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

TAMMY KITZMILLER, et al.,	:	CASE NO.
Plaintiffs	:	4:04-CV-02688
vs.	:	
DOVER SCHOOL DISTRICT,	:	Harrisburg, PA
Defendant	:	14 October 2005
.....	:	1:15 p.m.

TRANSCRIPT OF CIVIL BENCH TRIAL PROCEEDINGS
TRIAL DAY 9, AFTERNOON SESSION
BEFORE THE HONORABLE JOHN E. JONES, III
UNITED STATES DISTRICT JUDGE

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I N D E X
Kitzmiller vs. Dover Schools
4:04-CV-2688
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PROCEEDINGS

P R O C E E D I N G S

THE COURT: Be seated, please. All right, Mr. Walczak, you'll continue with the direct examination.

MR. WALCZAK: Your Honor, one of the things we did not do was formally move Professor Padian's as an expert, and I know that defendants have stipulated to his expertise.

THE COURT: Why don't you put the, I understand that, and I could refer back to this but it's easier for you to do it, state the exact purpose for which his testimony is being offered in the expert realm.

MR. WALCZAK: We would proffer Dr. Kevin Padian as an expert in paleontology, evolutionary biology, integrated biology, and macroevolution.

THE COURT: And then pursuant to the stipulation I assume you have no objections, Mr. Muise, is that correct?

MR. MUISE: That's correct, Your Honor.

THE COURT: All right. Then he's admitted obviously for that purpose nunc pro tunc. So let me ask you before you start your questioning, do you have an agreement as

to how long you're going to go in order to reserve --

MR. WALCZAK: Oh, I'm guessing we have an hour to an hour and fifteen. As I told Mr. Muise, if we have to bring Professor Padian back on Monday, then it's not the end of the world and we certainly don't want to cut them short on their cross.

MR. MUISE: And I'll do my best to get it done before the end of the day.

THE COURT: All right. Well, we'll work with that, and you may proceed.

CONTINUED DIRECT BY MR. WALCZAK:

Q. When we finished we were talking about the evolution of birds, and just one last point I want to make on that before we move on to mammals. On page 99 to 100 of Pandas it makes the statement there that I think has been read previously in this trial that, "Intelligent design means that various forms of life began abruptly through an intelligent agency with their distinctive features already intact," and it says, "birds with feathers, beaks, and wings, etc." Now, in fact does the fossil record show whether birds evolved with those features

intact?

A. You have a thing about the birds today. Dinosaur for lunch? To answer your question, it definitely doesn't show that these features evolved all at once intact, but rather in a step-like progression of features.

Q. So did the birds at first have just feathers and then the other features evolved?

A. We saw the simplification, we saw from a very simplified picture of all the feature that evolve in birds, but they start with very simple filamentous hair-like structures that are feathers, but if I had shown all the features of birds evolving we would have seen the wishbone appear very early before birds evolved and become a very boomerang shaped structure well before birds evolved or take flight. So that evolved for completely different purposes anyway, but birds do use the wishbone today as an anchor of some of the flight muscles. That wasn't the case originally for birds. There's just lots of features like that we could go through, sure.

Q. Let's talk about mammals. One of the examples that's referenced in Pandas is the

mammalian ear, inner ear. Could you talk to us about how Pandas discusses the mammalian ear and what science shows about that? And you've prepared a demonstrative for this?

A. I put a couple of slides together about the transition in the evolution of the mammal ear, which is unusual compared to all the other vertebrates. The next slide I think shows a bit about this. This is going to get a little complex anatomically, but I hope it will only hurt for a minute. The bones of the middle ear, mammals have three of them. You might have heard of them as the hammer, the anvil, and the stirrup.

The stirrup is a bone that's always in the ear, but the mammals have this anvil and hammer thing which are just outside that stirrup bone. These anvil and hammer bones actually correspond to bones that previously made up the upper and lower jaw joint in all the other animals, not just reptiles or anything like them, but everybody pretty much. So the Pandas authors claim that to make this correspondence is really stretching it, because they said there's no fossil record of this amazing process.

Consider, that to make this change one of these bones had to cross the hinge from the lower jaw into the middle ear region of the skull. Again this is from Pandas page 121. So they're saying there's no record of this process and it would be an amazing thing to have to change. The next slide shows that there are actually many sources going back several decades that differ, and there are just a few of them there.

The first one was actually an article by Romer, who was the dean of American vertebrate paleontology for half the century about a sinodaun that has an incipient mammalian jaw articulation, and I'll show you what that is in a minute. That comes from the journal Science in 1969. Here's a somewhat later paper by Edgar Allen of Madison, and now it's Chicago, on the evolution of the mammalian middle ear, and then a third one I put there is very recent piece, a little piece in Science by Thomas Marin from Germany and Gigi Lowe, who's curator at the Carnegie museum here in Pittsburgh just a few hours away, one of the great museums in the country, and they are talking about the

evolution of these bones in the middle ear something that is uncontroversial as a principle in comparative anatomy of vertebrates in paleontology.

Q. Now, I note that first article I believe was from 1969.

A. Was.

Q. So this isn't a new development?

A. Oh, no. Oh, no. It's been known for decades.

Q. So what you're going to show us is something that was known 25 years before Pandas was published?

A. Yes, and they discuss it. Sure. The next slide I think gives some detail of what's going on here. Trying to make this as painless as possible, there are essentially two sets of bones that are involved in one animal or another in the hinge between the upper and the lower jaw, and outlined in different colors in the skull on top I think you can see an orange bone and maybe a purplish type bone, and in the lower jaw you can see a red one and a blue one.

Now, this is an animal that is not a mammal. It's an ancient relative of mammals,

and the jaw joint in this animal is formed by two bones, that blue one marked by a "Q" in the top jaw and the red one, which is called the articulator, in the lower jaw. So the quadrate and the articular are the two bones that in all other animals except mammals make up the jaw.

The next image is of a critter called probanigmasis, which again is not a mammal. It's a little bit closer to mammals than the first guy is, and in this animal you will see that now not only do we have the articulation between the Q bone and the art bone, which is the quadrate and the articular in the upper and lower jaws, but also there is an articulation between the bone in the lower jaw marked with a "D" called the dentary and the squamosal in the skull, and this can be seen perhaps if I can rouse it, sort of in this area here where the dentary and the squamosal would meet right next to the quadrate and the articular.

So these animals actually have what we call a dual jaw joint of two pairs of bones that are actually articulating next to each other on the upper and lower sides of the skull. The next slide is of morogenucidaun, which is another

animal, again slightly closer to mammals, that also shares this dual jaw joint of the two bones, and the top of the two bones with the bottom I won't bother with the details, and finally the fourth slide is of a typical garden variety, garbage pail variety possum, which has now changed this articulation so that only the dentary and the squamosal bones are connected.

The quadrate and the articular are no longer part of the jaw joint. So we have gone from a quadrate articular joint in which the dentary and squamosal don't participate to two animals, the second and third I showed, there are others like diarthrodnatus I could have shown, in which you have two pairs of bones sitting next to each other and articulating, making that jaw joint, to a situation in mammals, the possum is an example, but many, many mammals in the fossil record would do as well as all the mammals today in which just the new articulation the dentary squamosal is made.

So you might ask what happened to the quadrate and the articular bones, and the next slide shows that actually in the course of time you can see that, again just to summarize this,

this transition, the next indication is of the original condition of the quadrate articular joint only to the next condition of having both the quadrate articular and the dentary squamosal joints which is present in these two animals to only the dentary squamosal joint, and this is the way that scientists understand this transition to have taken place.

The next slide gives you a sense of what this anatomy is on the inside of the ear. Now what you're looking at in the top is a depiction of the ear bones in some of early mammals. Now, if you can see where the pointer is pointing here on this upper right diagram, this long structure here with a big hole in the middle is called the stapes, and this is an ear bone that connects up to the eardrum in the inner ear, this little funny snail shaped thing, this bone, the stapes, has been in animals ever since they came out on land.

In fact, even the watery ancestors of land animals have this in one form or another. Next to this you'll see a little "Q" and a little "A" which are the quadrate and the articular. These are the two parts that usually that before just

made up the jaw joint, but now they are making up part of the ear bone. They are connecting up to it. On the bottom when you look at this, here is this stirrup shaped bone here which we would call the stirrup next to a bone marked by an "I", which is the anvil, and the bone next to it marked by an "M", which is the malleus, or hammer.

So malleus and the incus, or the hammer and the anvil, are actually the quadrate and the articular that used to be in the jaw joint, and now they are hooked up to the stapes here of the ear. They always were connected to the stapes, but now they are moved so that the hammer, or the articular, is now moved into the skull rather than being part of the lower jaw.

Now, Pandas says this is a very difficult transition to make, and yet we see it embryologically and we see this in the fossil record in the transition of the jaw joints. I think the next indication on the slide will give you a picture if I may, the next I think indication is the Pandas version of this, which identifies these bones as the incus and the states. The stapes as I have already shown is

the stirrup. That's always been in the ear.

I'm not really sure why they call this a relocation as the incus and the stapes when it's been there when actually what is relocated is really the articular bone which used to be in the lower jaw and now is in part of the ear. So the anatomy here is a little bit confused, and I'm sure they didn't mean to do this purposely, but again if they get this wrong, how much else is wrong that we don't know about or that is not being shown to students or has not been obviously corrected in the second edition or in any subsequent work as far as I know?

I think the next slide shows where the stapes is in both things. That's just so you can see where the stapes is the comparable structures. They may look different. One is much more stirrup shaped than the other, which is more rod shaped, but they're the same bone. They hook up to the same structures.

Q. So again here the point that Pandas makes is that there cannot be and have not been natural processes that account for this evolution?

A. And this is just an example of the kind of argumentation that's made to try to say that these transitions are difficult to make and we have no evidence for them, but as I have shown and as you have seen there has been fossil evidence going back decades that show us animals with dual pairs of bones in the jaw joints which is perfect intermediate form. It's kind of like if you had a cup in this hand and you want to transfer it to this hand, well, you could go like that, just toss it from one to the other. But if you take it in both hands and then move it this way, but for a while you've got it in both hands. That's sort of what the mammal jaw was doing.

Q. Now, you've pointed out that what you have just testified about was well known 25 years before Pandas was written. I mean, that those articles were from the late 1960's. Are you familiar with qualifications or backgrounds of the authors of Pandas?

A. I know them as the authors of Pandas. I know very little else about them from firsthand experience.

Q. So that would be Dean Kenyon, Percival

Davis, Nancy Pearcey, and Charles Thaxton. Have you ever encountered them at any meetings, paleobiology, evolutionary biology, seen any peer reviewed publications? What can you tell us about these authors?

A. I can say that none of those authors or the other people I know as consulting people on their masthead, I have never seen them at scientific meetings in my fields as far as I know. I've never known them to give papers at those meetings. I've never known them to publish in the peer reviewed literature of any of the fields related to evolutionary biology or paleontology if you want to go to specifics or anything else in related fields, and I haven't seen their work cited by scientists in those fields when discussing advances in science.

Q. Let me ask you the same question about two experts who will be testifying in the coming weeks for the school district. One is Michael Behe, and the other is professor Scott Minnick. Same question, are these folks who are recognized in the field?

A. Not in any of the fields in which I'm familiar, but it would hold they, like the

authors of Pandas, may be qualified in other fields, but as far as I understand their experience, accomplishments in the fields related to evolutionary biology, I know of no particular work that they have done that would provide expertise.

Q. So you haven't seen any peer reviewed publications from these individuals involving evolutionary biology or paleontology?

A. Not in those fields, no. Although I don't doubt in their own fold they might produce perfectly good work.

Q. Let's take one, just more example of the evolution of mammals, and one that Pandas identifies as not being able to evolve naturally is whales, and I'm wondering if, you've prepared a demonstrative to show us how Pandas treats the whales and then explain what science knows about the evolutionary process?

A. I would like to discuss this a bit if I may have the next set of slides. In Pandas, here on page 101 and 102 --

Q. Could you read that passage?

A. The whole passage?

Q. Yes, please.

A. "The absence of unambiguous transitional fossils is illustrated by the fossil record of whales. The earliest forms of whales occur in the rocks of the Eocene age, dated some fifty million years ago, but little is known of their possible ancestors. By and large, Darwinists believe that whales evolved from a land mammal. The problem is that there are no clear transitional fossils linking land mammals to whales. If whales did have land dwelling ancestors it's reasonable to expect to find some transitional fossils."

Q. End quote?

A. End quote.

Q. And in fact what does the science show?

A. Well, some of the disturbing things about that quote is apparently that the evolution of whales is something that Darwinists believe, and again it's sort of a faith based proposition that seems to have no real evidence. The Pandas authors then go on to say that there are no clear transitional fossils. It raises the question of what they might accept as a transitional fossil, but what I'd like to show you is what some of the evidence is accepted by

fossils in ways of making these transitions of features.

Again on the screen here you saw some peer reviewed publications from Nature, Science, and the Proceedings of the National Academy of Science of the USA.

17 Q. Could you just read a couple of the titles and journal articles into the record?

A. A title here is Skeletons of Terrestrial Cetaceans, which are whales, and The Relationship of Whales to Artiodactyls, which are the hoofed mammals.

18 Q. And what publication is that from?

A. That comes from Nature I believe. Another article here from Science is called Origin of Whales From Early Artiodactyls, which again are the hoofed mammals, Hands and Feet of Eocene Protocedite, which is an early group of whales from Pakistan. Those are couple of examples.

19 Q. So now the testimony you're about to give about whales, does this come from this and other peer reviewed studies?

A. Yes. If I could have the next slide I can show you a bit about this. Once again we're going to use this hat rack cladogram

relationship diagram, and again it's turned on its side so that you've got living cetacea, whales, on the bottom in blue. That group of whales and dolphins has a bunch of fossil relatives. The closest one are called basilosaurids. Outside them are protocetids, and there's a couple of forms from the Eocene called ambulocetis and pachycetis, and outside that are hippos, which are the closest living relatives of whales, and outside of that we've just listed some early Eocene artiodactyls, or hoofed mammals, from which we have recognized certain characteristics that are shared between hippos and whale, as odd as it might seem.

The skeletons you see there are some fossils from the Eocene of hoofed mammals, members of the group artiodachtyl, the ones with the even toes, and we just put them up there to show that we do have fossils of such things. The next slide gives you a sense of hippos, which no one needs any introduction to, so we'll pass to the next slide, which is a particularly interesting set of photographic views of a skull, or a partial skull and brain case of an animal called pachycetis, the critter

in the yellow, well, orange or whatever that is, outlined term, that is again closer to whales of today than hippos and the other Eocene artiodachtyls are.

This is a another of some of the oldest whales which come from Pakistan, India, Egypt, that area of the world, which once was the edge of an ancient sea in the early part of the Tertiary period, fifty, sixty million years ago when all this was happening. The images on the right are photographs of one of the brain cases and skulls of pachycetis, and the reason for showing this is just to let you know, although I won't go into any detail, that what pachycetis shares with whales that live today are not that it has a blow hole or flukes or anything like that, but that it has an ear region with features that are only found in whales.

And by this we infer that they share a common ancestor with the first whales. That would be fairly tenuous evidence if we didn't have other evidence, but the next slide will show you that the evidence of this animal does not make it look a lot like a whale either.

