications, to sort of widen its scope, to do the
5 reinterpretation of already existing phenomena. You
6 need to scope all that out before you can actually set
7 up an adequate research program on the basis of which
8 then you can do some tests.

9 Q. Well, in terms of testability again, let me ask
10 you. Is this openness to the supernatural, does that
11 render ID, therefore, not testable and, therefore, not
12 science?

13 A. No, it does not. In fact, it may turn out to be
14 a product of the imagination that may lead to hypotheses
15 that then can go on and be testable.

16 Q. And do you see analogies for that in the history
17 of science?

18 A. This is the point about bringing up Newton and
19 bringing up Mendel and bringing up Babbage and bringing
20 up all of these people who, in their variously
21 sacrilegious ways, thought they could get inside the
22 mind of God. And they tried to figure out how God's
23 mind worked and what he was doing when he was trying to
24 set up various things.

25 Q. Do you believe that intelligent design

1 necessarily relies on the supernatural for causation of
2 phenomena in the natural world?

3 A. No. It relies on intelligent design.

4 Q. Do you believe that the openness of intelligent
5 design to the possibility of supernatural causation
6 disqualifies it from science?

7 A. No.

8 Q. Let's look at the definition of theory and how a
9 theory is viewed by someone with your training. A lot
10 of attention has been drawn to the fact that there are
11 certain definitions of theory which require a theory to
12 be well-tested, well-substantiated. Do you, in your
13 discipline, accept that definition of theory as
14 accurate?

15 A. No. If what you mean is, does a theory have to
16 be well-substantiated in order to be scientific, the
17 answer is, no, because then no minority theory would
18 ever get off the ground. It would only mean that the
19 dominant theories count as science ever. So how would
20 there ever be any scientific change unless the dominant
21 theory imploded?

22 That seems to be the implication if one says that
23 only well-substantiated theories count as science. You
24 would never have change except from the inside.

25 Q. Well, I mean, in terms of that, a related

1 assertion has been that intelligent design is not a
2 theory, because it's just really a negative argument.
3 It doesn't offer anything in terms of the positive
4 explanation. Do you agree with that?

5 A. No. No. I think one of the things that it does
6 do is, it does provide a kind of a different way of
7 grouping together phenomena. I mean, because I think
8 one thing that one needs to take seriously when
9 assessing the prospects for intelligent design is that,
10 intelligent design is not an alternative theory of
11 biology strictly speaking.

12 I mean, I think it's -- in fact, it's really
13 covering a somewhat different range, and a broader
14 range, basically anything that can be designed. I mean,
15 I mentioned earlier that one difference between
16 intelligent design people and evolutionists is that
17 intelligent design people take the word design literally
18 across domains.

19 That is to say, when a human is designing
20 something and when, you know, organisms are being
21 designed by some intelligence, that's literally a design
22 thing happening in both cases. It's the same kind of
23 process going on in principle. And in terms of the way
24 in which biologists want to explain the nature of life,
25 there is, I think, a distinction made between how

1 artifacts are designed and how organisms come about.

2 And then in that sense, the word design is used
3 more metaphorically in biology. So there is a
4 difference in the way in which the domain is being
5 scoped out. So in that sense, what intelligent design
6 promises is kind of a different sort of way of scoping
7 out phenomena and explaining it.

8 Q. Well, in terms of that testability and the
9 difficulty of formulating a test for a new theory, do
10 you see precedence? I mean, I think you mentioned
11 Einstein's relativity to mean in terms of how someone
12 comes to grips with the implications of a new theory and
13 has to do that in order to determine a test. Can you
14 give an example that explains what you're getting at?

15 A. Well, I mean, one thing about the Einstein
16 example is, Einstein, obviously, was really changing the
17 foundations of physics in a very fundamental way, and
18 here I'm thinking particularly of general relativity,
19 which talks about space time being curved, which is a
20 very kind of unusual idea, sort of, to get your head
21 around in a way.

22 So people thought, well, this is just going to be
23 kind of a metaphysical or something. But the Royal
24 Society in 1919, having studied Einstein's work and
25 having elaborated, suggested a test of the theory, which

1 Einstein agreed to, which had to do with looking at a
2 solar eclipse in West Africa. And basically, it ended
3 up validating what Einstein would have predicted.

4 Q. Do you believe that intelligent design is
5 religious?

6 A. No, not inherently religious, no.

7 Q. And explain that.

8 A. Well, the point is, you don't have to be
9 religious to be able to develop it. I mean, I think
10 that's the key point here, that even though historically
11 it's been associated with a lot of religious people, one
12 doesn't need to be religious.

