

# Is it True that ‘Evolution is a theory, not a fact’?

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**1. Introduction.** In recent years the teaching of evolutionary theory in public school science classes has been called into question by school boards in various parts of the country. Salient results have included public bickering, high-profile court cases, and school board mandated disclaimers placed on school textbooks.<sup>1</sup> A 2005 court case that garnered a lot of attention occurred in Cobb County, Georgia, where the dispute concerned the legal status of a disclaimer placed, by the local school board, on a high school biology textbook. This disclaimer, which is typical of a number of “evolution is a theory, not a fact” disclaimers that have appeared on public school textbooks in several states, reads as follows:

This textbook contains material on evolution. Evolution is a theory, not a fact, regarding the origin of living things. This material should be approached with an open mind, studied carefully, and critically considered.<sup>2</sup>

My initial reaction to the disclaimer was puzzlement about what it says. This paper is an attempt to do some conceptual analysis on its key claim in order to discover whether there is any interpretation of it that can reasonably be considered to be advice helpful enough to high school biology students to warrant putting a disclaimer on a biology textbook.<sup>3</sup> I will argue that the answer to this question is “no”.<sup>4</sup> I will steer clear, for the most part, from considering substantive background assumptions of school board members and political pressures from their constituents. The only crucial global assumptions that I will make are that the disclaimer’s *key claim*, “Evolution is a theory, not a fact”, (1) is either true or false, and (2) is to be taken to be the supporting evidence for the advice to students to consider evolution carefully and critically before accepting it as correct.<sup>5</sup>

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<sup>1</sup> Such results have followed from statements and efforts by Boards of Education in Kansas, Georgia, Ohio, Pennsylvania, Texas, Alabama, and others, many of which concern including evolution disclaimers in textbooks.

<sup>2</sup> The disclaimer was placed on the textbook: Miller, Kenneth and Levine, Joseph, *Biology* (Prentice-Hall) 2002.

<sup>3</sup> The kind of warrant I have in mind has to do with the sort of epistemic warrant that matters in science. I have nothing to say about any legal justification or social justification for the disclaimers.

<sup>4</sup> It is worth noting that my conclusion is not influenced by anti-religious bias. Indeed, I am a theist and a Christian who believes that God is the creator and sustainer of the universe.

<sup>5</sup> I take it that these are modest, charitable assumptions about the intentions of the drafters without which the disclaimer becomes absurd.

I take it that there are at least three conditions satisfactions of which are required for a successful interpretation of the key claim. They are what I will refer to as the *no-triviality condition* (i.e., the key claim is not trivially true), the *no-clear-falsehood condition* (i.e., the key claim is not clearly false), and the *reasonable-support condition* (i.e., the key claim provides a non-legal, rationale that justifies the advice it advocates).<sup>6</sup> Before considering interpretations of the key claim, it may be helpful for me to say a word about the relations among these three conditions.

I assume that any interpretation of the key claim that violates either the no-triviality condition or the no-clear-falsehood condition thereby violates the reasonable-support condition. Hence, I see satisfactions of the no-triviality condition and the no-clear-falsehood condition to be necessary for satisfying the reasonable-support condition. However, satisfying the former conditions is not sufficient for satisfying the latter. An interpretation could satisfy the former but remain not even marginally reasonable as a rationale for placing a disclaimer on a textbook that puts students on their guard about a particular viewpoint at the heart of an entire scientific field of study.<sup>7</sup>

Searching for successful interpretations of the key claim will straightforwardly require considering the use of the words “evolution”, “theory”, and “fact”.

**2. Interpreting “evolution”.** Since the disclaimer appears on a biology textbook, surely the term “evolution” is intended to refer to the central concept of evolutionary biology. However, it is useful to note that, in the culture at large, there are a number of different ways that “evolution” is defined or described. Alvin Plantinga identifies five theses that seem to express views that people sometimes associate in some way with evolution:

**Ancient Earth Thesis:** The earth is very old (around 4.5 billion years old).

**Progress Thesis:** Life has progressed from relatively simple to relatively complex forms of life (from unicellular life forms to human beings).

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<sup>6</sup> Although I will not define the reasonable-support condition in a precise way, my commentary will reveal the gist of the condition. My main argument is that there is no interpretation of the key claim that provides even a marginally justifiable rationale, of the sort that matters in science, for the disclaimer.

<sup>7</sup> The general point I am making here may be appreciated by considering this example: The proposition *human beings exist on planets other than Earth* is neither trivially true nor clearly false, but it would surely not be reasonable to place a disclaimer on a public school textbook that is based on that proposition.

**Common Ancestry Thesis:** Life originated at only one place on earth, and all subsequent living things are related by descent to those original living things.