It's obviously a four-legged critter. It is happy running around on the ground. It looks like a garden variety quadruped, four-footed critter that runs around doing its business, whatever it does, and except for this funny ear region you might not really get a sense of its relationship to whales.

And so we note that they are quadrupedal, or four-legged, but the next slide shows you something interesting about them. That stop slide has now changed to just admit a little bit of the insights that we get from isotopes. These are isotopes of oxygen, and oxygen comes in different kind of molecular forms, and the percentage of those forms varies between terrestrial and aquatic horizons, environments, so that when we find bones that are made with oxygen elements that contain this isotopic signal, we can get an idea of whether these animals were primarily terrestrial or aquatic.

In the next slide there's a little indication on this slide there, you can see that the isotopes for pachycetis demonstrates that it falls in the fresh water marine kind of realm. So we think if this evidence is

correct that this animal was spending at least part of its time in water, including brackish or marine water. So it's already getting out there somewhere, but it's still a quadrupedal critter.

The next slide I think is going to give you a sense of ambulocetis, which means walking whale. Again it still has legs, and as the restoration at the top shows it looks like it's perfectly okay getting around on land, but the next indication on this slide will show you that the limbs are large and paddle like. So the hands and the feet are clearly already being broadened and are apparently some use to the animal in getting around in the water, and these are actual skeletons again from the Eocene.

The next slide shows you protocetids, which are ancient whale relatives that are a little bit closer than the last one was to the whales of today, and protocetids are kind of interesting. If you, the next indication I think will show that the hips on these animals have been decoupled from the backbone. That is they are no longer connected to the spinal column.

Why this would be might be difficult to

fathom, pardon the pun, except that these animals are probably using their backbone, moving it up and down the way whales swim in the water, and if you have your limbs encumbered to your backbone it's just going to be that much more difficult to do it. This may be part of the reason why the decoupling is there, and yet these animals, as you'll see from the next indication, still have skulls in which they're getting some increasingly whale-like characteristics, including the nostrils, which are beginning to move backward along the skull.

As you know, in whales the blow hole is right up close to the eyes. The next slide I think shows that even though these animals are quite aquatic and have a lot of whale features, they still have ankle bones that are very much like the ankle bones in the hoofed mammals from which they evolved, including ankles with a double pulley joint and a lever arm off the end.

Even though these animals are spending more and more time in water, they can still deal okay on lands. The next slide I think will show a basilosaurid, which is the next step toward living whales, and this is quite a different

proposition. The next indication will show you where the nostrils are, they're moving even farther up along the skull, and the next indication shows you about the hind limb bones, which are again the next indication is a close-up of this, the hind limbs are now not just decoupled from the back bone, they've become extremely reduced.

But as you'll notice, right in the middle of that slide is that pulley shaped bone with a little hook off it. That is the ankle. And so the ankle is still like the ankle of a terrestrial animal, a hoofed mammal, from which they evolved, even though this animal couldn't any more walk on land than it could fly. So what we're seeing here is the progression of features more and more whale-like from animals that are terrestrial and conventional land going animals through some really minor features beginning in such odd regions as the ear, which you might not expect to be one of the first things that would change, all the way down to this, the final thing we have here is the living cetacean, which looks, you know, very much like the whales of today because they are the whales

of today, and they've almost completely lost the hind limbs. So this is the situation as paleontologists know it in a kind of a, you know, very vague general nutshell.

Q. And this is completely contradictory to which Pandas has said?

A. Well, you look at the treatment that they've given us and that we've just seen, they've told us that there are no clear transitional fossils and that the fossil record of whales is a poster child for the absence of unambiguous transitional fossils, but we think the transition is pretty good.

Q. Now, most of these fossils that you have just pointed to were in fact discovered after the publication of Pandas in 1993?

A. Many of them were. Some of them were still around. Basilosaurids, the last, second to last guys I showed, have been known since the Civil War.

Q. Does the fact that Pandas suggests that there are no transitional fossils and kind of insert an intelligent designer as the cause because of that, what's the implication of finding new evidence where Pandas asserts a

designer?

A. Well, again I think it sets a very confusing message to students as well as to everybody, the public included, that I don't know what you're supposed to think from this. Either there is no designer or the methods of intelligent design are very badly flawed, but in each case it confuses rather than advances the educational purpose.

Q. Well, does it also not show up a flaw in the logic of intelligent design, so the fact that we don't have transitional fossils today means the only other possibility is there must have been a designer, whereas in fact what we have no found is no, there are other possibilities we may actually find natural causes for?

A. And so the fallacy is that if we don't have enough evidence for evolution, we must therefore conclude that these things had a supernatural origin.

Q. What's homology? Last concept, Your Honor.

A. Homology is the central concept of comparative biology. It's the idea that allows you to compare structures in different

animals, the kinds of structures that enable you to say that the bone you have here that we call a humerus is a humerus in a human, it's a humerus in a bat or a goat or a bird or a frog, and this is a very old concept. The notion of homology, the ability to compare comparable parts among organisms, goes back to the 1700's. Goethe was one of the first people who developed this concept in vertebrates as well as in plants because he was besides being the author of Faust and a great poet he was also a great morphologist.

He worked on plants and animals and was a great contributor to these ideas of morphology. Goethe, many of the other German scholars who worked with him, some of French scholars in days, and many of the scholars in Britain at this same time, contributed to this, including notably Sir Richard Owen, who was a little bit older than Darwin but really contemporary with him, but a complete anti-Darwinist in the sense of not accepting natural selection and not accepting the possibility of change from one species to the others in ways that Darwin and the evolutionists proposed.

What is so interesting about the presentation of homology by intelligent design advocates as with creation science, scientists and so on, is that they take a concept that isn't even evolutionary and they manage to completely destroy the fundamental basis on which it's built. Let's go back to the thinking of Richard Owen. In 1846 and 1848 a man who is Darwin's bitterest enemy, he is the only man that Darwin was ever said to have hated, so he's not exactly a big fan, these guys do not form a mutual admiration society, but Owen is a cosmic morphologist, he's the greatest paleontologist and comparative anatomist of his generation, and Owen said look, we have to be able to compare structures, and we can do it on a number of different criteria.

And he's not talking about evolution as saying look, this bone is a humerus because it connects to the same bones in all the animals we're looking at. Connects to the shoulder joint on the one hand, on the one arm, and it connects to the forearm bones on the other side, and that's the way we find it and that's how we can tell that this is a humerus, and this is the

same in a goat.

So it's in the same position, that's the first thing. The second thing is it's made of the same stuff, it's bone, and this bone -- so it's not muscle or it's not glass, it's not anything else. It's made from the same stuff, and that's another way you can tell it's the same thing. Another criterion he used is that it develops in the same way. So for example it develops along the arm primordium and it's first beginning to be formed in cartilage and the cartilage is largely replaced by bone as the bone develops in its place.

So you have criteria of position, of what it's made of, and how it develops, and these are only a few of the criteria that people use. This is before people talk about evolution in connection to homology. Now, what Darwin did by publishing The Origin of Species, many more people accepted that organisms had common ancestors, that common ancestry explained the diversity of life. And now homology had a second dimension to it. That is that homology, the resemblances that Owen had talked about and many other morphologists had talked about, why

were they similar? Because they were inherited from common ancestors. So common ancestry is not the rationale for homology. It's an explanation of the similarities that we see that is, that were actually established in pre-Darwinian terms by most classical scholars that we have.

Q. And so homology is a very well established concept within biology?

A. Yeah, and when I started by talking about how we classify things, how we make up these cladograms, we have to make sure that we're using homologous features, this is features that actually be compared and not just random features that aren't correlated to each other. Otherwise our classification systems would be invalid.

Q. And what you're talking about is something that's been established not just for a few years but for a really long time?

A. Hundreds of years.

Q. And what does Pandas do with homology?

A. It's really weird. If I can give you an example, this one here comes from their figure 5-2. This is their drawing of a dog, a wolf,

and an animal called the Tasmanian wolf, which is considered by all scientists to be a marsupial and not a placental mammal. Marsupial are animals like possums and kangaroos and phalangers and koalas and wombats that are a quite a different branch from the placental mammals, humans, primates, bats, wolves, things like that.

The caption here seems to make very little of the similarity between the dog and the wolf and a lot of the supposed identity between the Tasmanian wolf on the bottom, which they say in the caption is allegedly only distantly related to it. If I could have the next slide, this is what they're talking about in making these comparisons.

28 Q. And now this is from page 29 of Pandas?

A. It is. It says, "Despite these close parallels, because the two animals, that is the Tasmanian wolf and the conventional wolf, differ in a few features, the standard approach is to classify them in widely different categories." So the wolf with the dog and Tasmanian wolf with the kangaroo as a marsupial. Okay, and they're saying if similarity is the

basis for classification, what do we do when these similarities conflict?

The marsupial wolf is strikingly similar to the placental wolf in most features. Yet it's like the kangaroo in one significant feature, by which they mean the pouch. Upon which similarity do we build our classification scheme? Should we use the pouch or should we use everything else they're saying. So in other words, they're trying to say that the resemblances between the wolf and the dog are simply superficial, and that just because those other marsupials have pouches doesn't mean we should always classify them together.

I don't think there's ever been any doubt about this since marsupials were discovered. I don't think that there has been mass confusion about marsupials versus placentals. But the next slide I think I would, if I may I would like to show you how a morphologist would look at this question.

29 Q. I'm sorry, are those these photos taken from Pandas?

A. No. These are photos taken from literature.

30 Q. And are these reasonable depictions of what these animals look like?

A. Yes. I think as mug shots they're okay. The Tasmanian wolf, the last one died in a zoo in the 1930's. I don't think we know of any living population since then. The dogs and the North American wolf of course are still around. The Tasmanian wolf is a very strange animal. You can see its stripes, its funny ears, its snout and so forth, but superficial similarities as we have seen are not the basis on which we establish science. Let's take a look at next set of slides. What we've done here is to take actual skulls from our museum. Here's a dog and a wolf.

31 Q. And this is how scientists, real scientists would make these comparisons?

A. Oh, yeah, and in each case we have taken features of the jaws and teeth just to show you the comparability among them. I don't need to run through all the features. I just want you to take a look and see that on this slide the no's and the yes's and the numbers line up pretty well between the dog and the wolf. Do you want me to go through the similarities?

Okay, it's close enough for government work.

Then the next one here is the North American wolf and the so-called Tasmanian wolf, and in these features again every one of them is opposite, where you get no's, you get yes's, the numbers are wrong, and the carnassial tooth we see in the wolf above is missing in the Tasmanian wolf. So in these features they're completely different.

Let's go to the next slide, just looking at it the front way, which was not shown in Pandas, but the dog and the wolf, just to show that they both have nasal bones that are narrow or pinched in shape, with three incisors. The next slide contrasts the wolf with the Tasmanian wolf. The Tasmanian wolf has wide nasals and it has four incisors, which you wouldn't see from the side shot that the Pandas authors showed.

The next slide shows you a few of these skulls from underneath. The Tasmanian wolf has holes in the roof of its mouth, or palatal holes, which are lacked by the dog and the North American wolf. And the next slide shows the jawbones of these animals which have an opposite number of molars and premolar teeth between the

Tasmanian wolf, and the dog and wolf.

Also you'll see that Tasmanian wolf has a couple of structures at the back of the jaw which we call the reflected lamina. The term is not important, but it's just a significant feature that's not present in the dog and the wolf. Well, let's do our next comparison and look at the Tasmanian wolf as it relates to the kangaroo, which we know is a marsupial.

In all the features that we've been looking at so far the kangaroo and the Tasmanian wolf correspond exactly with one exception, which is that the kangaroo doesn't have three premolars, and it doesn't have three premolars because the front of its face is modified in a way that many plant eating animals are modified. They lose those front cheek teeth and they developed the very most front teeth in the skull into a cropping organism that they use to, a cropping organ that they use to crop grass and other plants. Except for that, the features of the two skulls correspond. The next one, if you like that here's the Tasmanian wolf against the possum, and although --

Q. That's another marsupial?

A. Another marsupial, yeah, our garden variety possum here, and although we saw that the kangaroo didn't have those first three premolars in front, the possum does. And the possum corresponds in all respects to those features in the Tasmanian wolf. Let's go a little bit further and look at then from the front. In each case all three, the kangaroo, the possum, and the Tasmanian wolf, have wide nasals. They have a different number of incisors, but they don't have three, except the kangaroo, which has very strange front incisors.

The next slide shows these three marsupials from the bottom. So I can just go back one, thank you. Shows these three skulls from the bottom. You can see that they all have palatal holes, holes in the roof of the mouth, which the dog and the wolf don't have. And the next slide I believe shows the jaws of these three animals, which everyone classifies as marsupials, which all have four molars, three premolars, except the kangaroo for reasons explained before, and they all have this reflected lamina in the back of the jaw.

So what are we to conclude from this?

As the next slide shows -- oh, there are genetic similarities as well. I should mention that there have been several molecular studies that leave no doubt that marsupials are not just united by the pouch. They're even united by many molecular similarities that have nothing to do with the pouch as far as we can tell.

33 Q. Can you just read into the record the name of these articles and journals they're from?

A. Sure. One is from Molecular Phylogenetics and Evolution. Its title is, "Nuclear Gene Sequences Provide Evidence that a Monophyly of Australodelphian Marsupials" by which monophyly means that they all come from the same ancestors, the australodelphian marsupials means the guys that we know that are down there in Australia and some South American mammals.

Here's "An Analysis of Marsupial Interordinal Relationships," that means the relationships within the marsupials, "Based on 12-S RNA, TRNA Valine, 16-SR RNA, and Cytochrome B Sequences." So here are four different molecules essentially, and this is in the Journal of Mammalian Evolution.

Here's a paper from the Royal Society of

London on mitochondrial genomes. Again these are DNA that comes out of the mitochondria of cells, on a bandicoot, a brush tailed possum, confirm the monophyly of australodelphian marsupials once again.

34 Q. Are these just a representative sample of the peer reviewed literature that's out there?

A. Yes.

35 Q. So there's many more than this?

A. Yes.

36 Q. So --

A. I think the next slide might give us an indication that in summary it's not just the pouch. It's all these similarities here that link the Tasmanian wolf to the other marsupials and exclude them from the placentals, and that probably should be brought out to students. I believe the next slide gives us an indication of --

37 Q. Well, let me just stop you there. So from what you have just explained to us, this homology is used to kind of systematically compare animals?

A. Yes. It's a method as I said that goes back to the 1700's, looking for unusual

similarities, listing all of them, putting them all together, and seeing which array of features makes the most sense.

38 Q. And is this widely accepted in science?

A. Yes. As I noted before, it's the basis by which we can do classification. Those shared features that we use for classification would not be anywhere if we didn't use the concept of homology.

39 Q. And as we saw, Pandas seems to suggest that the classification and comparisons are arbitrary. How does Pandas use this misrepresentation of homology?

A. I think the next slide might give some indication of that. It seems quite clear from their text that they prefer the explanation of special creation over descent. The highlighted passages here from page 125 of Pandas ask if there is any alternative explanation. They say yes, another theory is that marsupials were all designed with these reproductive structures.

An intelligent designer they say might reasonably be expected to use a variety, if a limited variety, of design approaches to produce a single engineering solution. They say that

even if we assume that an intelligent designer had a good reason for all these decisions, it doesn't follow that such reasons will be obvious to us. That's a perplexing statement, because it means that even though we have not been able to find a convincing pattern, and even though we do not know what the overarching plan is, we can still conclude that something was designed and could not have evolved.