13 In fact, I would say, and, in fact, this is one
14 of the scopes for development of intelligent design
15 theory across its current constituency, is to look at
16 things like the sciences of the artificial, artificial
17 intelligence, and artificial life, because those ideas,
18 those research programs, in fact, have a design
19 orientation that's quite similar to intelligent design.

20 Q. Well, you know, in your testimony here today, you
21 have, what shall I say, described a certain sympathy of
22 viewpoint between creator and the scientific mind set
23 that has led to scientific discoveries. How do you
24 separate? How do you police that boundary? How does
25 the discipline, which you work in, create distinction

1 between the religious origins or inspiration and the
2 actual work that's being conducted?

3 A. Well, this is where the context of discovery and
4 justification distinction comes up. It's precisely for
5 that reason. I think it's worth pointing out kind of
6 the origin of this in terms of what was really
7 motivating him.

8 So the idea being, you don't want to judge the
9 validity of a scientific theory just in terms of who
10 happens to be promoting it and what their background
11 beliefs and assumptions are.

12 This distinction was originally coined in the
13 1930's, and it was basically to get around genetic-based
14 arguments that were being made in Germany at the time
15 trying to invalidate modern physics because of Jewish
16 origins, because the people who were involved were from
17 a -- to a large extent, Jewish, and that this physics
18 was very counterintuitive, relativity, quantum
19 mechanics, and there was a sense of, ah, yes, you know,
20 Jews, very tricky, they say all these kinds of things
21 that, in fact, are trying to befuddle us and all this.

22 And people were disqualified just on those
23 grounds, sort of racist theories of knowledge.

24 Q. Well, how does the distinction that you've voiced
25 addressed that concern?

1 A. Well, the point being is, you know, any -- that
2 any physicist can work with, develop, and test these
3 physical theories, that one doesn't have to have -- in
4 fact, one doesn't judge the merits of those theories by
5 the origins of the people who happen to have promoted
6 them.

7 If we actually did do that, if we actually did
8 judge theories by the motives of people who promoted
9 them, we would never have gotten Newton, because Newton
10 was theologically suspect. We would never have gotten
11 Mendel. In fact, we almost didn't get Mendel, because
12 people figured he was theologically suspect.

13 And you could go down the line of a lot of very
14 important figures in the history of science who do have,
15 you know, very, you know -- you know, if we're going to
16 be banning religion, you know, religiously suspect
17 motives behind their work.

18 Q. Well, let me ask you, and we've talked about
19 this, but I'd like you to explain to the judge. In this
20 courtroom, there's been this discussion of theistic
21 evolution and a notion ventured that theistic evolution
22 is an acceptable position with respect to science.

23 And what I've been trying to figure out is, is
24 that -- go ahead --

25 MR. WALCZAK: Finish your question.

1 MR. GILLEN: What I'm trying to figure out
2 is, if we look at this relationship between context of
3 discovery and context of justification, is the situation
4 different in any material way than the position posited
5 for theistic evolution in principle?

6 MR. WALCZAK: Objection. Your Honor, I
7 don't believe anybody in this trial has posited theistic
8 evolution as a scientific concept.

9 MR. GILLEN: That's not what I asked him.

10 THE WITNESS: I'm not sure I actually got
11 your question.

12 MR. GILLEN: Okay.

13 THE COURT: Hold on.

14 MR. GILLEN: I'm not taking that point at
15 all, Judge. And I --

16 THE COURT: Why don't you restate --

17 MR. GILLEN: Certainly.

18 THE COURT: -- and we'll see if Mr. Walczak
19 has a continuing objection to the restated question. Go
20 ahead. Restate it.

21 MR. GILLEN: It may, in fact, be that my
22 question wasn't precise. Vic had that sense, and Steve
23 didn't get it. Plainly, I need to clarify.

24 BY MR. GILLEN:

25 Q. You talked about context of discovery, context of

1 justification. In this courtroom, the Plaintiffs'
2 experts, for example, Ken Miller, have taken the
3 position that theistic evolution, his position, is
4 acceptable because it separates religion from science.

5 I'm asking you, is the context of discovery and
6 context of justification any different when applied to
7 the situation concerning intelligent design?

8 MR. WALCZAK: Objection. Professor Miller
9 did not testify in any way that theistic evolution is
10 acceptable in science. He's talking about, there are
11 different explanations and they are not inconsistent
12 when viewed as different explanations.

13 But nobody is talking about the scientific
14 legitimacy or acceptability of any particular religious
15 belief. Our view is that these things need to remain
16 separate.