**Darwinism:** Life developed on earth by means of natural mechanisms (commonly expressed by “natural selection operating on random genetic mutation”).

**Naturalistic Origins Thesis:** Life itself originated from non-living matter.<sup>8</sup>

Although many scientists believe all these theses, and although each of them has sometimes been associated with evolution, as Plantinga points out, only the Common Ancestry Thesis and Darwinism are essential to the theory of evolution. Hence, when used in the key claim, some descriptions of “evolution” are bound to fail the reasonable-support condition, because they misrepresent the central concept of evolutionary biology. For instance, it is common for recent evolution disclaimers to say, as the Cobb County disclaimer does, that evolution is a theory about the origin of living things. Taken at face value, the disclaimer says that evolution is a theory about how life *originated*; that is, evolution is a theory about how life, any life, began. Let us take this as some evidence for thinking that “evolution” in the disclaimer, means the conjunction of the Common Ancestry Thesis, Darwinism, and the Naturalistic Origins Thesis.

Now, although it is true that many scientists are themselves thoroughgoing naturalists—and thus believe the Naturalistic Origins Thesis—it is just not true that what is called “evolution”, as used in biology, purports to tell us how life originated; rather, it purports to explain how life developed. Indeed, the very textbook on which the disclaimer was placed in Cobb County reads: “How then did life begin? . . . Although several hypotheses have tried to explain how life may have arisen, we may never know the answers”.<sup>9</sup> Hence, if we take “evolution” to include “a theory about how life originated”, then the result will be a disclaimer that is so misleading that it is surely not going to pass even a weak criterion of

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<sup>8</sup> See Plantinga, Alvin, “When Faith and Reason Clash: Evolution and the Bible”, *Christian Scholar’s Review* 21:1 (September 1991), 8-33.

<sup>9</sup> Miller, K.R., and Levine, J, *Biology: The Living Science* (Prentice-Hall) 1998, p. 398.

reasonable support (since it says that one of the topics in the textbook says something that it does not actually say).<sup>10</sup>

Whether or not those who have supported using the key claim in a disclaimer on biology textbooks have been confused about “evolution” as it is used in biology, it is worth thinking about whether a more accurate description of “evolution” may serve to provide a key claim that meets our three criteria. Toward this end, let us take “evolution” to mean the conjunction of **Darwinism** and the **Common Ancestry Thesis**. A handy way to express the conjunction of these two theses is to use Charles Darwin’s phrase, “descent with modification”. Accordingly, evolution implies that human beings share their ancestry with other animals. This understanding of “evolution” has two salient merits: it accurately and helpfully identifies what is commonly and popularly thought to be the central concept of evolutionary biology, and it is charitable in that it has a consequence that many of the proponents of the key claim either deny or doubt.<sup>11</sup> So, let us now consider the question: Is it true that descent with modification is a theory, not a fact? The answer, of course, depends on what a theory and a fact amount to.

**4. Interpreting “theory”.** The word “theory” is used in various ways.<sup>12</sup> I assume that we are looking for a scientific use. Scientists use “theory” in various ways, and things referred to as theories in science take various forms. The literature in the philosophy of science is rife with discussions of the variations. We might consider all of them, but I see no need to do so, because there is no reason at all to think that the drafters of the disclaimer intended their warning to students to depend on some narrowly prescribed,

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<sup>10</sup> Nevertheless, it may well be that the framers of the Cobb County disclaimer *did* intend “evolution” to mean or imply “a theory about how life originated”. In an *Associated Press* story about the evolution disclaimer trial in Cobb County, it was reported that Marjorie Rogers—who started the drive to put the disclaimers in the school district’s biology textbooks—said that it was only fair to put a small disclaimer in a textbook where religious-based ideas about the origin of life are not mentioned. See Kristen Wyatt, “Trial Begins Over Ga. Evolution Disclaimer”, *Associated Press*, Monday, November 8, 2004.

<sup>11</sup> Here I am, of course, thinking about background assumptions of the drafters of the disclaimers. It is no secret that a salient pressure point for the disclaimer was a shared view among some parents in the community that “descent with modification” is inconsistent with God’s creation of human beings as those parents interpreted the biblical account of creation. And, since “descent with modification” is widely cited as the gist of evolutionary theory by scientists, I think that it is appropriate, and at the very least, charitable, to take this interpretation to be the one intended.

<sup>12</sup> Philosophers often use the term to signify an analysis of some object of philosophical enquiry—often a *concept*—in terms of the necessary and sufficient conditions for that concept to apply. For example, what is often called “the correspondence theory of truth” is the following: “Proposition *p* is true if, and only if, *p* corresponds to the way the world actually is”.

highly technical, or highly specialized notion of theory. Surely they intended “theory” to be understood, at least in part, along the lines of “that which is, or may be used to provide, a general causal explanation of some widespread domain of physical phenomena”.