They go on to say that, "These questions can nevertheless generate research in areas we might never investigate." I think as a scientist I'd be very concerned about how you can generate research questions when you have closed off an empirical avenue of, a very conventional empirical avenue of investigation, which is that these similarities are the result of common ancestry and provide no program for analyzing what intelligent design is, what the nature of the designer is, what the rules of design are by that designer, and this is I think classically a science stopper, especially when you tell students that these ideas should be considered but then you forbid discussion, you forbid questions.

Q. Now, it says in there that intelligent design should generate research. Are you aware of a significant body of scientific research on intelligent design?

A. Well, before I left I checked our electronic database in biology that's available through our library that surveys thousands of peer reviewed scientific journals, and I looked for intelligent design in the field of biology and all I could find were instances where humans had for example designed ergonomic chairs. And they wanted this to be intelligent design. Okay? But they didn't say anything about a creator or that these had evolved, and obviously we don't think chairs have evolved, we know that they are designed by humans.

Other instances referred to for example DNA splicing, where people are designing DNA if you will. They want to do it intelligently. Things like that, but I never saw a single instance where intelligent design had been used as a research program or even as a scientific concept. And similar studies made by other people have I believe turned up the same lack of stimulation of research in any scientific

field.

41 Q. So we hear intelligent design proponents claim that some of their propositions are testable. How do you square that?

A. Well, they began by claiming that intelligent design should be considered on the same playing field with conventional science. They've had a couple of decades now to show that it should be. They don't seem terribly interested in producing reports, peer reviewed literature that will actually document that and change the scientific paradigm. So I'm not really sure what efforts they're trying to make to change the science.

42 Q. I guess what I'm asking about is that intelligent design makes claims that are testable, and those are claims that they have made about evolution.

A. I don't think any scientific society that's weighed in on this has accepted intelligent design as testable. Speaking for myself, I don't regard intelligent design as a testable idea scientifically. I regard it as a proposition of things that can't be tested scientifically but you recourse to when

scientific explanations have failed. Parts of the things that are alleged to make up intelligent design or that are associated with it, such as irreducible complexity, may be a testable proposition, but let's take a look at that.

Irreducible complexity on its face is a simple statement about a machine or some kind of structure that has several parts. If you take away one of those parts, then it stops functioning. Well, any 8-year-old with a broken bicycle chain knows that he can't ride around anymore with a broken bicycle chain, if that part is broken it's not going to work. No one's got a Nobel prize for that proposition. This only makes sense in the context of intelligent design when irreducible complexity is invoked as a way to assert that no structure could have evolved by natural means.

Therefore, it is irreducibly complex. And as we've seen in cases where works like Pandas have asserted this, we've often found that there is evidence to the contrary that we can produce transitional sequences of things, or that the intelligent design advocates have simply left

out a lot of the information probably because they do not accept it.

43 Q. So an essential component of the intelligent design argument is that evolution doesn't work?

A. That's correct.

44 Q. And they've given a number of examples involving the fossil record, involving your fields of expertise, whether it's no pre-Cambrian ancestors or the inability of fish to have evolved or birds to have evolved or we saw whales to have evolved, and in fact what has science done with all of the scientific predictions or those assertions where evolution doesn't work or that Pandas comes --

A. Well, they've been tested by the discovery of new evidence such as fossils, such as molecular evidence, such as new evidence in developmental biology, and in a great many cases we found that the proceeding difficulties or absences of evidence have disappeared. It's an important principle in philosophy that absence of evidence is not evidence of absence.

45 Q. But in fact the examples that Pandas has given to show that in fact evolution doesn't

work have been refuted by the scientific community?

A. I believe that would be the interpretation of the scientific community, yes.

46 Q. And in fact the examples that Pandas has selected are only a very few of far more evidence that's out there supporting evolution?

A. Yes.

47 Q. And they haven't attacked those other bits of evidence?

A. No.

48 Q. But even those few bits of evidence that they have selected to argue that evolution doesn't work have largely been invalidated by empirical studies?

A. In many cases we would say that we've got a much better resolution to this. I certainly don't want to present we've solved every problem. Otherwise I'd have to go home and retire.

49 Q. We are going to try to get you home this weekend. Turn to the last slide we have here. Would you say intelligent design is a scientific proposition?

A. I don't think there's anything scientific

about intelligent design. As I say, I think it's a sort of idea that you recur to when your scientific explanations fail.

Q. Do you think it's a religious proposition? And I direct your attention to page 122 of Pandas, and perhaps if you can read this passage into the record.

A. Well, this concerns me. They say, "For the design proponent, there is another explanation of the origin of analogous features and unrelated groups." They say, "For example, the skulls of marsupial wolves and of placental wolves are similar because one particular skull best suited the requirements of both organisms." We call this idea teleology. That is, they define this as organism that's designed for certain functions or purposes.

Now, when they say an organism is designed, that's maybe a statement, a static statement, it may be in the passive voice, but did someone design it. Again and again in Pandas they say that an intelligent designer has designed this for certain functions or purposes. This indeed is teleology, that things are there for, created for a certain end or purpose, and this is a

philosophical and overtly religious notion that is absent from ideas of evolutionary biology.

51 Q. So teleology is not a scientific term?

A. No, not in the sense they're using it at all.

52 Q. Dr. Padian, you are familiar with the four-paragraph statement that the Dover school district is reading to students?

A. I've read it before.

53 Q. I'm not going to ask you to critique it paragraph by paragraph, other witnesses have done that. Let me just ask you, the Dover school district's response has been it's a one-minute statement, students don't have to stay in the classroom to listen to it, you know, what's the big deal? Why are we fighting this? Why are students harmed? Why is anybody harmed by reading this one-minute statement to the students?

A. Well, in my view, having educated students for thirty years, and so at a variety of levels from middle school up to graduate students my sense is that it's very difficult to constrain inquiry just by saying you're going to cut it off, and it's very difficult to say that if you

just read a statement it's not going to harm anybody. It's quite clear from the evidence that's been given and from the fact that we're sitting here and by the situation that's developed in Dover, clear from news reports of people arguing with each other, parents arguing with other parents and teachers, teachers arguing with the school board, school board members arguing with each other and quitting, who knows how many bitter conversations have taken place in supermarket aisles and across telephone wires.

MR. MUISE: I'm going to object, Your Honor. This is going far down the road of speculation.

THE COURT: I'll overrule the objection to the extent that I'm not hearing anything that I haven't heard before, but why don't you interject a question at this point.

54 Q. So as a science educator, as somebody who has educated students for thirty years, why is this statement a problem?

A. It's clearly caused a great division in students, a great confusion. If some students are allowed to -- well, if students are required or allowed to hear a statement that is not read

by their teacher, and unlike any other statement in the curriculum they may not ask questions about this and they may not discuss it further, this roping off of this kind of a statement means that it's to be treated differently.

It essentially ostracizes this area of study. It makes students confused, and they do ask questions. My students ask me questions about this kind of thing all the time. I don't think you can say that by cutting off inquiry you're going to stop people from asking questions. There are questions that intelligent design raises for students, and not just about science.

They are going to ask about if we have a situation where certain structures cannot evolve, that the natural processes that were perhaps created by a creator aren't sufficient to accomplish things, then what does this say about the perfection of the creation or the creator? What does this say about the ability of the creator to intervene in natural processes? If the creator can intervene, why doesn't he do so more often to relieve pain and suffering? And if this is a problem, of what

good is prayer?

These concern me as someone who educates students in the science realm because they're not just asking questions about science. And if we close off inquiry to students and say that something cannot be anymore discussed in science, just accept it this way, or if we make religious propositions part of the science curriculum, then you cannot prevent them from being scrutinized in ways that are completely inappropriate in my view, in the purview of natural science, which never claims to answer such kinds of questions.

55 Q. And from your perspective as a scientist, what's the problem with this one-minute statement?

A. I think it makes people stupid. I think essentially it makes them ignorant. It confuses them unnecessarily about things that are well understood in science, about which there is no controversy, about ideas that have existed since the 1700's, about a broad body of scientific knowledge that's been developed over centuries by people with religious backgrounds and all walks of life, from all countries and faiths,

on which everyone can understand.

I can do paleontology with people in Morocco, in Zimbabwe, in South Africa, in China, in India, any place around the world. I have co-authors in many countries around the world. We don't all share the same religious faith. We don't share the same philosophical outlook, but one thing is clear, and that is when we sit down at the table and do science, we put the rest of the stuff behind.

MR. ROTHSCHILD: I have no further questions.

THE COURT: Why don't we get started, we've only been at it about an hour. So we can get started with your cross, and then we'll take a break.

MR. MUISE: Thank you, Your Honor.

THE COURT: Why don't we try to break, Mr. Muise, in about fifteen minutes or so. That'll give you some time to get started.

CROSS EXAMINATION BY MR. MUISE:

56 Q. Good afternoon, Dr. Padian.

A. Mr. Muise.

57 Q. Sir, you just testified that you believe that this reading of this one-minute statement

will clearly cause a great division in students?
A. Did I say those words exactly?
58 Q. I believe it was --
A. Something to that effect?
59 Q. -- something to that effect, is that correct?
A. Well, I don't know without looking at the transcript or what my exact words were.
60 Q. Is it similar to those words?
A. I think what I would say is it would cause great confusion among students.
61 Q. You've never interviewed any students, is that correct?
A. Ive talked to my own students. I have not talked to Dover students.
62 Q. None of the students who may have heard this statement?
A. Not the students that may have heard that statement.
63 Q. But it's your opinion that this would cause students to ask questions such as what good is prayer?
A. Yes.
64 Q. And why is there suffering?
A. Yes.

Q. From reading this one-minute statement?
A. Yes.
Q. And that's your expert opinion?
A. Well, it has a lot to do with it.
Q. Sir, you're not a microbiologist, correct?
A. No, sir.
Q. You're not an expert probability theory?
A. No, sir.
Q. As a paleontologist is it accurate to say that what you are doing is essentially reconstructing the life of the past by accumulating data concerning patterns and then trying to infer processes that account for the change of life through time? Would that be an accurate description?
A. That's a reasonably good statement.
Q. It's reasonably based on comparative evidence, is that correct?
A. Yes, sir.
Q. For example, you know what the function of the feathers of different shapes are in birds today, and you would look at those same structures in fossils animal and then infer that they were used for a similar purpose in the fossil animal? Is that the sort of reasoning

you apply?

A. They might be, yes. That would be one line of evidence. There may be others.

72 Q. But that's the sort of reasoning that you apply as a paleontologist?

A. That's part of it, yes.

73 Q. And you heard a lot about feathers in hair-like features. With the case of hair-like feathers that cover the body or the whole body of fossils, you infer that they are de facto insulation, correct?

A. Yes.

74 Q. And they would have to be insulation because they wouldn't simply exist on the body and not have something to do with warming or cooling, is that fair?

A. And this is because they trap air.

75 Q. And you conclude that they're used for insulation based on what we know about hair and feathers today, correct?

A. Yes.

76 Q. And that's scientific reasoning?

A. That's part of it, unless we have evidence to the contrary from some other source.

77 Q. So paleontologists make reasoned inferences

based on the comparative evidence? Is that correct?

A. We do our best.

78 Q. But not all reasoned inferences made by paleontologists are correct?

A. I certainly wouldn't claim that.

79 Q. For example, your dissertation advisor John Ostram at one point reasoned that there was an intermediate state for the first wing used for flying and, that stage involved the use of these wing-like features to chase down insects, and he called it the insect hypothesis, correct?

A. He suggested that as a hypothesis, that's correct.

80 Q. And that was based on his reasoned inference from the evidence?

A. Yes.

81 Q. Now, a few scientists had another reasoned inference based on that same evidence, correct?

A. Yeah.

82 Q. And that involved moving the prey catching function from the hands to the mouth and then they're relying on these wing-like features for balance and lift, is that correct?

A. Yes.

Q. So that seemed to work better, correct?
A. Yes, it surmounted a problem of balance.
Q. So you had scientists looking at the same evidence and drawing different reasoned conclusions?
A. Sequentially.
Q. Is the approach to paleontology similar to how scientists consider the structural similarity in embryology?
A. In what sense?
Q. The same sort of reasoned inferences from structural similarities.
A. Yes, with the difference that we can observe how individual embryos develop, but it's really hard to do that with fossils because you have a single specimen which is at one stage of death, and whereas in embryos of living animals we can do a lot of comparative work.
Q. The sort of comparative work that was done with the Heckle embryos, are you familiar with the Heckle embryos?
A. Somewhat. It's not exactly my field of the specialization history of science. I have a little familiarity with the case, yes.
Q. And those were drawings that had appeared

in biology textbooks for many years?

A. Some versions of those drawings appeared in biology texts for many years, yes.

89 Q. And they were subsequently determined to be fraudulent, is that correct?

A. I don't know if I'd use the word fraudulent. I would say that they were certainly inaccurate. It's not clear to me that Heckle intended to show anything fraudulently, but as with the situation of the insect wing or the insect net hypothesis, when we get more evidence we get better answers, and John Ostram as soon as he heard the insect net hypothesis was, actually had a big problem with it surmounted by these guys in Arizona who very cleverly postulated what would happen with the upset of balance. He said the insect net hypothesis is dead. It did its job. And in the same way, when we get better drawings of embryos, if we know about them we'll try to use them.

90 Q. Now, with regard to those embryos, is it your understanding they were fudged in some respect? Because you said you don't want to use the word fraudulent because --

A. Yeah, I don't know the details, Mr. Muise. I'm not an embryologist.

91 Q. Thank you.

A. I haven't studied those, I'm sorry.

92 Q. Sir, Darwin was not the first to propose the concept of evolution, correct?

A. Correct.

93 Q. And I want to be clear on this. When we're using the term evolution in this sense, we're talking about changes over time. Life as changed over time. Is that accurate?

A. That's part of it. There's also in there common ancestry of all organisms, which is a separate consideration of evolution that comes and goes, yes.

94 Q. When we generally use the term evolution, you're saying common ancestry is similar to the general term of evolution?

A. Change through time is a good one for a general explanation of evolution to be more specific. Other individuals, including Darwin, have a more precise or different definition. Darwin's I believe for example is descent with modification.

95 Q. And that would be a reference to change

over time?

A. Yes, sure.

96 Q. And I believe you testified he was preceded by others I believe it was by as much as two centuries?

A. Yes. Loc Buffon, many of the previous, Lamarck had a theory of evolution very different from his.

97 Q. But Darwin's evidence though persuaded people to accept evolution as an explanation for the diversification of life, is that correct?

A. It was, even though as noted before his book was about natural selection.

98 Q. And I believe as you have noted before, he used artificial selection as an analogy for natural selection, correct?

A. Yes, I did. Yes.

99 Q. And artificial selection is what for example a dog breeder would use to breed a variation of a particular dog, correct?

A. That's correct.

100 Q. So when Darwin was writing he was not talking about how major new adaptive changes took place. He was talking about how minor

variations could be selected upon by natural forces, correct?

A. Because he wanted to get people to accept the baby steps, and then he would let the bigger ones take care of themselves.

101 Q. Right. You used that term baby steps in your report as well. That's what Darwin was taking about?

A. Relatively speaking, yes.

102 Q. And I believe you stated that he made only passing reference as to how new major adaptive types might emerge, is that correct?