17 MR. GILLEN: And that's precisely the point
18 of my question.

19 THE COURT: Well, you attributed to
20 Professor Miller a particular position as it relates to
21 theistic evolution. That's the basis of your objection,
22 is it not? I think that might be a mischaracterization,
23 so I'll sustain the objection on that basis, but you can
24 rephrase.

25 MR. GILLEN: Thank you, Your Honor. And I

1 did not mean to mischaracterize Ken Miller's position.

2 Let me rephrase and make it abstract.

3 BY MR. GILLEN:

4 Q. There's been discussion by experts of the
5 position, including Dr. Pennock, of a position called
6 theistic evolution, which is regarded by as acceptable
7 by adherence of methodological naturalism, so-called,
8 because it represents an opinion that distinguishes
9 religion and science.

10 MR. WALCZAK: Objection.

11 THE COURT: Let him finish his question.

12 MR. GILLEN: What I am asking you is, is the
13 situation any different in principle insofar as religion
14 relates to intelligent design?

15 MR. WALCZAK: Your Honor, I still think it's
16 a mischaracterization. I don't believe there's been any
17 testimony that methodological naturalism has taken a
18 position that theistic evolution is acceptable. I mean,
19 science, I think we've had testimony to the contrary,
20 that science is religiously neutral and doesn't take a
21 position on religion.

22 THE COURT: All right. Well, I understand
23 the question. He can answer it. The objection is
24 overruled.

25 THE WITNESS: I still don't know if I

1 understand the question. Sorry.

2 MR. GILLEN: Okay.

3 THE COURT: Well, it's first important that
4 you understand it. I understand the question not to be
5 objectionable.

6 MR. GILLEN: But that doesn't mean it's a
7 good question.

8 THE COURT: Well, that's right. I don't
9 pass on the question itself as it's answerable. Restate
10 it.

11 MR. GILLEN: Thank you, Your Honor.

12 BY MR. GILLEN:

13 Q. And forgive me, Steve, if this is hard. But what
14 I'm getting at is this notion that there's a position
15 which we know as theistic evolution. Do you understand
16 that position?

17 A. Yeah.

18 Q. Is the relationship between religion and science,
19 which characterizes the position theistic evolution, any
20 different in principle between the relationship between
21 religion and science as it exists with respect to
22 intelligent design?

23 A. I'm having a hard time understanding what you're
24 getting at actually.

25 Q. Okay. Well, then it must be a bad question.

1 Give me a minute here, and I'll see if I can --

2 A. I only want to answer the question if I really
3 understand it, because I hear several things going on.

4 Q. Well, and I'm not trying to say several things,
5 so maybe we can look at it this way. Do you see the
6 situation with respect to evolutionary theory and its
7 relationship to religion as different in principle from
8 the relationship between religion and intelligent design
9 theory?

10 A. Oh, I see. No, no difference.

11 Q. And why is that? Explain.

12 A. Well, I mean, if -- in terms of the kinds of
13 motivations that people would have for doing both, they
14 could be quite similar. They could be religious or
15 non-religious.

16 Q. And in your judgment, in either case, would the
17 operative critical inquiry for determining whether the
18 theory of science being that they have a context of
19 justification apart from --

20 A. Yes.

21 Q. Okay. And how do you go about demonstrating that
22 a given idea has made that leap into a context of
23 justification?

24 A. Well, okay. You're able to actually test and
25 criticize and evaluate and develop the theory without

1 sharing the fundamental motivating assumptions of its
2 originators, okay. So, for example, one thing that, in
3 terms of this trial that counts in favor of intelligent
4 design is that it's possible to discuss the theory and
5 criticize it without actually making reference to its
6 religious motives.

7 So, I mean, I'm thinking in particular about the
8 way in which Dembski's work has been treated, and also
9 Behe's work for that matter, where it is possible to
10 kind of discuss the matter without ever, you know, and
11 if you didn't know in advance, you know, you would not
12 necessarily guess that these people had a religious
13 background.

14 So the mode of discussion in the academic
15 literature is such that it can be done without reference
16 to that. So that is a sense in which the theory has
17 made the cross-over into the context of justification.

18 Q. Well, let me ask you. In your testimony, you've
19 demonstrated a sort of linkage between this creationism
20 and/or creator's mind set and intelligent design. Do
21 you see that intelligent design is creationism?

22 A. No.

23 Q. Do you think there is some element of continuity
24 there?

25 A. Well, they're motivationally at the context of

1 discovery level. I mean, I think that's kind of
2 undeniable historically because, in a sense, the context
3 of discovery is something you determined by looking at
4 the histories of the theories and who the people are and
5 all that.