Although scientists often use the word “theory” off the record with respect to any old explanation (or, to indicate something more general that may be used to provide some explanation), when scientists are careful, such as when they publish articles in peer-reviewed journals, they usually differentiate what they call *theories* from what they call *hypotheses*. As we were taught in grade-school, a hypothesis is something like a scientist’s educated guess or hunch comprising an explanation of some phenomenon or phenomena, an explanation that has yet to be subjected to the various scientific methods involved in empirical observation, testing, measurement, prediction, and the like. Accordingly, a “theory”, when it is distinguished from a hypothesis, amounts to an explanation of phenomena that has been confirmed by some scientific method(s).

Of course, matters are not so clear-cut in the actual world of science. For instance, many things that are called “theories”, such as string theory, have not been confirmed by the sorts of observations and tests that are characteristic of science, but they appear plausible to many scientists. And, what is sometimes called a “hypothesis” in science is much more like a prediction concerning some single phenomenon that a scientist hopes will be confirmed by some particular test or observation.<sup>13</sup> We can make use of some of these uses to draft interpretations of “theory” that are very likely to be in the neighborhood of what the disclaimer writers had in mind.

**T is a theory**1 =df. “T is a general scientific explanation (or T may be used to yield a general scientific explanation) of a widespread domain of physical phenomena that has been confirmed by some widely approved scientific method(s) to be well-supported by the available empirical evidence”.

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<sup>13</sup> The word “theory” is used in other ways among the general public. For instance, suppose that, during the intermission of a mystery play, two audience members are discussing the outcome of the play. One says to the other, “My theory is that the butler did it; after all, he appeared to be holding a bloody knife when he walked past the window.” The other retorts, “My theory is that the stepmother did it; after all, she hated the boy.” This kind of conversation goes on frequently in ordinary conversations between people. In using the word “theory”, neither audience member implies that he has done anything that constitutes a widely accepted scientific means of confirming an explanation such as what is involved in empirical testing, measurement, or prediction; rather, this use of theory is much more akin to our grade-school understanding of a hypothesis: it is an educated guess or hunch based on the person’s general background information about how murder suspects get treated in plays, or based on more general folk psychology, or the like.

**T is a theory2** =df. “T is a general scientific explanation (or T may be used to yield a general scientific explanation) of a widespread domain of physical phenomena that has not been confirmed by some widely approved scientific method(s) to be well-supported by the available empirical evidence, but which some experts in the relevant scientific field believe will be confirmed by some widely approved scientific method(s) to be well-supported by the available empirical evidence”.

**T is a theory3** =df. “T is merely a scientist’s hunch or educated guess that some explanation of physical phenomena will be well-supported by some widely approved scientific method(s).<sup>14</sup>

Here it may be worthwhile to point out the kind of thing that has been said by everyone I have talked to about the meaning of the disclaimer. According to this popular view, as well as by some of the experts involved in the Cobb County trial, the disclaimer was intended to say something along this line:

‘Evolution is an explanation of phenomena that amounts to little more than a hunch or educated guess of scientists, and, therefore, we should not regard evolution as well-supported by the actual scientific evidence.’<sup>15</sup> If this is correct, then the first part of the key claim says this: “Descent with modification is a theory3”. The problem with this interpretation is that what it says is clearly false. Indeed, scientific experts have employed numerous scientific tests, measurements, and predictive tools that confirm the explanation involved in the theory of evolution.<sup>16</sup> Thus, it is not true that evolution is a mere educated guess or hunch based on general background information (scientific or otherwise). This is so even if scientists have made some serious mistakes and even if they are wrong about evolution.

The key claim is also clearly false if it uses theory2, since evolution has already been confirmed by some widely approved scientific methods. So, if we are to have any chance of producing an interpretation of the key claim that satisfies our three criteria, then, among the alternatives, we must go with theory2 as the relevant interpretation of “theory”.

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<sup>14</sup> There is also a popular meaning of theory corresponding with the use I discussed in footnote 13: **T is a theory5** =df. “T is merely a person’s hunch or educated guess, based on that person’s general background information or intuition, that an explanation or claim is true, or that the explanation or claim will be well supported by future evidence to be revealed”.

<sup>15</sup> For instance, Kenneth Miller (a biologist at Brown University, the author of the textbook in question at the Cobb County trial, and an expert witness in that trial) said that the disclaimer used the word “theory” in a colloquial way that suggested that it was “a guess, or little hunch”. See Ellen Barry and Rennie Sloan, “Georgia Evolution Lawsuit is a Fact”, *Los Angeles Times*, November 9, 2004.