A. That's correct.

103 Q. So Darwin's main concern in his writing was with the mechanism of natural selection?

A. That was what his book was about, that first book.

104 Q. Now, this mechanism of natural selection, isn't it true that it cannot be observed directly in the fossil record?

A. As I mentioned when Mr. Walczak asked me, there are two ways to look at natural selection. Darwin's view of looking at individuals replacing individuals in populations is at one level, but natural selection also figures very

importantly in the evolution of adaptations, and if you know that the cause of adaptation is natural selection, which by definition it is, then you can watch adaptations emerging in the fossil record, then scientist would conclude from this that they are looking at natural selection doing this, and the way we tell it's natural selection rather than something that's random is that we're looking at functional improvement, the change of functions from one thing to the other with the emergence of new types of organisms and organs.

105 Q. Do you remember in your report you wrote a statement, "His main concern," referring to Darwin, "however was with a mechanism of natural selection, which cannot be observed directly in the fossil record."

A. In his sense, yes. But as of looking at individuals and telling this fossil clam was more fit than that fossil claim or how many offspring it left.

106 Q. Are you saying in his sense of natural selection that you can't observe that directly in the fossil record?

A. In his sense of natural selection it's

very difficult.

107 Q. And I want to see if I'm following what your argument is. Is it the use of the demonstration of adaptation as a proxy for natural selection that you claim that you can observe it in the fossil record, is that correct?

A. Rather than a proxy I would say it's an effect of natural selection.

108 Q. I'm sorry, I didn't hear --

A. It's an effect of natural selection at the individual level, exactly what Darwin was talking about, but rather than seeing it at the individual level, we're seeing its effects in the wholesale transformation of lineages over time.

109 Q. Now, is it that these effects, what you're concluding, are the result of natural selection?

A. That is the standard interpretation of evolutionary biologists, because adaptation is defined as being produced by natural selection.

110 Q. Now, you're familiar with, I'm not sure if it's a term or a concept, of punctuated equilibrium?

A. Yes, sir.

111 Q. And did that pose a significant challenge to the theory of evolution?

A. No.

112 Q. Or did it not challenge the notion, which was the prevailing notion, that the pattern of evolution is slow and yet gradual?

A. That's an interesting question. When Darwin uses the word gradual, and we all accept that Darwin accepted gradual evolution, we have to remember that words meant different things in Darwin's time than they do today. The meanings of words have changed. So for example when Darwin was on the Beagle, fresh out of Cambridge, and he's traveling around the world for five years, and he goes to Chile in the course of collecting specimens on some of the days that he's off the boat, and he gets up in the mountains and he's around Concepcion, and at that time there's a violent earthquake that shakes the whole coastline.

It throws buildings down, ruins the city, hundreds of people are dead. The coastline is jacked up about twenty feet in some places, leaving putrefying sea creatures clinging to the rocks, Darwin in his journal describes this

as a gradual change. If you told anyone in California that earthquakes are gradual, they'd think you ought to be taken out and shot. But in that, gradual means step-like, and when Darwin was talking about gradual change, he meant equally step-like as well as proceeding slowly and steadily.

So it's very difficult sometimes to interpret Darwin just by reading him through today's lenses. Punctual equilibrium is I think you're exactly right, is a different idea than there is really tiny, tiny, tiny changes that are constantly, constantly, constantly, constantly changing like this, but it amounts to the same thing, because punctuated equilibrium is a statement about how morphology in a lineage changes through time, and the empirical evidence that Niles Eldridge and Steve Gould, who proposed this in 1972, they proposed that for most of the time in the fossil record eight species, that is individuals of a particular species, not whole groups of marsupials or whole groups of whales, are going to remain static.

Rather, that within an individual lineage

alone that there's not going to be this, that is gradual change toward from one point to point A in a very slow and stately fashion, but rather that it's going to be pretty much business as usual, and then a fairly rapid change to another form that then becomes progressively more stable, and in the intervening years this indeed has been confirmed by a number of paleontological studies.

113 Q. I'll let you take a look at this for reference if you'd like. In your deposition you said, "Punctuated equilibrium challenge that notion that the prevailing pattern of evolution is slow and gradual. That's a huge challenge. It was regarded as such. In fact, it was regarded as a greater challenge than his proponent suggested."

A. That's right. It was regarded this way not because it challenged the paleontologists, they were happy with it, and one of the interesting things that Eldridge and Gould did when they proposed this is that they didn't say to the population biologists and the speciation biologists, they didn't say, you know, guys, look, you got the completely wrong model here.

You've been thinking about this slow steady thing.

Instead what they said was we've been paying attention to the wrong model in evolution because Ernst Mayr in the 1940's and 50's proposed that actually probably what's happening is you have a whole big species range, and then there's this little population on the fringe in which evolution can evolve very -- I'm sorry, in which genes and the genetic constitution can evolve much more likely than it can through the whole range of population, and that here evolution may be very fast.

This may be where the new species comes in, and Eldridge and Gould said maybe now it's just coming back and taking over the ancestral range. They thought that the evolutionary biologist would be happy with this, the people that worked at the population levels and studied speciation. Instead they were apoplectic. They really didn't think that this was a mechanism. They just never had studied stasis before because, you know, if you are going to write a grant for research to study evolution, you say I want to study how things don't change, they'd think you

were nuts.

And so no one had really looked at it this way. So they turned the whole study on its head, and that's pretty much how it led to decades of inquiry by different kinds of scientists about it, and we're still talking about what is making these populations states of static through time. It's a great, great question.

114 Q. So again just following up on this punctuated equilibrium question, and I think this is how you referenced it in your deposition, you said, "Basically scientists don't know whether it applies to 90 percent of the cases or 40 cases of the cases," but in either case whether you have a punctuated pattern or a gradual pattern you surmise that selection could still be working within those patterns," is that --

A. Yes.

115 Q. Basically summarizing what you had just described?

A. Selection is not excluded from working at any of those levels. It's just all this is a statement about what we'd say is morphology

through time really.

116 Q. And again you cannot observe the selective process in the fossil record, you observe what you believe to be its effects in that first selection?

A. And in the case of punctuation --

117 Q. Is that yes? I'm not sure --

A. Yes, I'm sorry, it is a yes, but in the case of punctuation where morphology is static, population biologists, population geneticists have said that the reason that these morphologies stay stable in time is exactly because of selection, and the term they use is a certain kind of selection which is called stabilizing selection. It's a form of natural selection that weeds out the extremes that are produced in a population and canalizes the middle. So as far as population biologists were concerned, and it surprised me, they felt that they could see population processes, individual and individual, in these fossil sequences. Now, whether that's the case is not for me so say.

118 Q. Is natural selection responsible for punctuated equilibrium?

A. That's a great question. We're not really

sure what happens in the transition, and as I said even in keeping a morphology static, that can be a kind of selection that we know very well from populations occurring today.

MR. MUISE: This may be a good time to take a break, Your Honor.

THE COURT: All right, then why don't we do that. We'll break for fifteen minutes, take our afternoon recess, and we'll return with continued cross examination by Mr. Muise after that.

(Recess taken at 2:33 p.m. Trial proceedings resumed at 2:55 p.m.)

THE COURT: Be seated, please. All right, Mr. Muise, we continue with cross examination.

MR. MUISE: Thank you, Your Honor.

THE COURT: Mr. Millen has returned.

MR. GILLEN: My pleasure, Your Honor. There's just not enough of me to go around.

THE COURT: Don't lie to me, Mr. Gillen.

(Laughter in courtroom.)

CONTINUED CROSS BY MR. MUISE:

119 Q. Dr. Padian, you testified on direct about the Cambrian explosion, correct?

A. Yes.

120 Q. I want to ask you if you think this is an accurate statement. "It is this relatively abrupt appearance of living phyla that has been dubbed the Cambrian explosion."

A. Yes.

121 Q. Do you know where that statement is from?

A. No. It's a reasonable one.

122 Q. I can represent to you, and you can check as well, it's from the article that you cited on your direct testimony by Mr. James Valentine.

A. Valentine.

123 Q. Entitled Fossils, Molecules, and Embryos: New Perspectives on the Cambrian Explosion.

A. Okay.

124 Q. So other scientists use the term "abrupt appearance" in different context, correct?

A. Other scientists use the term "abrupt appearance" in different context?

125 Q. Well, there's been a lot of testimony so far, and you as well, referring to the use of the term "abrupt appearance" in Pandas, and I'm just -- I mean, you acknowledge that abrupt appearance appears if the literature in other contexts?

A. Oh, may I say it means two different

things?

Q. I believe you just said it.

A. That abrupt appearance means two different things? Yes. One thing to scientists and another thing to intelligent design proponents.

Q. Let me ask you this. This was I'll represent to you a statement by Stephen Gould found in Natural History. It says, "The fossil record, with its abrupt transitions, offers no support for gradual change. All paleontologists know that the fossil record contains precious little in the way of intermediate forms. Transitions between major groups are characteristically abrupt." Do you believe that, do you agree with that statement?

A. I think that Steve is talking about two different things. So I would say I would agree with his overall statement in context with that article, which I think it comes from a 1980 paper? Am I right about that?

Q. 1986, correct?

A. 86, okay, yes.

Q. I'm sorry. June/July 1977?

A. 77, okay. This is in Paloeobiology?

Q. Natural History?

A. Natural History. Okay, I'm getting close. I'll keep at it. Yeah, Steve was talking about two levels of understanding. One is the transition we talked about before from one species to the next which is abrupt in the shift of morphology in a lineage, and another which he says there is that in that sometimes we have transitions in the fossil record that are abrupt, and there are abrupt changes for some lineages. That is an abrupt appearance in the sense of it appears to be abrupt as opposed to abrupt appearance with no possibility of an intermediate. So we would certainly agree that we haven't worked out transitional stages for all organisms. That's absolutely true.

131 Q. Let me ask you about this statement, "paleontologists have long..." -- strike that. "Paleontologists had long been aware of a seeming contradiction between Darwin's postulate of gradualism and the factual findings of paleontology. Following phyletic lines through time seemed to reveal only minimal gradual changes, but no clear evidence for any change of a species into a different genus or for the gradual origin of an evolutionary novelty.

Anything truly novel always seemed to appear quite abruptly in the fossil record," and I'll represent to you that's from Mayr in his one long argument Charles Darwin and the Genesis of Modern Evolutionary Thought.

A. Yes, Ernst Mayr there is paraphrasing Steve Gould's findings and he's talking about species levels. In other words, the level at which punctuated equilibrium applies to single lineages of one species moving to the next as we talked about before. I think he's not actually talking about the origin of things like I showed in the slides here.

132 Q. So he's not talking about the origin of a news fossil type?

A. He's not talking about things like the origins of birds and feathers and whales and getting land creatures out of that. Or I should say I can't, because I don't know all the rest of the context in question, but Ernst Mayr was not a paleontologist and did not familiarize himself with the date of the fossil record, and he was not familiar with most of the evidence I talked about today.

133 Q. And so it's the abrupt appearance of what

that they're referring to?

A. In the case of what Gould is talking about with punctuated equilibrium, he's really talking about just new morphological changes that bring us new kinds of species, individual species from a lineage that was already present to a lineage that then appears in the fossil record, and he's talking about that change being relatively rapid, which Mayr would have had no problem with because we know that rapid change can happen in evolution. That's not a problem. The whole question was the lack of gradual change in the slow and steady sense.

134 Q. And one more statement, and again I want to see if you agree with this. "The Cambrian explosion refers to the seemingly abrupt appearance of diverse metazoan groups representing a number of extent phyla as well as some problematic clades during the Cambrian period."

A. That's sounds like a fair description.

135 Q. And this is from an article I believe entitled Lower Cambrian Vertebrates from South China.

A. Okay.

Q. Author E.G. -- or excuse me, Shu, S-H-U?
A. Okay.
Q. Are you familiar with that author?
A. No.
Q. But that's an accurate statement?
A. It's made sense to me.
Q. Now, is it the case -- let me back up. Do you see the Cambrian explosion as mainly a problem of fossil preservation?
A. I see it largely as a problem of fossil preservation, although the people that work on the problem more closely than I do and I accept what their findings are about it certainly say that there's a lot of evolution going on in the period of millions to tens of millions of years.
Q. Are with regard to the fossil preservation, the problem is that obviously you have to read the life of the past from the preserved rocks, correct?
A. Yes.
Q. And obviously longer the locks lay around, the less chance you have of finding what you're looking for in those rocks?
A. That's exactly right.
Q. And so there are increasingly more gaps

in the fossil record the further back we go?

A. As a general matter of course that's true, because the rocks on the crust of the earth are continually eroded as you pointed out, and also subducted by geological processes, destroyed inside the earth.

143 Q. Is it the case that fossil evidence suggests that many of the animal phyla which first appeared without, that first appear without evident precursors during the five to ten million areas in the Cambrian rocks?

A. I think it depends on what you mean by evident precursors. You're correct that at that great distance in time it's harder and harder for us to find rocks of exactly the right age for every integral that we would love to have, but the fact is as I showed that in pre-Cambrian rocks there are already complex metazoan animals going back in some cases to as many as ninety million years before the Cambrian explosion was over. So metazoans in a sense are there. We would call them precursors.

144 Q. So it's your understanding that there are multicellular precursors to the Cambrian fauna which are the metazoans?

A. In the pre-Cambrian, yes.

145 Q. Are there scientists who felt that these are ancestral to the pre-Cambrian fauna?

A. What do you mean by the word "ancestral".

146 Q. That they are precursors to the fauna that found in the Cambrian period.

A. Well, if somebody says that they are not directly ancestral or we can't establish that they are directly ancestral but might be collateral ancestors, I think most paleontologists would be fine with that statement. The reason being that many of these animals the preservation is not great, they don't give us a lot of characteristics to work with, all those shared features that I talked about as being the scientific basis on which we read classifications.

So we might see a little curly thing in the fossil record with maybe some shell associated with it, but is that really a snail when it's like a millimeter long and, you know, typical snails, you know, are bigger. I mean, are we going to call that a snail or are we going to say well, maybe that's just like some little wormy guy that lived in a tube. So

we don't know all the timing, without enough characteristics we're going to look for really derived, you know, unusual characters of snails before we start hanging the label snail or direct snail ancestor on a little piece of Cambrian or pre-Cambrian shell.

147 Q. Is that the, I don't know if I'm saying it right, the Idiacrin fauna?

A. Idiacrin fauna is the soft body at the time, I'm sorry, and it's a tough thing, and these are, Idiacrin is normally a fauna of the remains of soft bodied organisms, many of which don't look at all like creatures we find much later in the record.

148 Q. Are they considered by some scientists as ancestors to the Cambrian fauna?

A. Most of the critters we fined in the Idiacrin fauna are just weird. They seem to represent early metazoan, like the word experiments is often trotted out, but it's a misleading thing, but they are animals that diverged and had a nice run, and they basically, you know, played out their string and they didn't leave many descendant for very long and finally there's nobody left, but the

question of whether they contained the ancestors of the Cambrian fauna is often difficult to say. Again without proper characters we don't really know, and we can't for the ancestors of a particular group to be found. Could I give you a different example that might clarify?

149 Q. Well, we're talking about pre-Cambrian and Cambrian fauna and the relationship, I'm trying to establish, because my understanding is that some of the work by Stephen J. Gould and Simon Conway Morris called into doubt whether or not these multicellular precursors of the metazoans were actually ancestral to the Cambrian fauna. Is that, are you familiar with that?