6 But that is not, at the end of the day, what
7 determines whether it's science. It's what happens once
8 it passes over to the context of justification. I mean,
9 in a sense, it's almost like, you know, you really need
10 other people other than the people with the vested
11 interest in it, to sort of look at it before it can be
12 said to be science.

13 Q. Would the linkage you pointed to, as historical
14 point of origin or inspiration, would that disqualify
15 intelligent design from science?

16 A. No.

17 Q. And again, why exactly? What's your point?

18 A. Well, it's the distinction between context of
19 discovery and justification. I mean, again, if you look
20 at successful scientific theories, the people who put
21 them forward had all kinds of strange views. And in a
22 sense, you know, were those views taken into account in
23 evaluating their theories? They would immediately be
24 overruled because they often were politically or
25 religiously subversive.

1 Q. There's a notion in which the intelligent design
2 is said to be a science stopper because of that context
3 of discovery. Do you agree with the notion that a
4 religious context of discovery makes a theory a science
5 stopper?

6 A. No, not at all. And, in fact, I would say, and
7 this is, I think, this is something I would say about.
8 I made an elusion to this earlier. If you actually look
9 at the history of the way knowledge has developed across
10 cultures, modern science, starting with the scientific
11 revolution, is a very distinctive thing.

12 And I think there's been no disagreement on that
13 point. But there is always a disagreement about what
14 makes is distinctive. And the point that I would make
15 in relation to this, in relation to the religion point,
16 is that, actually believing, and I know prima facie this
17 sounds strange, but it's a very unique feature, namely
18 that the people who started modern western science and
19 started thinking in these terms was people who believed
20 in a mono-theistic God, and human beings were in the
21 image and likeness of this God.

22 I'm not just talking about the people in the 17th
23 century. But if you look at the kind of impulse that
24 led the Muslims to unify Greek and Roman knowledge as
25 some kind of common legacy of humanity to work on, which

1 then kind of got carried over, over the centuries, why
2 do that?

3 Well, there is this idea that human beings in
4 principle have kind of access to the nature of reality,
5 to maybe what the creator was up to. And these guys in
6 Greece and Rome may be able to help us out with this, so
7 we're putting it altogether in one package.

8 And, in fact, this goes even further, because one
9 of the things that very striking about western culture,
10 and has been very instrumental in the scientific
11 revolution, is the idea that nature has a unity, that
12 indeed one can have, as it were, unified theories of
13 nature, whether we're talking about Newton's theory or
14 Darwin's theory.

15 And that's actually a very rare thing. First,
16 the idea of thinking of reality as a unified thing, one
17 thing, and thinking of it as something that has, as it
18 were, a kind of structure that is sufficiently both
19 intricate and knowable, okay.

20 And this is where the idea of human beings being
21 in the image and likeness of God helps, because it
22 suggests, first of all, that there is this creator who
23 makes this one thing, right. And the powers this
24 creator has is, in a way, not that different, at least
25 in principle, to what human beings, as the privileged

1 part of creation, has.

2 Q. Well, I want to ask you. Has this benefit of a
3 certain western mind set been discussed by a proponent
4 of evolutionary theory?

5 A. Well, yes. In fact, Dobzhansky, who I mentioned
6 earlier, he was a Russian Orthodox Christian, and one of
7 his later books called The Biology of Ultimate Concern,
8 and there he actually very explicitly says, you know,
9 evolutionary theory is necessary for having a sort of
10 satisfying cosmology, one that is able to actually give
11 us meaning in the universe.

12 Q. Well, now that's a fairly recent 20th century
13 example. How about, you mentioned Thomas Huxley to me.
14 Did he recognize this same --

15 A. Well, Thomas Huxley, in a sense, was the person
16 who I first -- the person who first clued me in, you
17 might say, into this aspect of the history of western
18 culture. Toward the end of his life, he gave a very
19 famous lecture called Evolution and Ethics.

20 And at that point, you know, Darwinism is
21 already a generation old. It's already very important
22 as a kind of cultural presence in England. And there
23 are a lot of people, like Herbert Spencer, for example,
24 Darwin's nephew, Gaulton, all these guys who are
25 basically saying that evolution can provide a basis for

1 ethics.

2 And Huxley disputes this. And, in fact, one
3 of the things that really concerns Huxley is the fact
4 that it's very important that evolution, given the sort
5 of deprivileging of humanity that goes on in
6 evolution -- in evolution, right, all species, human and
7 otherwise, are subject to the same laws, the same
8 principles, extinction, all the rest of it.