<sup>16</sup> Even Alvin Plantinga, who is quite skeptical of evolutionary theory, claims that descent with modification is the most probable of all the properly scientific hypotheses, given the evidence and methodological naturalism. See Plantinga, Alvin, “When Faith and Reason Clash: Evolution and the Bible”, *Christian Scholar’s Review* 21:1 (September 1991), 8-33. I discuss the relevance of methodological naturalism later in the paper.

**3. Interpreting “fact”.** The word “fact” is used in various ways. By philosophers, “fact” is often used to mean a *true proposition* or a *state of affairs that obtains*, or the like. Used in this way, “fact” is intended to assert that some feature of the world is a particular way. This meaning of “fact” does not imply anything about epistemic factors; for instance, it does not imply that there is public evidence, logical support, observational confirmation, proof, or anything of the sort, in relation to the claim asserted. Some examples of this use of “fact” include these: “There is a fact about whether God exists”, “There are moral facts”, and “Regardless of which side of the debate one favors, there is a fact about the matter”, etc.<sup>17</sup>

Although there is no single way that “fact” gets used by scientists, a common use of “fact” by scientists means “an experimental observation”. Examples might include “It is a fact that the blue litmus paper turned red when I applied vinegar to it”, and “It is a fact that the most powerful existing telescope revealed no satellite of the moon”. Accordingly, a fact is something along the lines of a single observation.<sup>18</sup>

These uses of “fact” are exemplary in that they imply that the person who asserts that something X is a fact believes that X is *true*. I think that this point generalizes: anytime one asserts that “X is a fact” one expresses one’s belief that the thing asserted is true. Note how odd it would be to hear someone say, “It is

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<sup>17</sup> Closely allied to this meaning of “fact” is a more colloquial use. For example, in writing a letter contesting a parking ticket I recently received, I wrote, “I did, in fact, display a legal parking permit on my windshield”. Interestingly, I did not mean to imply that I had proof or physical evidence that I had displayed the permit. Although I was relying on memorial experiences as a kind of evidence or motivation for making the claim, I did not mean to imply that I had any non-private available evidence for the claim. Indeed, as I pointed out in the letter, there was no way at all for me to provide any non-private evidence. In saying that I did, in fact, display a legal parking permit I merely intended to say that it is *true* that I displayed a legal parking permit. A little observation and reflection reveals that “fact” is used in this way quite often by ordinary people.

<sup>18</sup> Such a view is consistent with theory1, according to which a scientific *theory* is more general than a fact in that a scientific theory is either something that purports to explain a fact or a set of facts, or something that may be used to yield an explanation of a fact or a set of facts. Kenneth Miller, the biologist who wrote the textbook on which the Cobb County disclaimer was placed, said:

“Most scientists upon careful reflection would say that evolution is not a fact but a theory. The reason for that is not because they aren’t sure that evolution is true, they are sure that evolution is true, but because a fact is simply an experimental observation. A theory in science is a higher level of understanding because theories explain the facts. Evolutionary theory is considered well supported and reliable, in ordinary language true simply because it explains so many facts from so many observations from so many areas of science”.

See Femia, Will, “Biologist Ken Miller: Can God and Darwin Coexist?” MSNBC.com Chat Transcript (<http://www.msnbc.msn.com/id/3080890/from/ET/print/1/displaymode/1098/>).

a fact that water is H<sub>2</sub>O, but I do not believe that water is H<sub>2</sub>O”, or “It is a fact that I locked the door, but I don’t know whether to believe it or not”. If someone were to say such things, we would wonder whether that person has any idea what a fact is.<sup>19</sup>

However, it does not follow that saying “X is *not* a fact” indicates that one believes that X is false. Although believing that X is true is necessary for thinking that X is a fact, there are uses of “fact” in which it is clear enough that believing that X is true is *not sufficient* for thinking that X is a fact. We can see this clearly enough when we consider uses of “fact” that imply some epistemological status.

At one end of the epistemic spectrum, I suppose one could mean by “fact” something like “conceptual truth”: for example, “It is a fact (or, it is a conceptual fact) that  $2 + 3 = 5$ .” One might use “fact” in such a sentence to indicate that  $2 + 3 = 5$  is *conceptually true* such that anyone who thinks rightly about the concepts involved in the claim can come to know with epistemic certainty that it is true. It would be possible for someone to think that a claim is true but not think that the claim is a conceptually true; hence, such a person who uses “fact” to mean “conceptual truth” could believe that a claim is true but not a fact.<sup>20</sup>