A. To the specific animals within the Cambrian fauna, I believe they had a disagreement about parts of that. Part of what they're talking about is when you find these really weird Cambrian, pre-Cambrian forms, can you shoe horn them into existing groups or relatives of existing groups, or were they simply early lineages that simply resembled them in some respects but then became extinct, and that's again a case by case assessment by people, and the only way to find out is roll up your sleeves

and go look for these characters who shared derived features by which you can establish relationships.

It's really difficult to tell. For example, in the famous Burgess shale of the Cambrian, as Steve Gould has pointed out once, you know, we have a little animal there that looks like it's an ancestral chordate, and chordates are animals that include vertebrates, and if that little animal, pychea, he said if that animal had been snuffed without any relatives to continue on, whether or not it's the direct ancestor or just a close personal friend of the animal that eventually became chordates, the whole tape would have ended right there for us, but do we know about these critters? Well, you know, we just happened to find that one and that one happened to survive. So we can't always choose what we're going to find in the records when we write about the vagaries of preservation.

150 Q. I believe you called a Cladogram?

A. Cladogram, yes, sir.

151 Q. Would it be possible to construct one of those with the metazoans to the Cambrian fauna?

A. Yes.

152 Q. But there would be a lot of questions in-between to make that connection, is that accurate?

A. Well, there would be questions as to the relationship of many of the specific animals found in the pre-Cambrian, that's exactly right.

153 Q. What would allow you then to make that connection between the pre-Cambrian fauna and the Cambrian with all of these questions?

A. Because in the Cambrian fauna, in addition to animals that we're not sure what they are or who they're related to, we do have animals that we know at least are metazoans, and some of the animals that I talked about included the trace fossils, which means the kind of tracks that animals make when they wiggle along or burrow or walk. These traces well before the Cambrian show us that these animals are proceeding in this specific front to back direction, forward progression, and that therefore that their sides are symmetrical.

So they're what call bilateral, they're bilaterians, and bilaterians are a subgroup of metazoans. So because we have bilaterian traces

in the pre-Cambrian we can understand that metazoans were present. In the same with the embryos that I described from way, tens of millions of years before the Cambrian boundary, have the characteristics of metazoan embryos. That tells us that metazoans are present, but maybe not specifically brachiopods or clams or snails, but that some kind of metazoan is there. And unfortunately we're all sorry about it, we don't have better records of these.

154 Q. Getting back to the writings by Gould and Morris, do they question that connection between the metazoans and the Cambrian fauna?

A. That there are metazoans in the pre-Cambrian.

155 Q. That they're ancestral. I know you used that term --

A. Oh, that these specific animals that are found in the pre-Cambrian fauna are directly ancestral to the metazoans of the Cambrian?

156 Q. Yes.

A. I think we all question that, yes. I don't remember their particular words, but many of them are clearly not directly ancestral.

157 Q. Is that based on fossil evidence and/or

the molecular systematics? Is there a molecular systematics claim to that at all?

A. The molecular evidence can't tell you a lot about things. The molecular evidence is mostly used to tell you about what the approximate divergence times is of living groups of organisms and their ancestors. The fossils are pretty much what we depend on for those things you mentioned.

158 Q. So would it be accurate to say that molecular systematics can say anything nothing about the relationships or roles of fossil organisms to each other or to living lineages?

A. If you can't get molecules out of a fossil you can't assess its relationships to other fossils or to living organisms. So for example ichthyosaur were denizens of the oceans during the age of dinosaurs. They're not related closely to any known animals, but no one has gotten any DNA out of an ichthyosaur yet. So how an ichthyosaur is related to a plesiosaur or a dinosaur or how it's related to a turtle of today we really don't know.

159 Q. Poor court reporter. There's been several I guess recent molecular analyses which would

agree that whales and hippos are each other's closest relatives, correct?

A. Yes. Living relatives.

160 Q. And from this conclusion some scientists have suggested that because both kinds of animals spend time in the water that their common ancestor would have been aquatic?

A. There were a couple of molecular biologists who suggested that hypothesis.

161 Q. And the fossil records show that this inference was incorrect, is that accurate?

A. The fossil record shows that that inference is apparently incorrect.

162 Q. According to the fossil record the first hippos were terrestrial and not amphibious, is that correct?

A. That is what we understand now, and furthermore that they evolved from a terrestrial group called anthracoceres that reach back to the Eocene when we have the whales first evolving.

163 Q. And the fossil record shows that whales were fully aquatic some 35 million years before the first hippos evolved?

A. That's what the fossil record tells us.

164 Q. And that the whales, too, evolved from animals that were entirely terrestrial?

A. As we showed.

165 Q. So even if the whales and hippos are each other's closest relatives among living animals, they didn't have a common ancestor that lived in the water but rather was terrestrial?

A. That is what we understand.

166 Q. So based on this, the fossil evidence was more important than the molecular evidence for showing the common ancestor? Is that accurate?

A. No. For showing the ecological condition of the common ancestor. The molecular evidence was wonderful because it showed us that hippos and whales share molecular characteristics that nobody else has, and on this basis scientists accepted that whales and hippos were each other's closest relatives.

167 Q. But the inferences that were drawn from the molecular evidence which these molecular biologists concluded that the common ancestors had been aquatic was actually shown to be not true through the fossil --

A. Yeah, they made an inference, a hypothesis, that they just hadn't looked at the fossils, and

when we were able to assess the fossil evidence and to determine as a post-doctoral student and his team did in the laboratory across from mine at Berkley that hippos actually came from anthracoceres, these other terrestrial animals from earlier, about the time when the whales were first getting started, that it was really quite clear that these animals had independent origins into water, and the hippos never become fully aquatic as far as we know.

168 Q. And that was something that could not be determined from the molecular evidence?

A. Because the molecular evidence won't tell you about the lifestyles of the old and extinct.

169 Q. I believe you testified something to the effect that the fossil record provides strong support for evolution and has since the mid 1800's?

A. Yes.

170 Q. And again when you use the term "evolution" here, you're referring to the change over time, life has changed over time?

A. The progression of life, in that sense. And increasingly through the 1800's, the idea of common ancestry. In the middle of the 1800's

it was quite possible to talk about the early records of birds and reptiles and other animals in very, very old rocks from the Mesozoic era and so forth if that's what you mean.

171 Q. Is it your understanding that intelligent design refutes the claim that life has changed over time?

A. I don't think intelligent design refutes anything in science that I'm aware of.

172 Q. Would you think ID, intelligent design, proponents don't agree with the notion that life has changed over time?

A. Oh, I think as the quotes from Pandas shows, they're typical, I think that they accept some limited change within lineages. However, the diagram that I showed that for them represents the face value interpretation of the fossil record, that diagram shows straight lines from the bottom to the top without much change if any.

173 Q. You testified about irreducible complexity, the concept of it, correct?

A. I did talk about that.

174 Q. And your characterization of irreducible complexity is that it applies beyond the

molecular level of biology?

A. I testified that Mr. Behe says that they don't, but that the other IDC proponents indicate quite clearly that it does.

175 Q. And I believe with the slides that you showed, the term "irreducible complexity" wasn't used in any of those slides, correct?

A. Instead the term "adaptational packages" was used, which are indications that they cannot be disassembled without not working, and that is the same concept as irreducible complexity.

176 Q. Dr. Behe rebutted such an application in a journal article he wrote in Biology and Philosophy. Are you aware of that?

A. No.

177 Q. Is it your opinion that it's impossible to test the concept of irreducible complexity?

A. No, it's possible.

178 Q. Is it your belief that the evidence has falsified the claim of irreducible complexity?

A. If the claim of irreducible complexity is made as a blanket statement, it's not possible to falsify every instance until every instance is tested. What I showed here was many instances where the examples given in Pandas

which seem to suggest that evolution of complex structures such as are claimed for irreducible complexity can be tested, they have been shown that in fact we can show transitions, and that the irreducible complexity in these features is not shown.

179 Q. In your report you reference to some study or evidence on the flagella as demonstrating Dr. Behe's claim of irreducible complexity was falsified.

A. As a principle. In principle that the question of whether, of how, whether the bacterial flagellum could evolve or not is a testable question.

180 Q. I believe from your report, this is one of the conclusions you reached, "The reasonable conclusion is that the structure we call flagella at first served the secretory purpose (and before this perhaps other purposes) and only later changed behaviorally and structurally to work in propulsion." Do you recall making that conclusion?

A. Yes.

181 Q. Would that conclusion be consistent with what Darwin's theory would predict?

A. I don't think Darwin's theory would predict a specific outcome in every case. My statement simply says that if you could take one function of a flagellum in a simpler form and have that flagellum acquire a second function and become more complex in the process, much like the wing of a bird became more complex as it evolved flight, then that would be a testable proposition and it would be reasonable to conclude that's one way it could happen.

182 Q. And is that your conclusion that that falsified based on what I just read?

A. Oh, no, I don't know whether that's the way it went or not. I say it's a reasonable way to say it.

183 Q. Do you know researchers who work on this flagellum have concluded that the flagellum came first and that the TTS was actually later derived from the flagellum?

A. Some researchers have concluded that, but some researchers have concluded the opposite I believe, but again it's not my field of expertise.

184 Q. But your reasonable conclusion, the term you use, would be the opposite of what some of

researchers actually --

A. The opposite would also be a reasonable conclusion, and the question is if you test it with enough evidence maybe you'll come to a good one.

185 Q. Two of the main concepts that intelligent design proponents advance, one is the irreducible complexity that we talked about and the other one is specified complexity, is that correct?

A. Specified complexity, correct.

186 Q. That was a concept that was advanced by Dr. William Dembski?

A. Yes.

187 Q. Do you know Dr. Dembski?

A. Personally? I've met him.

188 Q. Do you know of him?

MR. ROTHSCHILD: Your Honor, I'm going to object. It's beyond the scope of the direct.

MR. MUISE: Your Honor, I'm not going to go into the details. One of the points I want to bring out, he testified that they haven't published any of their works, and I'm just going to go into some of the details of what Dr. Dembski actually published without going

into the details of specified complexity.

MR. ROTHSCHILD: I would object to that characterization. I don't believe that Dr. Padian has testified he haven't published in any other works, but he published in lots of books and magazines, but he hasn't published in peer reviewed publications in his field of expertise.

THE COURT: Restate the purpose, Mr. Muise, of the line of questioning.

MR. MUISE: Your Honor, the way I understand his testimony is that they have not, they haven't published any credible materials advancing their claims in peer reviewed --

THE COURT: They?

MR. MUISE: Intelligent design proponents.

THE COURT: Okay.

MR. MUISE: In peer reviewed literature.

THE COURT: All right. I'll allow it for that limited purpose. I'll overrule the objection.

BY MR. MUISE:

189 Q. Sir, do you know that Dr. William Dembski holds a Ph.D. in mathematics from the University of Chicago?

A. He does.

190 Q. Do you understand that his ideas were published in a book call The Design Inference?

A. I do.

191 Q. And that was an academic monograph which was part of a monograph series with the academic editorial board at Cambridge University?

A. I know that.

192 Q. And the name of the series that it was published in Cambridge Studies and Probability Induction and Decision Theory, are you aware of that?

A. Yes.

193 Q. Are you aware that this book was published -- strike that. Cambridge University conducts peer reviews of the books they publish, isn't that correct?

A. In some sense, yes.

194 Q. And his book would have been one that was peer reviewed by Cambridge University?

A. I do not know.

195 Q. Does intelligent design require adherence to the claim that the earth is no older than six to ten thousand years old?

A. Intelligent design as a, as sort of a dogma

as it is, does it postulate a six thousand year old earth?

196 Q. As a theory does it require adherence to the notion that the earth is no older than six to ten thousand years old?

A. Wow. I don't know of any theory that requires adherence to a, certainly not a scientific theory, but I would agree with you that I think intelligent design is about special creation of things, not about the age of the earth.

197 Q. Do you think intelligence design requires adherence to the six-day creation event that's the literal interpretation of the Book of Genesis?

A. I don't believe it requires that. Individual proponents may agree with it or not.

198 Q. Does intelligent design require adherence to the flood geology point of view advanced by creationists?

A. I don't know if it requires that or not.

199 Q. It's your understanding that intelligent design requires the action of a supernatural creator?

A. I think that this is entailed because they

eliminate natural forces, and if you eliminate natural forces then the supernatural is left. Now, whether they are talking always about supernatural that couldn't possibly be natural forces, that would be an item that perhaps is under disagreement by intelligent design proponents.

200 Q. Let me ask you it this way then. Is it your understanding that intelligent design rules out all natural explanations for design?

A. Well, as you saw from some of the statements that we quoted there from Pandas, they are removing natural cause explanations, they're taking them off the table and positing creative intelligence as explaining these things. In that sense I think I would have to agree with that statement that they really do require a supernatural intelligence doing that and the denial or removal of natural causes that can be discovered by conventional scientific means.

201 Q. If I understand your testimony correctly, it's your understanding that intelligent design doesn't make any positive argument for design, only a negative argument against evolution?

A. About 90 percent or more of their argument is certainly about criticism of evolutionary theory, much like creation science was. There is this bit about irreducible complexity and there is this bit about specified complexity, but there's been very little work done on it. For example, I don't know whether Mr. Behe -- sorry, Mr. Dembski has elicited a single natural example, a case where specified complexity is an explanation of a particular biological incidence in the record.

202 Q. You said 90 percent is negative to evolution. Is that, I'm assuming that there's at least 10 percent of the argument that demonstrates a positive argument for design?

A. Up to 19 if I were being charitable, I'm trying to, but I really don't see that there's very much here. If you look at Of Pandas and People there's very little evidence for a designer. It's all evidence against conventional biological concepts.

203 Q. Have you ever read Darwin's Black Box?

A. I have looked at parts of it.

204 Q. The parts you looked at, was Dr. Behe citing to scientific evidence?

A. For intelligent design?

205 Q. Correct.

A. Not that I can recall.

(Brief pause.)

206 Q. Now, when you referred to supernatural agency in your deposition you said it means, "Causes, mechanisms, processes, and influences that are not part of the normal behavior of the natural world as we know it. Things that suspend or override these processes or disrupt them or otherwise influences them in extraordinary ways." Do you still adhere to that definition of supernatural?

A. I believe that would have to be supernatural as opposed to natural.

207 Q. Would you agree that forces could exist in the natural world that we have not yet discovered, for example thermonuclear fusion, at one time we didn't know what was the force that powered the sun, but then later science discovered this force known as thermonuclear fusion?

A. Sure, and now the front page in the New York Times several years ago is an article about a fifth force in gravity which is still under

discussion.

208 Q. So those examples might not be normal behavior of the natural world as we know it today?

A. Well, would we say that it might be according to the natural laws and processes consistent with those, or would we have to say it would be inconsistent with those?

209 Q. Well, I'm just asking you, that was your definition. I want to see if it fits that definition. Would those examples be considered a normal behavior of the natural world as we know it?

A. Well, those, these words you say come from my deposition, and that could be if I wanted to think about it a really sort of best crafted definition I could make that would be clear to everyone, maybe some words in that definition might be confusing or ambiguous to people, but by and large I would say that's a generally good description.

210 Q. Would you agree that this is a good general definition of a theory in science, "A theory is defined as a well tested explanation that unifies a broad range of observations"?