9 There's a flattening of the antilogical
10 differences, you might say, between different species in
11 Darwinism. Huxley realizes this, and he accepts this as
12 kind of a fact. But he said, had we discovered this
13 very early on, right, we would never have been motivated
14 to do very systematic kind of science, because you think
15 about has -- you take the Darwinian world view as kind
16 of a basis for conducting your life, you just basically
17 say you survive and you die.

18 And everything happened -- and then the
19 genes just get recycled, as Richard Dawkins would say
20 now. And Huxley points out that, in fact, such -- the
21 metaphysics behind Darwinism, which I just described,
22 was, in fact, known to the ancients, both in the east
23 and the west, and it never motivated them to do science,
24 right.

25 So, in a sense, there was all kind of primitive

1 versions, what we would call natural selection and so
2 forth, and even notions that there might be some kind of
3 circulation of germ plasm through successive forms,
4 which is like what we talk about when we talk about
5 differences and changes in life forms.

6 And that never motivated people to do
7 science systematically. What it motivated people to do
8 was to cope with the inevitability of death. Okay. And
9 it's only when you get to a point where you have people
10 thinking, well, you know, the universe may have been the
11 created thing, and the creator may be someone like us,
12 and then maybe we can figure all this out.

13 And that, in fact, leads to the movement
14 towards science, and that gives, of course, an enormous
15 amount of human arrogance and hubris and so forth. And
16 in light of that, Huxley says, maybe it's not such a bad
17 idea human beings get taken down a peg a little bit,
18 right, in terms of Darwinism, kind of making people a
19 little more moderate, a little more humble about what
20 their aspirations could be.

21 But it's very important that the humans
22 started thinking about themselves as being in the image
23 and likeness of God in order to motivate all of the
24 effort, all of the thinking, all of the work of a very
25 systematic and specific kind that goes into doing

1 science, because it is really unprecedented in the
2 history of culture.

3 Q. Is he saying that the, this particular context of
4 discovery was necessary for evolutionary theory to
5 develop?

6 A. In a sense, yes.

7 Q. Well, let me ask you. Does that context of
8 discovery also have a relationship to the development of
9 theory?

10 A. Well, I mean, if you think about theory as
11 something that aims to unify (inaudible) phenomena,
12 which is, of course, the very normal way we think about
13 it in science, there's always a question to ask, why
14 unify? Why unify?

15 In other words, why not -- because one of the
16 things you find when you look at knowledge in other
17 cultures, especially cultures that have very developed
18 forms of knowledge, like it had in Ancient China or
19 India, places like this, where you actually have very
20 developed disciplines of mathematics, let's say, various
21 forms of technology, medicine, things of that kind, but
22 what you don't have in those cultures is this drive
23 toward unifying all these things under some one large
24 picture of reality that, in some sense, is integrated
25 and interconnected.

1 And that's largely because they didn't really
2 have a sense of a universe in this kind of modern sense.
3 They basically thought reality was multiple. It moves
4 in many different places, different practices for
5 different kinds of aspects of reality. So there was --
6 they didn't feel there was any kind of impulse. Why
7 unify?

8 So I think that's always a question that we need
9 to ask when we think about the motivation for doing
10 science, especially when we're doing theoretical
11 science, is why unify. Why do you want to unify things
12 that otherwise can be explained and worked with
13 perfectly well in their own independent settings?

14 So Dobzhansky, why does he want to unify
15 genetics, natural history, all these branches of
16 biology, is because he has this kind of universal,
17 unifying view of the cosmos, okay. He doesn't talk
18 about God in his major book. But that's adamanting it.

19 It becomes very clear in the later writings that
20 that's, in fact, motivating it. And what you even do
21 see in his writings is an attempt to sort of figure out
22 what is a science that, in fact, will, if not serve
23 humanity by being put together in this way, will at
24 least give a kind of coherence to our understanding.

25 And that's, you know, that kind of drive, that

1 motivation is not something you find in every culture
2 historically, even ones that are intellectually very
3 developed.

4 Q. Well, just to close off this point. You
5 mentioned these differences between cultures and
6 contexts of discovery as they relate to science. But
7 you've also said that science takes root in non-western
8 cultures. How is that communication possible although
9 there's not the shared context of discovery?

10 A. Well, because it is possible -- this is where the
11 context of justification comes in. And in the little
12 book I wrote on science, I always use the example of
13 Japan, where Japan is an example of, you know, an
14 obviously non-western place that for many centuries
15 closed off its doors to any kind of external influences
16 until the 1860's, and then very selective appropriated
17 aspects of western culture.

18 They brought in loads of western advisors and
19 they sort of picked and mixed, you might say, what they
20 wanted and what they didn't want. They kept the science
21 bit. And within 25 years, they became one of the five,
22 ten leading scientific powers in the world, and they've
23 sort of maintained that.