More ordinary epistemological uses of “fact” concern empirical claims, such as “It is a fact that the sun is larger than the earth”. I will mention various uses of “fact” that seem to pick out the kinds of things that some actual person might mean by the term. These examples start with a highly restrictive use and become less restrictive. For ease of presentation, I will use *p* to refer to the assertion *The sun is larger than the earth*. In addition to the uses I have previously mentioned, someone might mean by “It is a fact that *p*” that *p* is true and the actual publicly available evidence *proves* that *p* (i.e., proves in the sense that no new evidence could show that *p* is false). Or, that all the *publicly available evidence strongly supports p* (i.e., that the publicly available evidence makes the claim *beyond a reasonable*

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<sup>19</sup> To be sure, one might use the word “fact” in a sentence without implying that one believes that the thing said to be a fact is true; for instance, “Joe Blow believes that X is a fact, but he is wrong.” But, such a statement clearly indicates that one thinks that there is a truth about X, namely, that X is not a fact. It seems to me, then, that a necessary condition on asserting “X is a fact” is the belief that X is true.

<sup>20</sup> Although it seems that someone *could* use “fact” in something like the way I have identified, I do not know of any actual person who uses the term in that way. I mention it here because it picks out a possible use of “fact” that is radically restrictive.

*doubt*), or that  $p$  is true and the *scientific evidence* strongly supports  $p$ .<sup>21</sup> Or, one might mean that  $p$  is true and *all* astronomers (or, scientists) believe on the basis of their expertise that  $p$ ; or, that all educated people (or, people in general) believe that  $p$ . Or one might mean that the *vast majority* of astronomers (or, scientists, or educated people, or people generally) believe on the basis of their expertise that  $p$ . Or, one might mean that  $p$  is true and a *majority* of astronomers (or, scientists, or educated people, or people generally) believe on the basis of their expertise that  $p$ . Or, one might mean that  $p$  is true and a *substantial minority* of astronomers (or, scientists, or educated people, or people generally), whose view about the size of the earth and sun one agrees with, believes that  $p$ . Or, one might mean that  $p$  is true and a *few* astronomers (or, scientists, or educated people, or people generally), whose view about the size of the earth and sun one agrees with, believe on the basis of their expertise that  $p$ . Or, one might mean that  $p$  is true and *some* astronomer (or, scientist, or educated person, or person generally), whose view about the size of the sun and earth one agrees with, believes on the basis of that person's expertise that  $p$ . I doubt that there is any epistemological use of "fact" in such a sentence that differs substantially from the ones I have mentioned.<sup>22</sup>

I doubt that "fact" actually gets used in all the ways I have mentioned, and some of those ways are so weak or so wacky that it would be very uncharitable to the disclaimer writers to suggest that they had any of them in mind. For clarity's sake in what follows, I will list a range of interpretations of "fact" that I take to be in the relevant neighborhood.

**fact1:** X is true (or, X indicates a particular state of affairs that obtains in the world).

**fact2:** X is true, and X is conceptually true.

**fact3:** X is true, and some scientist has observed that X (i.e., it has seemed to some scientist on the basis of some empirical observation that X is true)

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<sup>21</sup> The reason for distinguishing between a use of "fact" involving the publicly available evidence from a use involving the scientific evidence is this: there may be evidence that is not scientific (empirical) evidence. In any case, many people believe that there is such a distinction. Hence, the word "fact" may be used in either way.

<sup>22</sup> Reflection on these uses of "fact" reveals the point I made earlier, namely, that for one to say, "X is not a fact", one does not necessarily indicate that one believes X to be false; indeed, one could believe  $p$  to be true but think that  $p$  is not a fact because, for instance, one believes that it is not the case that the vast majority of scientists believe on the basis of scientific work they know about that  $p$ ; that is, one might think that  $p$ 's being a fact requires a near consensus among scientists, or the like.

**fact4:** X is true, and the publicly available evidence supporting X proves that X is true in the sense that no new evidence could show that X is false.

**fact5:** X is true, and the publicly available evidence strongly supports X's being true.

**fact6:** X is true, and my total internal evidence strongly supports X's being true.

**fact7:** X is true, and all the specialist experts in the relevant specific field of inquiry believe on the basis of their expertise that X is true

**fact8:** X is true, and all the experts in the relevant general field of inquiry believe on the basis of their expertise that X is true.

**fact9:** X is true, and all educated people believe that X is true.

**fact10:** X is true and all people believe that X is true.

**fact11:** X is true, and the vast majority of specialist experts in the relevant field of study believe on the basis of their expertise that X is true.

**fact12:** X is true, and the vast majority of experts in the relevant general field of study believe on the basis of their expertise that X is true.

**fact13:** X is true, and the vast majority of educated people believe that X is true.

**fact14:** X is true, and the vast majority of people believe that X is true.

**fact15:** X is true, and the majority of specialist experts in the relevant field of study believe on the basis of their expertise that X is true.