A. Yes.

211 Q. Would that properly define Darwin's theory of evolution?

A. Yes.

212 Q. You would agree that Darwin's theory continues to be tested as new evidence is discovered?

A. Yes.

213 Q. You would agree that Darwin's theory of evolution is not an absolute truth?

A. I don't think anything in science is an absolute truth.

214 Q. And that would include Darwin's theory of evolution?

A. I don't use the word truth in science.

215 Q. Some scientists do?

A. Yes, they do.

216 Q. Is it true that all -- strike that. Is it true that scientists still debate questions such as how new species arise?

A. Yes.

217 Q. And they still debate the question why species become extinct?

A. Yes.

218 Q. Would you agree that the origin of life

is an unsolved scientific problem?

A. There's always more to find out, yes.

219 Q. Would you agree that this is an area of which there is little direct fossil evidence?

A. Yes.

220 Q. Would you agree that Darwin's theory of evolution continues to change as new data are gathered and new ways of thinking arise?

A. Yes.

221 Q. Would you agree the fossil records are incomplete?

A. Yes.

222 Q. Would you agree that Darwin's theory of evolution is complete?

A. By Darwin's theory do you mean what Darwin said in 1859, or do you mean the current corpus of evolutionary theory?

223 Q. I think some of it has been called the neo-Darwinian synthesis?

A. Oh, the neo-Darwinian synthesis. Yeah, the modern synthesis. Yes, it is incomplete, certainly.

224 Q. And even Darwin's theory as he postulated back in the 1800's would be incomplete as well?

A. In the sense of natural selection not being

a good process to account for a lot of evolution or that there's more to natural selection or that we haven't found all the processes yet?

225 Q. Well, when you answered that the neo-Darwinian synthesis is incomplete, the same standard that you're applying there, would that apply to --

A. Oh, it didn't solve all the problems of course, sure.

226 Q. I want to see if you agree or disagree with this national science education standard, "In areas where data or understanding are incomplete, such as the details of human evolution or questions surrounding global warming, new data may well lead to changes in current ideas to resolve current conflicts."

A. That's certainly true.

227 Q. So you would agree that our understanding of the data are incomplete with regard to the details of human evolution?

A. They're incomplete with regard to virtually everything in evolution, as with everything else in science.

228 Q. That would include human evolution as those standards identify?

A. I would think so, judging by my understanding of the human fossil record, sure, we've got lots more to learn.

229 Q. Would you agree that the leap from non-life to life is the greatest gap in scientific hypotheses of earth's early history?

A. I'm not sure, because I'm not an expert on earth's early history before life. There may be lots of other big problems we don't know about.

230 Q. Do you disagree with that statement or you just don't know?

A. I don't know that I would agree with it because I'm just not that familiar with protozoic earth evolution.

231 Q. Now, Pandas was published in 1993 I believe, is that correct?

A. Second edition.

232 Q. Second edition, correct?

A. Yes, sir.

233 Q. And that's the one you were citing to today?

A. Yes, sir.

234 Q. Is it your opinion that there's been no new original thoughts by intelligent design proponents since that book was published?

A. Oh, I think there has been. Different works by intelligent design proponents have been published since 1993.

235 Q. Now, those -- did you call it a cladogram?

A. Cladogram.

236 Q. Cladogram, are those essentially a phylogenetic tree?

A. They're structurally a little bit different, but they're logical precursors, sure.

237 Q. And I believe you testified that they reflect a grouping based on shared characteristics?

A. Yes, sir.

238 Q. Would those be described also, I heard the term a tree of life, would those be considered a tree of life?

A. Insofar as they show relationships, the metaphor for this is tree of life. Sometimes it's shown by that, yes. In fact, there's a great web site --

239 Q. I'm sorry?

A. There's a big web site where people are trying to assemble all the biological cladograms they have, linking them all into a great tree of

life.

240 Q. I believe you testified that no one in science thinks that a trout gave rise to a frog I think was the example you used, is that correct?

A. Correct.

241 Q. I believe you said that their histories are quite separate?

A. Since about the Digonian or even earlier, sure. So for 400 million years or so.

242 Q. Is there then just one tree of life or could there be multiple trees of life?

A. Well, if we have only one reality and if we have a history to life, then it's follows it seems to me that there would be only one tree of life, but whether we can discover it in all its ramifications is probably a never ending process.

243 Q. I want to see if you agree with this statement, sir. "The extreme rarity of transitional forms in the fossil record persists as the trade secret of paleontology. The evolutionary trees that adorn our textbooks have data only at the tips and nodes of their branches. The rest is inference, however

reasonable, not the evidence of fossils."

A. Steve Gould said that some years ago.

244 Q. That's correct. Do you agree with that statement?

A. No. Steve didn't know what he was talking about. On a lot of areas of paleontology he was one of our greatest scientists and thinkers and scholars as I think any of this goes, but what he knew was not perfect. Steve studied snails, and if you asked me to try to give you a full phylogeny of snails, I ain't going to be able to do it and neither is Steve. But that doesn't mean that we can't do it for other organisms or that we don't find transitions. This was just one of the things that Steve didn't focus on very closely. He was -- his trade secret is really applying to this punctuated equilibrium level of the one species and then the next species that seems to arise or split off from it.

245 Q. Isn't the late Stephen Gould, wasn't he touted as one of the prominent Darwinian evolutionists?

A. Yes, he was, the whole century. Ernst Mayr was, too, but Ernst Mayr didn't know beans about

fossils, and he didn't work on macroevolution. By contrast I don't work on population genetics. I'm not going to tell you about, you know, balanced and stabilizing selection of things. That's not my area, but I think that Steve would be the first to, and Ernst Mayr would certainly say that he would acknowledge what he hadn't worked on. Ernst Mayr worked on birds.

246 Q. Well, that quote was published in an article that was published in Natural History. Is Natural History a peer reviewed journal?

A. No. And Steve was notorious. He was a great writer, but no one could take a pen to his prose. His columns were put in there, and if you touched them he was going to have a fit. So nobody edited a word. I know this from personal experience working with Steve. He was a great man, he was a great writer, but he worked on an old typewriter, didn't do drafts, he typed it out, and that was it, and he never used a computer in his life.

247 Q. Let me see if you agree with this statement. "The most striking features of large scale evolution are the extremely rapid divergence of lineages in the time of the

origin, followed by long periods in which basic body plans and ways of life are retained. What is missing are the many intermediate forms hypothesized by Darwin and the continual divergence of major lineages into the morpho space between distinct adaptive types," and that was written by Robert Carroll.

A. Yes. Bob wrote that in about it was `89.

248 Q. In an article entitled Toward the New Evolutionary Synthesis, published January of 2000?

A. Okay. Yes, I think I would disagree in detail on that. Bob in some regards is restating a principle that we have understood since, well, at least the 1940's with George Gaylord Simpson, and that is that the major groups of animals seemed to diverge first. Obviously you have to the higher levels, like phylums appearing before the classes and the orders and the individual families all appear, but these things appear and then they seem to move quickly into a variety of ecological niches. There's sort of an explosion if you will, and then it starts winnowing things out, and you get less diversity as you go on through

time and less production of types. That's a pattern that's been noted for many different kinds of animals through the fossil record, and I can't tell you so much about plants.

249 Q. A couple of more quotes I want to see if you agree with. "Paleobiologists flocked to these scientific visions of the world in a constant state of flux and add mixture. Instead of finding the slow, smooth, and progressive changes Lyel and Darwin had expected, they saw in the fossil records rapid bursts of change, new species simply appearing out of nowhere, and then remaining unchanged for millions of years, patterns hauntingly reminiscent of creation." And that is from Oxford zoologist Mark Pagel writing in Nature magazine.

A. Can you tell me what, from the context perhaps what years he's talking about that these scientists are experiencing this?

250 Q. In 1999. And as I said in 1999 writing in Nature?

A. I'm sorry, I mean of the -- when he's talking about the paleontologist, the paleontologists of which era is he talking about, do you know?

Q. I don't know. And he's referring to paleobiologists. I don't know if that's --

A. Okay. I don't know either. I mean because I think it's quite possible that in the early days of paleontology that would be probably a more acceptable pattern than it would be later on, but I don't know.

Q. And here's one in 2001 written by Ernst Mayr. "Wherever we look at the living phyata, discontinuities are overwhelmingly frequent. The discontinuities are even more striking in the fossil record. New species usually appear in the fossil suddenly, not connected with their ancestors by a series of intermediates." Do you agree with that statement?

A. Well, let's parse it, there's a long, if you unpack it just a little bit, it's a long statement, and he's talking first about, if I heard you right he was talking about the living biota and how it's disconnected by forms, we don't have all the transitional forms living today. Mayr is simply restating one of the most important basic conclusions of Darwin's Origin of Species, which is that you get a branch or a bush like that, but through time selective

extinction does its work and it removes all those intermediate forms, leaving those that then create artificial gaps between species, and so this was a basic, a very, very important principle of Darwin's work. In fact, the only illustration that Darwin has of the Origin of Species is a scheme, a tree of life where he's showing exactly this principle in schematic form.

So as far as that applies to living biota, that's a perfectly ordinary statement that everybody knows is true. Where then Ernst changed his attention to the fossil record, then he's talking about the progression of intermediates from one form to another, that you have something progressing through the record and then there's not a lot of intermediate and then there's another form progressing through the record.

If I heard you right there's a perfect description of punctuated equilibrium, which actually Gould and Eldridge took pains to credit Mayr with when they first developed as sort of being incipient in his work. So I think what he's saying there is just basic understood

stuff, not anything radical.

253 Q. In your direct testimony when you were talking about Pandas, and I believe one of the points you were talking about was the origin of feathers?

A. Yes.

254 Q. And the evidence that you cited was evidence that had come out subsequent to the publication of Pandas, is that correct?

A. That's correct.

255 Q. Now, you testified about the one minute statement that's read to the students, but I just want to explore your understanding about what may or may not actually be happening in the biology class. Is it your understanding that the theory of evolution will be taught in the ninth grade biology class at Dover pursuant to the state standards?

A. I understand it's required to be taught.

256 Q. Is it your understanding that the state standards that require students to learn about Darwin's theory evolution take a test which would include aspects of evolution?

A. I gather that that is the requirement or that's the expectation for students.

257 Q. Do you know that the book that was purchased for use in the ninth grade biology class is a 2004 version of the Miller and Levine biology book?

A. That eventually this was purchased, yes.

258 Q. And that the book Pandas that you've been testifying about today is going to be placed in the library?

A. Was it originally placed in the library or in the classroom?

259 Q. What's your understanding?

A. I'm not sure. I believe I know that, or I'm given to understand that it's now in the library.

260 Q. Is it your understanding that it's a required text for the class?

A. My understanding is that no, it was rejected as a required text. I believe the teachers did not want to use it.

261 Q. So in terms of how it's going to be applied or used in the ninth grade biology class, it's you're understanding that it's been put in the library and it's only there if students want to voluntarily go to it?

A. They are recommended to go to it to learn

more about other ideas about origins.

Q. Is your understanding that whether or not the students will be tested on any of the concepts of intelligent design?

A. I'm not aware that they will be.

Q. Are you familiar with the 2004 biology book by Miller and Levine?

A. No.

Q. Do you know who Dr. Miller is?

A. Oh, yes.

Q. Do you have an understanding that the biology book covers evolution in a manner that's consistent with his status in the scientific community?

A. I trust that it is. I know that Ken has always been very strong about including evolution in his book.

Q. Would you, based on what you know about Dr. Miller and what he does with his science books, will you conclude that the treatment of the fossil record in the biology book would be one that would be consistent with what you believe the scientific evidence shows in the fossil record?

A. Not having reviewed it I wouldn't be

prepared to tell you that specifically, I'm sorry.

267 Q. Would you have any measure of confidence based on the fact that you know Dr. Miller as the co-author?

A. I think Ken would be the first person to say he's not an expert on fossils. I hope he's getting good evidence and good reviews from other people, but I haven't seen that part of the book.

268 Q. Are you the president of the National Center for Science Education?

A. Yes, sir.

269 Q. And directors include Dr. Brian Alters, is he one of your directors?

A. Yes.

270 Q. And Dr. Barbara Forrest?

A. Yes.

271 Q. And Dr. Miller is considered one of the supporters of the National Center for Science Education?

A. I believe he's on our letterhead as a supporter, scientific supporter.

272 Q. Is the National Center for Science Education a political advocacy organization?

A. No, it's not.

273 Q. Are you familiar with the web site of the organization that you're a president of?

A. Well, I must say I don't look at it every day, and I should explain that the role of the president is not to superintend the daily activities of the staff of the center, but rather to preside over the board of directors.

274 Q. Do you have any familiarity with your web site?

A. I do consult it, but I don't have anything to do with its production and I haven't memorized its contents or have I say a great familiarity with what's up there at the moment.

275 Q. Do you know if it has a page entitled "25 Ways to Promote Science Education"?

A. I do not know that.

276 Q. Do you know if your web site encourages individuals when there's a controversy in the community of evolution to hold press conferences with colleagues, record public opinion announcements, send letters or editorials supporting evolution education to local newspapers, are you aware that your web site makes those representations?

A. I don't think I've read that particular page.

277 Q. Now, plaintiffs' experts in this case and I gather from your testimony as well have criticized intelligent design proponents for not having their ideas published in peer reviewed journals. Do you share their criticism?

A. In the appropriate fields, yes.

278 Q. Do you know who Dr. Richard Von Sternberg is?

A. I don't believe so.

279 Q. Sir, do you know if the U.S. Office of Special Counsel conducted a preliminary investigation of a complaint made by this individual that he was, that reprisals were made against him for actually publishing an intelligent design article written by Dr. Steven Meyer in the Proceedings of the Biological Society of Washington, are you aware of that controversy?

THE COURT: All right, go ahead.

MR. WALCZAK: It's way beyond the scope of direct, and the witness has testified that he didn't know who Dr. Sternberger is.

MR. MUISE: I asked him about the

controversy, Your Honor, as follow-up.

THE COURT: I guess if he doesn't know him on that basis, the second question might be objectionable. He can't identify him, so how would he know?

MR. MUISE: He may be aware of the controversy surrounding an article that was not published in the Proceedings, and I see the witness is nodding his head right now. So chances are he probably does have some understanding of the controversy.

THE COURT: All right, I'm going to give you some latitude. I'll overrule the objection.

THE WITNESS: I recognized the name when you started to explain the circumstances. Sorry, I don't mean to give you a false impression.

BY MR. MUISE:

280 Q. So you're familiar with the controversy surrounding the publication of this, what was purported to be an article on intelligent design written by Dr. Steven Meyer?

A. Well, I'm familiar that there is a controversy.

281 Q. The U.S. Office of Special Counsel

conducted a preliminary investigation, and let me read you a portion of this.

THE COURT: I'm going to sustain the objection now. I don't, I think that's beyond the scope.

MR. MUISE: Your Honor, if they're going to complain that intelligent design proponents are not publishing articles, and his organization was identified in a preliminary investigation as placing undue pressure and influence on an organization because he accepted an article, an intelligent design article, that clearly goes to the bias, and you know, there's one thing for them to criticize and it's another thing for them to just take every effort, use all their political clout they can to prevent these articles from being published in peer reviewed journals.

MR. WALCZAK: I think we've got a hearsay problem here, too, Your Honor.