24 So there's a sense in which, as it were, the
25 testing of the science, that it works, and that you can

1 produce results doesn't actually require that you have
2 this particular mind set that the west had.

3 Q. All right. There's been some discussion of peer
4 review in this case, and I want to get your sense for
5 peer review and how it affects scientific progress.
6 You've done work on the sociology of science. Just give
7 us a sense for, in brief, for the sociology, the
8 sociological factors that affect the reception of
9 scientific theories?

10 A. Well, I think one thing, when one talks about
11 this in terms of peer review, I think one thing that's
12 very important to understand is that the function of
13 peer review has kind of, in a way, expanded over the
14 years.

15 When we talk about peer review initially, I
16 suppose the benchmark is the Royal Society where, you
17 know, it's a self-organizing, self-selecting group of
18 self-defined scientists in the 17th century received a
19 charter from the King of England, and they basically
20 decided who were the members, and they decided what got
21 published in their proceedings and so forth.

22 The thing that's very important about that early
23 type of peer review was that, what was reviewed, other
24 than your membership into the Royal Society, was the
25 work, whether the work passed muster. And typically,

1 what that involved was, back in those days, not only
2 that you did work that had observations and reasoning
3 that was transparent to other people, but that you
4 didn't insult other people's political and religious
5 views as well.

6 There was a sense which that was forbidden from
7 the outset. Now over the years, peer review has kind of
8 mutated in a way. And so now peer review is used for a
9 lot more things, not just for publications, but it's
10 also used for determining who gets grants to be able to
11 do research.

12 And so there's a sense in which, back in the old
13 days with the Royal Society, in a sense, if you were
14 kind of a wealthy person, a person with leisure, you had
15 the time and the wit, you could do some work and publish
16 it, and they might accept it at the Royal Society.

17 And, in fact, somebody like Darwin was a bit like
18 this. But nowadays, because of the costs of research,
19 the start-up costs in various ways, there is a sense in
20 which people need to get grants in order to be able to
21 set up the labs, in order to do the research that's
22 necessary to then produce peer reviewable publications.
23 But that's peer review, too.

24 So we get peer review at the very beginning of
25 the process in terms effectively who's allowed to do

1 research, because the way you get money for a grant
2 going through the peer review system is typically in
3 terms of your track record, which gives you a kind of
4 rich gets richer, poor gets poorer situation, because
5 they basically look, has this guy done reliable research
6 before.

7 Well, you know, we'll then give him some more
8 money to do it. So what happens then is that, the peer
9 review system, in effect, turns out to be a kind of
10 self-perpetuating, you know, elite network where, in
11 some sense, you kind of have to get into that in some
12 way, and it's very difficult if you're not there at the
13 beginning.

14 So if you don't actually go to the best
15 universities, if you don't get the best post-doc or the
16 best first job, if you don't actually get in to all of
17 those gatekeeping practices, it's actually quite hard to
18 make it through the peer review system.

19 Q. Well, can peer review, which plainly has benefit
20 in mind, can it be used to stultify or retard scientific
21 progress?

22 A. Well, here's the problem. As scientific research
23 has become more and more specialized, the number of
24 peers for any given piece of research that gets peer
25 reviewed gets smaller and smaller, which means, there's

1 a greater and greater likelihood that you know who
2 you're reviewing, even though it's supposed to be blind
3 peer review.

4 So there is this issue of the potential for a
5 conflict of interest to arise in peer review
6 increasingly as time goes on. This is one of the
7 reasons why there's been this great concern about
8 intellectual property law and research ethics boards and
9 all this kind of stuff.

10 It's a kind of a biproduct of peer review
11 becoming very specialized and the ability of people to
12 be able to sort of, kind of, yes, I know his work so
13 well, you know, I might benefit from it more than he
14 would, you know.

15 Q. Well, how about in terms of the process you
16 described earlier of an idea trying to get started? Can
17 peer review serve to stultify that starting of a new
18 theory in the professional community?

19 A. Yeah. I mean, it can and will happen that way.
20 One of the problems with the peer review process
21 generally, and I think one needs to appreciate this,
22 too, it's supposedly a mark of a good citizen of science
23 that you do peer review when you're asked for it. So if
24 I get sent an article to review from a colleague, you're
25 supposed to do it.

1 You're the guy who knows about it. You're doing
2 a favor to your field. But, in fact, fewer and fewer
3 people are willing to give their time to do it. So it
4 turns out that the peer reviewers, in effect, become a
5 relatively small group of people in the field, even
6 smaller than the potential number, okay.