**fact16:** X is true, and the majority of experts in the relevant general field of study believe on the basis of their expertise that X is true.

**fact17:** X is true, and the majority of educated people believe that X is true.

**fact18:** X is true, and it is common sense that X is true (i.e., the majority of people believe that X is true).

**fact19:** X is true, and a substantial minority number of specialist experts in the relevant field of inquiry whose view on the matter I agree with believe on the basis of their expertise that X is true.

**fact20:** X is true, and a substantial minority number of experts in the relevant general field of inquiry whose view on the matter I agree with believe on the basis of their expertise that X is true.

**fact21:** X is true, and a substantial minority number of educated people whose view on the matter I agree with believe that X is true.

**fact22:** X is true, and a substantial minority number of people whose view on the matter I agree with believe that X is true.

**fact23:** X is true, and a few specialist experts in the relevant field of inquiry whose view on the matter I agree with believe on the basis of their expertise that X is true.

**fact24:** X is true, and a few experts in the relevant general field of inquiry whose view on the matter I agree with believe on the basis of their expertise that X is true.

**5. Meanings of the Key Claim.** Let us pause to consider what we have achieved thus far forth. The key claim, which I will refer to as the *penultimate claim*, means this:

**Penultimate Claim:** Descent with modification (expressed by the conjunction of Darwinism and the Common Ancestry Thesis) is a general scientific explanation (or may be used to yield a general scientific explanation) of a widespread domain of physical phenomena that has been confirmed by some widely approved scientific method(s) to be well-supported by the available empirical evidence, and descent with modification is not a fact.

We now need to consider the various uses of “fact” in order to figure out whether there is any interpretation of the penultimate claim that satisfies our three conditions.

I will begin by discussing those claims that fail to the no-triviality condition. Filling in the penultimate key claim with fact2, fact3, or fact4 clearly runs afoul of the *no-triviality* condition. Descent with modification is surely not a conceptual truth, but neither is any scientific theory; so, the penultimate claim with fact2 fails the no-triviality test. Also, descent with modification is not itself an empirical observation but is rather an explanation of many empirical observations; and, this is true of any scientific theory; so, fact3 is no good. Finally, descent with modification would not be a scientific explanation at all if it were not open to revision based on new evidence. But, it is surely a scientific explanation. So, the penultimate claim understood along the lines of fact2, fact3, or fact4 is trivially true in the sense that it is true of *all* scientific explanations. I can think of no even marginally reasonable rationale for instructing students to be especially careful about accepting one particular scientific theory when that rationale applies equally well to all scientific theories. Hence, a successful key claim is not to be understood along the lines of fact2, fact3, or fact4.

Interpretations using fact7, fact8, fact23, or fact24 have to do with experts (biologists or other scientists) who do not believe that descent with modification is true. Each of these is true, since there are some biologists and some scientists who deny descent with modification. However, the number is very small and the percentage of biologists and scientists who deny descent with modification is extremely low.<sup>23</sup> That a few scientists deny descent with modification hardly warrants a disclaimer; for, if it did,

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<sup>23</sup> According to a 1996 survey, only 5% of scientists deny descent with modification as the correct explanation for the development of human beings, whereas 95% agreed that descent with modification is the correct explanation for

then almost every scientific theory would warrant a disclaimer, since almost every scientific theory has a few detractors among scientists. But surely even the drafters of the Cobb County disclaimer do not think that nearly all scientific theories warrant a disclaimer. It seems clear to me that, even though these uses of “fact” in the penultimate claim do not yield claims that are trivial in the sense that they apply to *all* scientific theories, they are nevertheless trivial because they apply to *almost all* scientific theories; but, no reasonable person, I take it, thinks that we are justified in putting disclaimers on science textbooks for almost every scientific theory, just because he or she is aware that some scientist or other dissents from the prevailing view.

Other interpretations clearly fail to satisfy the *no-clear-falsehood* condition. Used in our penultimate claim, fact11, fact12, fact15, and fact16, fact19, or fact20, are false. The vast majority of specialists in the relevant general field of study (biology), as well as the vast majority of scientists generally, believe, that descent with modification is a true explanation of the development of human beings, a claim about which many disclaimer supporters are surely sensitive. According to a 1996 survey, 95% of scientists said that they believed that human beings evolved over millions of years from less developed forms of life.<sup>24</sup> Hence, the penultimate claim used with fact11 or fact12 is false. Furthermore, if the vast majority of biologists and scientists believe this, then so does the majority of biologists and scientists; hence, the penultimate claim used with fact15 or fact16 is false. Furthermore, there is no substantial minority percentage of biologists or scientists who believe that descent with modification is false. To be sure, there is a fairly high percentage of scientists who believe that God exists and that God is the creator of life. But, those views are consistent with descent with modification. Descent with modification, by itself, implies nothing at all either about God’s existence or about the origin of life. Perhaps this point has not been appreciated by many parties in the disclaimer disputes.