THE COURT: Well --

MR. WALCZAK: And it's way beyond the scope of --

THE COURT: The purpose of the question then, Mr. Muise, is to, if I understand it,

and I'm not sure that I do, but help me out, you are embarking on a line of questioning that stems from a complaint that was initiated by the witnesses, by the entity, by the group that the witness is the president of.

MR. MUISE: No. The complaint was, this individual Dr. Richard von Sternberg, was an editor of a peer reviewed journal in which an intelligent design article was submitted for review. He as the editor agreed to accept it. He was then, reprisals were then taken against him for doing so to the point where he initiated a complaint to the U.S. Office of Special Counsel. The U.S. Office of Special Counsel conducted a preliminary investigation, and part of the investigation revealed that his organization, the National Center for Science Education, was involved in creating, in helping the strategy to get, for the reprisals against Mr. Von Sternberg.

THE COURT: Well, you can establish that by testimony I suppose. I think it's not an inappropriate line of questioning, but I guess the, ostensibly I guess it goes to bias on the part of this witness. I think I'd ask the

question a more focused way, what does he know about that.

MR. MUISE: And I was going to read a section of the report and see --

THE COURT: And/or what did he have to do with it.

MR. MUISE: Your Honor, I think the section of the report I was going to read was going to provide the foundation for those, or the basis for those follow-up questions, whether he knows this is true, whether he had any part in that.

THE COURT: Well, you've read that. I mean, by the dialogue we've just had you've gotten that in. I think it's clear now the area that you seek to get into. So I think you can hone your questions based on the dialogue that we just had, because it really goes to what he knows and what if anything he did. Isn't that what you're trying to get?

MR. MUISE: Correct, Your Honor, but the dialogue we had was between the court and myself. Not between the --

THE COURT: We didn't put the cone of silence over him while we had the dialogue. I assume he heard it. So why don't you narrow

your questions as according to that. I mean, everybody understands now what we're talking about. Ask him what he knows about that, and if anything what he, what part he had in it or what he did. Mr. Walczak, what do you want to say?

MR. WALCZAK: If we might see what the document is that Mr. Muise allegedly is pointing to, we have no idea whether he's accurately characterizing the situation or not here.

THE COURT: Well, I don't think you have to yet. I'm going to let Mr. Muise proceed. That may be necessary and maybe he's going to do that, but go ahead and see --

MR. MUISE: Your Honor, I was going to say if he doesn't believe I have a good faith basis for my question on cross examination, I have a copy of the letter from the U.S. Office of Special Counsel, I'll be happy to show opposing counsel --

THE COURT: Do you want to see that now?

MR. WALCZAK: I'm not imputing that he's got a good faith basis. I do not know as I sit here whether his characterization of what that document says is fair and accurate.

THE COURT: Well, that may or may not be an issue depending on the answers we get. So go ahead and --

MR. MUISE: That's party the reason why I was going to read that one paragraph, Your Honor, so there wasn't any misrepresentation about what the basis of the question was.

THE COURT: What do you say about that?

MR. WALCZAK: It appears to be a multipage document. Reading one paragraph out of there again I don't know whether that's taken out of context or --

THE COURT: Well, you'll have him on redirect. So why don't you share, do you have a copy, Mr. Muise? Mr. Gillen looks like he's looking for a copy.

MR. GILLEN: I believe that we do, Your Honor. It's Defendant's Exhibit 282.

THE COURT: All right. Then Mr. Muise, your point is well taken. Why don't you go ahead and read that at this point and I'll give you some latitude, and then proceed with your questions on that point, and at the same time plaintiffs' counsel is then alerted to the exhibit number and they can check it. Go ahead.

BY MR. MUISE:

282 Q. And just so the record is clear the acronyms that will be used, when I use the acronym SI I'm referring to the Smithsonian Institution, and the acronym NMNH is referring to the National Museum of Natural History, and I just want to read you a portion from this preliminary investigation, sir. "Of great import is the fact that these same SI and NMNH employees immediately aligned themselves with the National Center for Science Education, NCSE. Our investigation shows that NCSE is a political advocate organization dedicated to defeating any introduction of ID," meaning intelligent design, "creationism, or religion into the American education system.

"In fact, members of NCSE worked closely with SI and NMNH members in outlining a strategy to have you investigated and discredited within the SI. Members of NCSC furthermore e-mailed detailed statements of repudiation of the Meyer article to high level NMNH officials. In turn, they sent them to the society. There are e-mails that are several pages in length that map out their strategy.

"NCSE recommendations were circulated within the SI and eventually became part of the official public response of the SI to the Meyer articles. OSC, Office for Special Counsel, is not making a statement on whether the SI or NMNH was wrong or right in aligning with the NCSE, although OCS questions the use of appropriated funds to work with on outside advocacy group for this purpose.

"This is only discussed to show that the actions taken on the part of SI employees clearly had a political and religious component. Therefore, it may lend credence to your allegations that your religion and political affiliations were investigated and made a part of the actions taken against you," and the you referring to is the Dr. Richard Von Sternberg whom this was directed to. Sir, are you aware as the president of the NCSE whether or not the NCSE had taken any of the actions that were identified that I just read to you in this preliminary investigation?

A. I was not personally involved in any of those actions.

283 Q. Do you have any knowledge of any of

those actions actually taking place?

A. Well, I am not sure that -- let me put it this way. I expect that there may have been communication. I was not copied on any of the communication between NCSE and anyone in the Smithsonian, but it's common for agencies as well as individuals to consult NCSE, which by the way is a tax exempt organization, not a political advocacy group as the paragraph states, when there is a question about the propriety of introduction of creationist material into for example scientific curricula or such ideas. My understanding is that Mr. Von Sternberg, is his name von Sternberg or Sternberg?

284 Q. It's Von Sternberg. People refer to him as Mr. Sternberg as well.

A. Mr. Sternberg, okay. That he was an editor for the Proceedings of the Biological Society of Washington, is that an organ of the Smithsonian Institution or the National Museum of Natural History?

285 Q. You don't know or are you --

A. I don't know. I'm asking.

286 Q. Well, it doesn't work that I answer

questions. If you don't know, that's fine.

A. Then I probably can't help you any farther, I'm sorry. That's all I know about NCSE's part in it.

287 Q. Do you know if anyone within NCSE sent e-mails to any of members of the SI?

A. I don't have any personal knowledge of specific e-mails.

288 Q. Is Genie Scott, is she a member of the NCSE?

A. She is our executive director.

289 Q. Do you know if she just happened to be out giving a lecture on October 12th at the University of Idaho arguing against the teaching of intelligent design?

A. I don't know where she was on that date, sorry.

290 Q. Do you know Dr. Scott Mennick?

A. Personally no.

291 Q. Do you know who he is?

A. I think he's going to be deposed in this case, and I think he has submitted an expert report.

292 Q. Do you know he's a professor at the University of Idaho?

A. I believe I'm aware of that. Is it Idaho or Idaho State? Idaho, okay.

MR. MUISE: No further questions, Your Honor.

THE COURT: Mr. Walczak, redirect?

REDIRECT BY MR. WALCZAK:

293 Q. National Center for Science Education, NCSE, is a nonprofit group?

A. It's a nonprofit tax exempt group.

294 Q. And what is the mission of the NCSE?

A. The mission of NCSE is to clarify science for the public. Normally major people we clarify it would be government officials, including education officials and school boards, parents, PTA's, members of the press, and individually concerned parents and community members.

295 Q. Is it a secret that NCSE has taken a position that creationism is not science?

A. Oh, that's no secret at all.

296 Q. Is it a secret that NCSE has taken a position that intelligent design is not science?

A. No, in that sense NCSE has aligned itself with the major scientific societies.

297 Q. And is it a secret that the National

Academy of Science has taken a position that intelligent design is not science?

A. They certainly have done.

298 Q. Mr. Muise asked you about abrupt appearance, and he read a number of quotes from individuals. I believe they talked about, I don't remember the exact language, about relatively abrupt appearance in the Cambrian ear, and at one point you said the use of that abrupt appearance in scientific terms is different than the use abrupt appearance in intelligent design terms. Could you explain that, please?

A. Oh, yes, of course. When we say, if a scientist were to say that a form would evolve abruptly or appear abruptly, I mean it has the appearance, that is it seems as far as our record goes to happen very quickly. But abrupt appearance in going back to creation science parlance means something quite different. Wendell Bird for example, who is a lawyer and a conservative Christian anti-evolutionist attorney, wrote a book a couple of decades ago about abrupt appearance theory.

And so for him I mean it's a code word in

the old style creation science, antecedent in many ways to the phraseology and the language that's often used in intelligent design that abrupt appearance means that you get these very complex groups, very distinct appearing at once, with no possibility of intermediates, certainly no evidence of intermediates in the fossil record, so that there's an implication there that there aren't ancestors and they aren't going to be found as opposed to a scientist who simply is making a statement about these things appear to come in just now as opposed to later or how rapidly.

299 Q. The Cambrian era lasted how long?

A. Oh, a few tens of millions of years.

300 Q. So when you see a bar on a chart and it starts in the Cambrian era, does that mean it was formed abruptly on a certain minute or day?

A. It means it's the first place where we find it. I should emphasize that the first appearance, the earliest appearance in the fossil record is for us a minimum early appearance because we may always be missing earlier ones, just like the last one is not necessarily the last critter to choke.

301 Q. But you're talking about many millions of years. So you're not talk about instantaneous appearance. You're talking about in a relatively short period of time which in geological terms is in millions of years?

A. If we look at the appearance in the fossil record of the major groups of marine animals, that appears over a sequence of millions of years.

302 Q. And in geologic terms that's abrupt?

A. It's really relatively fast. To give you an idea, the asteroid that hit the earth at the end of the Cretaceous period when the last dinosaurs that weren't birds and many other things died out is dated at something like 66.5 million years, plus or minus 40,000 years. That means that at a distance of 65 million years the best we can go is like 40,000 years either way for a determination. Now, 40,000 years is enough the take four ice ages, you know, from now back to the extinction of all the big Pleistocene mastodons and mammoths and Irish elks and things, do it four times and put it either way and collapse it into an instant, and we can't tell. That gives you an idea of somehow what

the resolution of dating can often be.

303 Q. Mr. Muise, asked you about William Dembski.

A. Yes.

304 Q. And he asked you about a book that Mr. Dembski published or contributed to.

A. Yes.

305 Q. What book was that?

A. Is it called the Design of Life? I don't remember the --

306 Q. And that was published by an academic press?

A. Cambridge.

307 Q. Cambridge Academic Press?

A. The Design Inference. Thank you.

308 Q. Is that the same thing as the peer reviewed publications you were discussing this morning?

A. Book publishers, even book publishers of scholarly presses publish a variety of different kinds of books. Some of them are very scholarly, some of them are not so. I happen to be on the board of editors of the University of California Press and I know sometimes they publish biographies or reminiscences or cookbooks or things like that, as well as scholarly books in semiotics and sociology and

molecular biology or whatever they happen to do.

So just because it's published by a scholarly press doesn't necessarily tell you what the peer review is. Also, you don't know in a specific instance what kind of understanding authors and editors have about who or how something would be reviewed. If someone who is publishing a book in a scholarly press based on my experience with UC Press and many other presses I have worked with is any indication, and an editor at the book company, the press itself, is an acquisitions editor someone who would like to do business with the press.

And so the first concern is to public books that will be read, that will be good for the press to public, because they'll be discussed, one way or another drum up interest in the press, sell other books by the press. They certainly want to get scholarly works in there and they want to get things as right as they can, but you know, you're serving several masters, whereas in a scholarly journal an editor has a lot of submissions coming in, and he doesn't have to worry about selling journals.

If he does he's probably not running a very good journal because people in his field are going to go for it. So he can hold authors to a standard that says well, look, if the reviewers say that you can do it, and he sends them to anonymous reviewers for this reason. Now, I think something should be pointed out here is maybe Mr. Dembski's book was reviewed by people who know about math and probability theory.

I don't have a dog in that fight. I don't care or know anything about that stuff, but I do know that it's not biology. It wasn't published in a biology series, it has nothing to do with evolution biology, and so when someone said this is a peer reviewed contribution that bears on evolutionary biology, we say where's the beef.

309 Q. So there's a couple of points there. One is that this academic press is not subject to the same peer review as for instance you described that would occur at Nature or Science?

A. Not necessarily at all, right.

310 Q. And we don't know what the peer review was for that if any?

A. We don't know. I don't know. I have no

personal knowledge.

311 Q. And second, does Dr. Behe have to your knowledge any kind of degree in biology?

A. I don't know what he has in biology. In terms of evolutionary biology or paleontology I mentioned I don't know of any expertise in that regard.

312 Q. I'm sorry, I'm thinking about Professor Behe already. I mean --

A. Oh, Professor Dembski. No, I'm not aware that he has any credentials in any of the natural sciences. I believe that mathematics and theology maybe, or divinity.

313 Q. And let me ask you that same question I asked before about the Pandas authors. Have you seen Mr. Dembski at any of the conferences that you attend?

A. No.

314 Q. Have you ever seen any presentations by Mr. Dembski made at evolutionary biology or paleontology conferences?

A. No. I've never heard of him.

315 Q. Have you ever seen any publications in your field from Mr. Dembski?

A. No.

316 Q. Mr. Muise asked you about a number of people, and in fact read you quotes from people. He mentioned Stephen J. Gould?

A. Yes.

317 Q. And it seems the suggestion was that Stephen J. Gould had some problems with evolution. It seems that you knew Stephen J. Gould?

A. Yes. Well.

318 Q. And are you familiar with his writings?

A. Oh, yes.

319 Q. Was he someone who questioned evolution?

A. He certainly questioned the relative importance of various mechanisms and patterns in evolution, but not the idea that evolution had occurred or that organisms were related by common ancestry. That was a great theme of Gould's writing that he was always frustrated that anti-evolutionists were trying to make out that there was question about, among in the scientific community about whether evolution had in fact occurred, when really it was just a question of how important is punctuation versus slow and steady change and questions like that, but the overall fact and pattern of evolution

was not in question.

Q. And are you aware of whether Stephen J. Gould ever testified as an expert witness in a case?

A. I believe he testified in McClean vs. Arkansas, was that right?

Q. And would that have been a trial in 1981 about scientific creationism?

A. Presided by Judge Overton I believe, yes.

Q. And was he an expert witness in that trial very much in the way you are an expert witness here today?

A. Yes, except he likes the Yankees and I like the Oakland A's.

Q. And in fact which side of the case did he testify on?

A. The Yankees. I'm sorry, he testified on the evolution side.

Q. And I believe Professor Gould was one of the proponents of punctuated equilibrium?

A. He and Niles Eldridge.

Q. I'm not going ask you to explain it. I know you've explained it to me before. I don't fully understand it, but is that an argument against evolution?

A. Not at all. It's simply an argument about what the pace of change is.

326 Q. And in fact scientists disagree about a whole lot of things, don't they?

A. Oh, yes.

327 Q. And they disagree about a lot of things within evolution?

A. Oh, yes.

328 Q. But that doesn't mean that they don't firmly believe in the basics of evolution?

A. Well, I wouldn't again use the word belief. I'd say that they accept it as the best explanation of things. My friends in the physical community argue about string theory. Some of them think it's good idea, some of them think it's nonsense. I have no idea what it is, but it's obviously something that keeps them going and it has ramifications for important understanding of the natural world.