7 And so what happens then is, you end up getting
8 fields pretty much bottlenecked by a few people who kind
9 of make all the decisions in effect. And this is kind
10 of the problem. It's not a problem, you might say,
11 that's deliberately set up, but it's a kind of default
12 problem.

13 And journal editors are always struggling with
14 this. When I was a journal editor, trying to find
15 people who are willing to take the time to peer review
16 work. And you always have to fall back on the same
17 people. And, of course, those people may be very
18 reliable, but it's very risky as well.

19 Q. And why do you say risky?

20 A. Well, because you basically have a few people's
21 judgments on which large portions of the field depend.
22 They are peers, but they're not, you know, as it were,
23 you know, they are a very small percentage.

24 Q. How about the professional societies and the role
25 that they play in mediating claims for scientific

1 theories? Do they present this risk that you've
2 described?

3 A. Well, I mean, one of the things that's very
4 tricky about science is that, there are lots of
5 different professional bodies represented. All of them
6 get called peer bodies, but, you know, one wants to see
7 how these peers are actually selected and maintained.

8 So some bodies, you know, are, as it were,
9 self-selecting, where people already in the society
10 select others, you know, the more elite societies, like
11 the National Academy of Sciences would be in that
12 category.

13 Professional societies are different in the sense
14 that people who claim to be members of the field just
15 pay a contribution and so forth. And so those tend to
16 be quite large, but they're not necessarily
17 democratically represented bodies, right, in the sense
18 of the people who govern those professional bodies
19 aren't necessarily, you know, their accountability to
20 the larger constituency is not so straight forward.

21 They maybe get elected to office at one point,
22 but then they have kind of a free hand very often in
23 what they can do. So there are issues of accountability
24 here with these professional societies. So it's always
25 uncertain exactly to what extent do official

1 pronouncements reflect actually rank and file views of
2 people in a given field.

3 Q. Well, at the same time, you peer review. So
4 what's your take on the process as a whole? Is this a
5 risk that's inherent in it or one that potentially crops
6 up in certain situations? Give us your sense for that.

7 A. Well, it's very difficult. I think one thing
8 is -- well, I mean, there are several things that could
9 be done to deal with this. Peer review, it's kind of
10 like democracies. It's the worst political system,
11 except every other one. Right. I mean, it has that
12 kind of quality to it, that it's not clear exactly what
13 the alternative would be.

14 But it is -- it's -- in terms of putting, you
15 know, saying, something's intellectual value is proven
16 by the fact it's been peer reviewed. I think one should
17 not make that kind of inference. It's not that peer
18 review is awful, right, but it is sufficiently
19 unreliable and sufficiently questionable that you at
20 least want to find some other means of showing
21 intellectual merit.

22 You want some other way of doing it. I say this
23 as someone who found a journal and does a lot of peer
24 reviewing all the time. And there's all kinds of work
25 that just doesn't get published in journals. Okay. And

1 so it's not that peer review is intrinsically bad, but
2 it's not a gold standard.

3 Q. Okay. And you're pointing there to reliability
4 in light of sociological factors?

5 A. Well, yes, in terms of how the peers are
6 selected, in terms of what percentage they represent of
7 the overall group of people in the discipline. Yeah, I
8 think so. I mean, in the past, it was a little better.
9 I mean, if you look at the history of academic journals,
10 it used to be that academic journals were -- the editors
11 of the journals were these kinds of personalities who,
12 in a sense, you know, very strongly associated
13 themselves with the contents of their journals.

14 So there would be kind of almost competition
15 among journals to be more distinctive and more
16 innovative. So there would be incentives for these guys
17 to take risks in terms of publication, like Max Planck
18 with regard to Albert Einstein. In a sense, you know,
19 hey, we published this guy, and this guy might turn out
20 to be something, and it shows what an innovative guy I
21 am, and maybe you'd like to publish in my journal, too,
22 kind of thing.

23 But journals nowadays don't quite have that
24 character. The most prestigious journals in academic
25 disciplines tend to be associated with professional

1 societies, and there the journal editors are typically
2 elected or at least maintained by the professional
3 societies, okay, which means that they operate as kind
4 of, you know, kind of like a chairman of the board where
5 they're responsible as shareholders.

6 There's a sense in which their hands are tied on
7 a lot of things. And peer reviewed, in a way, in that
8 context serves as serve as a way of not introducing too
9 much distinctiveness or bias that might offend the
10 membership.

11 So there's a kind of conservative tendency as a
12 result in these kinds of publications, and that the
13 editor doesn't really have a free reign in the matter.

14 THE COURT: We should wrap up shortly, and
15 we'll take our lunch break. So I just want to alert you
16 as you get through this particular area.