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the development of humans. Interestingly, 40% of those scientists reported believing that God guided the evolution of humans. The survey was a random sample of the 1995 edition of *American Men and Women of Science*. See Witham, L., “Many scientists see God’s hand in evolution”, *Washington Times*, April 11, 1997: A8. See also the report found here: *Nature* (April 3, 1997) 386: 435-6.

<sup>24</sup> See Witham, L., “Many scientists see God’s hand in evolution”, *Washington Times*, April 11, 1997: A8. See also footnote 25.

Other interpretations clearly run afoul of the *reasonable-support* condition. This is so of the penultimate claim used with fact1, fact5, fact6, fact9, fact10, fact13, fact14, fact17, fact18, fact21, or fact22. It will be helpful to discuss fact1, fact5, and fact6 before the others. Fact1 used in the penultimate claim says that *descent with modification is false*. However, even if the drafters of the disclaimer believe that descent with modification is false, surely they did not intend for the disclaimer to tell schoolchildren that descent with modification is false. This would be an uncharitable interpretation. To see why, consider that the key claim of the disclaimer is followed by this: “This material should be approached with an open mind, studied carefully, and critically considered”. Such an injunction indicates that something along the line of *suspending judgment* on the issue is called for, rather than disbelief.<sup>25</sup>

Fact5 and Fact6 are the most interesting. Before discussing what is most interesting about them, I will make some preliminary observations. Used in the penultimate claim, fact5 says that *it is not the case that the publicly available evidence strongly supports descent with modification's being true*. However, that almost all the biologists and scientists believe that the publicly available evidence strongly supports descent with modification provides considerable support for thinking that the penultimate claim using fact5 is false. Of course, it is *possible* that the biologists and scientists are wrong about the matter. But, it is uncontroversial that biologists and scientists have a very large body of scientific work that does strongly support descent with modification, and the vast majority of them believe on the basis of their expertise that the publicly available evidence strongly supports descent with modification. Furthermore, there is no rival theory that enjoys even a miniscule percentage of the confirmation by widely approved scientific methods that descent with modification enjoys. Moreover, it is very hard to see how the framers of the disclaimer could have publicly available evidence that scientists do not have. Have the vast majority of biologists and scientists misidentified the data, or misapplied the data, or failed to recognize what the evidence actually supports? If so, then there is a great deal of motivation for some

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<sup>25</sup> Also, if the drafters of the disclaimer really thought that they had good scientific reason to believe that descent with modification is false, then since it is the guiding, over-arching explanation in biology, with important consequences for almost everything said in the textbook, we would expect them not to put a disclaimer on it but rather to ban the book as an instance of bad science.

enterprising scientist to argue for such claims in the science journals. But, I take it, the framers of the disclaimers are in no position to argue for such claims. Hence, the penultimate claim used with fact5 seems to be false, and, in any case, it runs afoul of the reasonable-support criterion.

Fact6 used in the penultimate claim also fails to satisfy the reasonable-support test, but for a different reason. It says that *it is not the case that my total internal evidence strongly supports descent with modification's being true*. I think that we should grant that it is possible for someone's total internal evidence to support thinking that descent with modification is false. For all I know, for instance, it is possible that someone has legitimate evidence (whether or not it would be widely considered to be legitimate), perhaps some form of special religious evidence, which supports thinking that descent with modification is false, even if that person knows that scientists overwhelmingly endorse descent with modification. This would require, I think, some very special evidential circumstance, but it seems to me possible. Suppose that some framer of the disclaimer managed to get such evidence. Would it follow that it would be reasonable for him or her to put a disclaimer about evolution on the textbooks of every student in a public school district? Surely not. It would be reasonable only if one had good *scientific reasons* to deny descent with modification. But, again, the framers of the disclaimer are not scientists, and they possess no good scientific evidence that descent with modification is false. I conclude that even if the penultimate claim used with fact6 is true for some school board member(s), that claim does not make putting the disclaimers on the textbooks a reasonable thing to do.