329 Q. And Mr. Muise mentioned Ernst Mayr?

A. Yes.

330 Q. And are you familiar with Mr. Mayr's work?

A. Yes, I knew Ernst Mayr and his work.

331 Q. Is he a proponent of evolution?

A. Well, I'd say he probably is recognized as

one of the foremost evolutionary biologist of the 20th century.

332 Q. How about Robert Carroll?

A. Bob Carroll is an old friend, he's one of the deans of vertebrate paleontology. He's up at McGill university in Toronto.

333 Q. And are any of those individuals proponents of intelligent design?

A. No.

MR. ROTHSCHILD: I have no further questions.

THE COURT: All right. Recross, Mr. Muise?

MR. MUISE: I have none, Your Honor.

THE COURT: All right. I thank you for your testimony, and you can have a safe trip back now with the cooperation of counsel getting your testimony in. We'll take up the exhibits in just a moment, but you may step down, sir. We thank you. All right, we have some exhibits to take both, from both of the last two witnesses, but --

MR. ROTHSCHILD: Your Honor, we have a suggestion. We have one more plaintiff who needs to testify. We expect it to be very short, and if it's agreeable we'd like to put

him on.

THE COURT: That's what I was going to ask. Do we want to take another witness rather than take time today? Would this be your last witness other than, you're going to take the reporters out of turn? Do I have that right?

MR. ROTHSCHILD: And Mr. Buckingham out of turn and we have designations which I think will likely go out of turn as well.

THE COURT: So technically you're not going to rest after this next witness?

MR. WALCZAK: Correct.

THE COURT: Just to be clear, but are we going to start with the defendant's case on, by agreement of counsel on Monday?

MR. GILLEN: Yes, we'd like to get started.

MR. ROTHSCHILD: If we could put this witness on now we would have no objection --

THE COURT: Let's go ahead and we'll start, if we run a little longer we'll start with the exhibits on Monday, we'll take care of that, so we don't belabor that today. Go ahead.

MR. ROTHSCHILD: Thank you.

MR. HARVEY: Your Honor, the plaintiffs call to the stand plaintiff Joel Leib.

(Joel Leib was called to testify and was sworn by the courtroom deputy.)

COURTROOM DEPUTY: State and spell your full name.

THE WITNESS: Joel A. Leib, L-E-I-B.

DIRECT EXAMINATION BY MR. HARVEY:

334 Q. Where do you live Mr. Leib?

A. I live in Dover.

335 Q. How long have you lived in Dover?

A. I was born fifty years ago, so I've lived in and around Dover all my life.

336 Q. Your extended family, parents and --

A. Yes. If somebody dropped a bomb in Dover that would be the end of the line.

337 Q. How long has your family lived in Dover?

A. We got here before this was the United States.

338 Q. Do you have any children, Mr. Leib?

A. Yes, I do.

339 Q. How many children?

A. I personally have three.

340 Q. Do you have any children in the Dover High School?

A. Yes. Well, in the junior high.

341 Q. What's the name of that child?

A. Ian.

342 Q. How old is Ian?

A. Ian is 13.

343 Q. And what grade is he in?

A. He's in 8th grade.

344 Q. Is he going to attend Dover High School?

A. Yes, he is.

345 Q. And are you married?

A. No. I have a significant other.

346 Q. Tell us the name of your significant other.

A. Deb Fenimore.

347 Q. And is she also a plaintiff in this action?

A. Yes, she is.

348 Q. She is the mother of Ian, correct?

A. Correct.

349 Q. What do you do for a living, Mr. Leib?

A. I'm a teacher out at Bradley Academy.

350 Q. What do you teach?

A. What do I teach? Graphic arts, animation arts, things of that nature.

351 Q. Did there come a time when you learned that there was going to be a change in the Dover Area High School biology curriculum?

A. Yes.

352 Q. And tell us what did you learn?

A. The first time I was hit with something called intelligent design that I didn't know exactly what it was.

353 Q. When was this?

A. August, September somewhere around there. I don't exactly remember.

354 Q. Did you know that the board passed a resolution on October the 18th of 2004 changing the biology curriculum?

A. Yes.

355 Q. How did you learn about that?

A. Let's see, I was kind of following the newspaper articles from the first one I had read sometime in September.

MR. GILLEN: Judge, if I may just for the record, same objection we made before. Apparently the witness lacks any personal knowledge apart from what e he read in the paper, so he's not competent to testify. It's hearsay. What we're about to hear is hearsay.

THE COURT: I'll note the objection for the same reason as stated previously by the court. The objection is overruled. You may proceed.

356 Q. Please continue your answer, Mr. Leib.

A. Can you repeat the question for me again?

Q. Yes. You learned about the school board resolution on October 18th, correct?

A. Correct.

Q. And you learned about that from reading it in the newspaper, correct?

A. Correct.

Q. Was there any other source for you of information about the school board change to the curriculum?

A. Are you referring to my conversation with Jeff Brown?

Q. Yes.

A. Casey Brown?

MR. GILLEN: Objection, Your Honor. Hearsay.

MR. HARVEY: Not offered for the truth of the matter asserted, Your Honor.

MR. GILLEN: Then what's its purpose?

THE COURT: Well, let's go right to the bottom of it. There's no question that the curriculum was changed, was there?

MR. GILLEN: That's correct.

THE COURT: So let's not stand on ceremony.

MR. GILLEN: You know, I got to preserve the record, judge. If all he heard is what he heard

from Jeff and Carol Brown, they were in court, they testified. But this is hearsay.

THE COURT: Well, it's not hearsay if it doesn't go to the truth, and the truth is not at issue here as to the change in curriculum. Now, it may be as to other things that he would testify to, but not on that point. Is it?

MR. GILLEN: No, you're right, Your Honor, that the evidence shows that the curriculum was changed.

THE COURT: So at this point I think we're not in a hearsay situation, or at least -- well, I don't want to belabor this today. It's late in the day. I'll overrule the objection.

MR. HARVEY: I'll try to make this easier, Your Honor.

THE COURT: I think likely you can avoid some of these objection. Why don't you do that, so go ahead and proceed.

BY MR. HARVEY:

361 Q. Sure. You know that the school biology curriculum was changed to include reference to supposed gaps in problems in Darwin's theory and other theories of evolution, including intelligent design. You knew that, didn't you?

A. Right.

362 Q. And you knew that it was included to, changed to include reference to a textbook by the name of Of Pandas and People, is that right?

A. That's correct.

363 Q. You knew that the school, the Dover area school district published a newsletter in February of 2005?

A. Correct.

364 Q. Did you know that?

A. Correct.

365 Q. May I approach, Your Honor?

THE COURT: You may.

A. Yes, that's the one.

366 Q. That in fact P-127, what I just handed you, that's the newsletter you received?

A. Correct.

367 Q. Mr. Leib, do you believe that you have been harmed by the Dover area school district board of directors' change to the biology curriculum and publication of the newsletter?

A. Yes, I do.

368 Q. How do you believe you've been harmed?

A. Two ways. Number one, I've got a child in

the school. Intelligent design is not science. Every second that he's either in the class listening to it or out in the hallway objecting to it is a second he's not getting an education and he can't be functional in a world market. These kids need education. Let me handle the religious aspect of it.

369 Q. Do you believe that the Dover area school district board of directors' actions have affected you and the Dover community?

A. Well, it's driven and a wedge where there hasn't been a wedge before. People are afraid to talk to people for fear, and that's happened to me. They're afraid to talk to me because I'm on the wrong side of the fence.

MR. GILLEN: Well, that was my only objection, Your Honor. To the extent he's testifying about harm to the community, same objection as this morning. His own harm he's entitled to testify.

THE COURT: Well, I think he tied it up at the end of his answer, so I'll overrule the objection.

MR. HARVEY: I have no further questions, Your Honor.

THE COURT: Cross examine, Gillen?

CROSS EXAMINATION BY MR. GILLEN:

370 Q. Good afternoon, Mr. Leib.

A. Hello.

371 Q. Hello. We met at your deposition. A few questions about your testimony today, the basis for you being here. I believe you testified you have a son, Ian?

A. Yes, I do.

372 Q. And I'm not sure, is he in biology class this year?

A. He's in science class. It's a general science at this point. Next year he will be in 9th grade, and that will be the biology I believe.

373 Q. Do you know whether you will tell your son Ian -- let me first, I believe that Ian is the basis of your claim in this suit, correct?

A. Yes.

374 Q. Do you know whether you will tell your son Ian not to attend the biology class while the statement is being read?

A. I would prefer he didn't, but I'm also looking at him as being a relatively young adult. We're going to discuss it as we have

in the past. But no, I would advise him not to be part of that.

375 Q. Well, and that's all I'm trying to get at. You understand that he can opt out of the statement being read if wishes, correct?

A. He can opt out, but that mean for that fifteen or twenty minutes he's not getting an education. That is one of my big objections. I teach a post-secondary educational class and I'm still asking people if they can read and write. That's wrong. We need to educate these kids so they can go into the world market and they can be productive. This doesn't do it for them.

376 Q. So am I understanding you correctly, Mr. Leib, that you're testimony as to harm is if Ian steps out for however long it takes to read this statement, he's being deprived of an education?

A. He's being deprived of an education, yes.

377 Q. You have no, you're not advancing the claim based on your other children, correct?

A. No.

378 Q. You realize that the text, do you know that the text Of Pandas has been placed in the

library at Dover Area High School?
A. Right.
379 Q. You have no objection to that?
A. No.
380 Q. I believe Ian has already been instructed in both evolution and creation at St. Rose School, correct?
A. Correct.
381 Q. And when you use the term creation, you mean the Biblical account of creation, is that correct?
A. Correct.
382 Q. You would have no objection to intelligent design being taught in a comparative religion class, correct?
A. No.
383 Q. Or a social studies class?
A. No.
384 Q. You just don't think it's science?
A. It's not science.
385 Q. You have no degree in science education, correct?
A. I have a degree, but not in science.
386 Q. Okay. You understand that evolution is a theory?

A. Yes, I do.

387 Q. Do you understand that it's a theory that will probably never be fully proven?

A. Yes.

388 Q. Do you understand there's a controversy about evolution theory?

MR. HARVEY: Objection. Beyond the scope of direct.

MR. GILLEN: Your Honor, I'm trying to get to the nature of the harm that he's positing for his son. I'm asking a few questions about evolutionary theory and I'm going to ask him if he recognizes that it's going to be taught to his son.

MR. HARVEY: Your Honor, this is far beyond anything we discussed.

THE COURT: I'll give him some latitude. I'll overrule the objection.

THE WITNESS: Can you repeat the question for me, please?

MR. GILLEN: You know what? I'm going to ask Wes. Wes, would you be so kind as to read back the question?

(The record was read by the reporter.)

THE WITNESS: I don't see it as a

controversy over the theory of evolution. I have no problem with the gaps as you said before. It may never be totally, totally proven. Fossils don't exist everywhere. We haven't found all the fossils there are to find, nor have we done all the scientific research we possibly can do. So I don't see there's a controversy as far as evolution goes.

BY MR. GILLEN:

389 Q. Sure. The first board meeting you attended I believe was February 2005, correct?

A. Correct.

390 Q. Do you object to the fact that your son Ian, if he attends biology class, will be instructed in evolutionary theory?

A. Can you run that by me again? I'm sorry.

391 Q. I take it you have no objection to the fact that Ian will be taught evolution theory if he attends biology class at Dover Area High School.

A. No. I have no objection to that.

392 Q. Do you understand that the text Miller and Levine recognized by the science faculty is the text that your son will be assigned?

A. Yes.

393 Q. You have no objection to that text?

A. No.

394 Q. But it's your testimony here today that the reading of the statement is going to undermine science education for your son?

A. Yes, this does undermine scientific education.

395 Q. That's because you believe intelligent design is not science, correct?

A. Creationism for me and for probably everybody in this room is a very personal thing. If you teach it in a comparative religion class, you talk about all religions, not just Christianity, not just Buddhism, not just any particular religion. You look at them, you compare them, you see how they are alike and how they are different. I have no objection to that. I just am telling you it is not a science. You're comparing apples and oranges, and there's no place in one for the other. It's like teaching science from the pulpit. There's no place for science from the pulpit.

396 Q. I take it from your answer it's your understanding that intelligent design theory is creationism, correct?

A. Yes.

MR. GILLEN: No further questions, Your Honor.

THE COURT: Redirect?

REDIRECT BY MR. HARVEY:

397 Q. Very brief, Your Honor. You testified that your son learned creationism and evolution at St. Rose's School, correct?

A. Correct.

398 Q. Do you know what class your son learned creationism in?

A. Creationism was a religion class.

399 Q. St. Rose's School was a private religious school that your son previously attended before he attended the public schools, isn't that correct?

A. Correct.

MR. HARVEY: No further questions.

RECROSS BY MR. GILLEN:

400 Q. Given that your son learned creationism at St. Rose's School in religion class, do you believe that he'd think intelligent design is science when he was in the classroom?

MR. HARVEY: Objection, Your Honor. He's asking about what the child thinks. No foundation, and it's hearsay.

THE COURT: You opened the door. I'm going to overrule the objection. I'll let him answer the question.

A. I'm not exactly sure. We discussed it, but he's a typical 13-year-old. If it's not video games or the latest movie, he doesn't discuss too much about things like that. However, I'm sure that as he grows older he's going to have questions about both the science and the religion of things. I plan to be there, hopefully I plan to be there to answer some of those questions. I'm a fan of The Discovery Channel and The Learning Channel and various and sundry other programs that are scientific in nature. We have a religious curriculum that we go through and he learns about both. He learns basically religion from us, our ministers, so on and so forth, and hopefully my school is teaching him more science than I know.

MR. GILLEN: No further questions, Your Honor.

THE COURT: You pay your nickel and you go for a ride. That will have to be it.

MR. GILLEN: And I can say with no intention to slight this witness that both his deposition

and his testimony today has been quite a ride.

THE COURT: So it ends. Sir, we thank you for your testimony. You may step down. That will complete the testimony for today, is that a fair statement?

MR. HARVEY: Yes, Your Honor. We do have some exhibits. We can do that on Monday.

THE COURT: Well, remarkably we've ended close to 4:30. I give everybody credit for that, and I can't imagine why we would torture everyone with the laborious process of attempting to admit exhibits on 4:30 on Friday afternoon. It just doesn't seem right to me.

MR. HARVEY: I second the motion.

MR. GILLEN: But think about Monday morning, Your Honor.

THE COURT: Well, it seems so far away.

MR. GILLEN: I wish.

THE COURT: We'll then recess, we'll adjourn for the day and we'll be in recess until Monday morning and we will start with the first defense witness, a bit out of turn by cooperation with counsel. I'll trust you, if I forget I'll put the onus on plaintiffs to remind me to take the exhibits on first thing before we take that

witness on Monday morning. Fair enough?

MR. HARVEY: Very good, Your Honor.

THE COURT: Anything else to good of the order before we adjourn? We'll be in recess until 9:00 Monday morning.

(Court was adjourned at 4:30 p.m.)

Tammy Kitzmiller, et al. vs. Dover Schools

4:04-CV-02688

Trial Day 9, Afternoon Session

14 October 2005

I hereby certify that the proceedings and evidence are contained fully and accurately in the notes taken by me on the trial of the above cause, and that this copy is a correct transcript of the same.

_____

Wesley J. Armstrong

Registered Merit Reporter

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