17 MR. GILLEN: We are wrapping up, Your Honor.

18 THE COURT: All right.

19 BY MR. GILLEN:

20 Q. Steve, let me ask you. Do the concerns you've
21 referenced with respect to the peer system and its
22 potential to stultify scientific progress in some cases
23 explain why you're here?

24 A. Well, yes. It seems to me that, because of the
25 way -- I really do think, in many respects, the cards

1 are stacked against radical innovative views from
2 getting a fair hearing in science today because of the
3 way peer review is run, the way in which resources are
4 concentrated, and so forth, much more so than in the
5 past actually.

6 It was a kind of much freer field back in the old
7 days. And so there's a sense in which, unless special
8 efforts are made to make space for views that do show
9 some promise, okay, they're never actually going to be
10 able to develop to the level at which then they could
11 become properly testable and then their true scientific
12 merit can be judged.

13 So special efforts have to be made. And in one
14 of my earlier books, *The Governance of Science*, I
15 actually talked about this as an affirmative action
16 strategy with regard to disadvantaged theories. It's
17 not obvious in the normal system of science that these
18 theories will get a fair hearing.

19 Q. Well, does that concern you have for encouraging
20 scientific progress explain in part why you're
21 supporting Dover's small step in this case?

22 A. Yes. Well, in fact, that is, in a sense, the
23 main reason, because if you think about this
24 sociologically, how do you expect any kind of minority
25 view with any promise to get a toe hold in science?

1 Okay. And you basically need new recruits.

2 This has been the secret of any kind of
3 scientific revolution or any kind of science that has
4 been able to maintain itself. You need enough people on
5 the ground, a critical mass to develop it. You just
6 can't count on three or four people and somehow expect
7 them to spontaneously generate followers, especially
8 when they're being constantly criticized by the
9 establishment.

10 You have to provide openings and opportunities
11 where in principle new recruits to the theory could be
12 brought about. And, of course, the way to do it, the
13 most straight forward way is by making people aware of
14 it early on, and to show promise, not to mandate it, but
15 to show that it's there. Take it or leave it.

16 And some will take it. And they may go on and
17 develop it further. And then you'll see the full fruits
18 of the theory down the line. But unless you put it into
19 the school system, it's not going to happen
20 spontaneously from the way in which science has been
21 developing at this point.

22 Q. And as we wrap up here, let me ask you, first of
23 all, I mean, do you see intelligent design as religion?

24 A. No.

25 Q. Do you see intelligent design as science?

1 A. Yes.

2 Q. Do you see intelligent design as at least holding
3 out the prospect for a scientific advance?

4 A. Yes.

5 Q. Just briefly describe some of the ways in which
6 you see that.

7 A. Well, I mean, I think that the main thing would
8 be a kind of unified science of design where, you know,
9 the kinds -- the design of artifacts, the design of
10 computer programs, and the design of biological systems
11 and social systems would be covered under one unifying
12 science.

13 It would be a somewhat different conception of
14 the, you know, map science differently from the way we
15 currently do it, but it's one that's very promising and
16 I think will become increasingly relevant, especially as
17 computers form a larger and larger part of not only how
18 we do science, but, in fact, how we think about the
19 scientific enterprise itself.

20 And I think the fact that, for example, Pennock
21 claims to be doing biology on a computer, he's showing
22 natural selection on a computer and not by looking at
23 actual animals or even doing lab experiments is very
24 striking. It seems to me, that is moving us in the
25 direction of this design mentality.

1 Q. Well, how about the openness to the supernatural?
2 Does that militate against the possibility of the
3 benefits you described?

4 A. No, because, historically, the people who have
5 had these interests have gone on to do important
6 science, whether we're talking about Newton or Mendel,
7 which has been the main examples here, because, in fact,
8 when other people take it up, take up the science
9 they've been doing, they don't necessarily have to share
10 those background assumptions. But nevertheless, once
11 the science has reached a certain point, they can take
12 it further and test the science on its own terms.

13 Q. Standing here and thinking about it from the
14 perspective of your academic training, do you see that
15 openness that leads to the possibility to the
16 supernatural causation as potentially eristic?

17 A. Yes, indeed. And it has been eristic. This is
18 not a speculation. It has been eristic.

19 MR. GILLEN: I have no other questions, Your
20 Honor.

21 THE COURT: Thank you, Mr. Gillen. This is
22 an appropriate place for us to break for lunch. We will
23 reconvene at 1:40 this afternoon, and we'll pick up
24 cross examination at that point. We'll be in recess.

25 (Whereupon, a lunch recess was taken at

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