Nevertheless, I think that there is an important issue to be discussed with respect to fact5 and fact6. That issue is *methodological naturalism*. According to methodological naturalism, no theory or hypothesis utilizing anything supernatural can count as *scientific*. Apparently, this view is thought by virtually all scientists to be *essential* to science.<sup>26</sup> However, it is no secret that a large percentage of Americans, as well as a large percentage of the disclaimer supporters, take descent with modification to be inconsistent with some of their deeply held religious beliefs, according to which God has played a

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<sup>26</sup> Basil Whiley seems to speak for a lot of scientists (theists and atheists) in saying: "Science must be provisionally atheistic or cease to be itself". See Whiley, Basil, "Darwin's Place in the History of Thought" in M. Banton (ed.), *Darwinism and the Study of Society* (Chicago: Quadrangle Books) 1961.

causal role in the origin and development of life. Some such views (but surely not all of them) are almost surely false if descent with modification is true.<sup>27</sup> Nevertheless, if methodological naturalism is essential to science, then descent with modification is without question the most probable theory among any properly scientific alternatives. Indeed, if methodological naturalism is true, then descent with modification is very probable on the evidence: it is the only game in town about the development of life on earth. Perhaps some rival theory that also enjoys a great deal of scientific confirmation *will* arise in the future, but there is no such rival at present. This explains why most scientists think that disclaimers, political battles, and court cases over the teaching of evolution in public schools are either idiotic or the result of ignorance about the nature of science.<sup>28</sup>

Fact9, fact10, fact13, fact14, fact17, fact18, fact21, or fact22 also fail the reasonable-support criterion. These uses of “fact” have in common the feature that some group, comprised mostly, if not solely, by non-scientists, believe that descent with modification is false. But, why would the views of people with little or no training in science warrant placing a disclaimer about a scientific theory on a science book? Generally, it is unreasonable to believe the claims of non-experts about a matter when those claims are inconsistent with the claims of the vast majority of experts about that matter. If I want to know something about what it takes to build a car, it would be reasonable for me to rely on the advice of a professional car builder, but it would surely be unreasonable for me to rely on the advice of a non-car builder when I am aware that the non-car builder’s advice is inconsistent with the professional’s advice. But, since non-scientists do not do science, they are in no position to have special scientific information about the development of species. They may, and often do, claim to have special information about the matter, but it is not the result of science. And, the issue here is the reasonability of putting a disclaimer on a biology textbook that tells students to be especially on their guard about a particular scientific

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<sup>27</sup> For instance, the proposition that the earth is only a few thousand years old is almost surely false, given descent with modification; but, it does not follow that God did not create the universe or that God did not create life.

<sup>28</sup> Nevertheless, there are philosophers of science (including some who are no friends of intelligent design theory or any view according to which a supernatural being exists) who argue that it is possible for a properly scientific theory, explanation, or hypothesis to appeal to the supernatural. I am not prepared to discuss the reasonability of this view here. Instead, I just want to point out that the truth-value of methodological naturalism is crucial here.

explanation, which is doubted by some group of non-scientists. Even if it were true that a *very* large majority of non-scientists believed that descent with modification is false, this would be irrelevant: although I have not done a survey, I would bet that a very large majority of non-scientists do not believe that there is indeterminacy at the sub-atomic level. If that were so, would we thereby be justified in putting a disclaimer on physics' textbooks?

**6. Conclusion and Final Comments.** I do not think that there is any meaning of the key claim that provides even a marginally reasonable ground, of the sort that pertains to science, for a disclaimer of the “evolution is a theory, not a fact” sort to be placed on school textbooks.<sup>29</sup> Is the key claim true? If I am correct, then this is what we should think: On some interpretations, the key claim is true but trivial; hence, those interpretations do not make it reasonable to place a disclaimer on a science textbook. On other interpretations, the key claim is clearly false; hence those interpretations do not make it reasonable to place a disclaimer on a science textbook. On all the other interpretations, the key claim is true but not even marginally justifiable as a rationale, of the kind pertaining to science, for placing a disclaimer on biology textbooks. Therefore, there is no interpretation of the key claim that justifies putting a disclaimer on biology textbooks.

Is there anything to be learned from all this? Three things come to mind. First, it seems to me that the reasoning involved in disclaimers of the “evolution is a theory, not a fact” sort is in neighborhood of

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<sup>29</sup> For what it is worth, my sense is that the disclaimer writers actually intended something along this line: Evolution (the conjunction of the Ancient Earth Thesis, Progress Thesis, Common Ancestry Thesis, Darwinism, and Naturalistic Origins Thesis) is a theory<sup>3</sup> (merely a widely accepted scientists' hunch or educated guess that evolution will be well-supported by widely approved scientific methods), but evolution is not a fact<sup>5</sup> (i.e., it's not the case that the publicly available evidence strongly supports evolution's being true). This claim may be true, but if so, it is worth noting that it misrepresents what is central to the theory of evolution; hence, it does not provide a good reason to put a disclaimer on a biology textbook. It is worth noting, however, that, if the disclaimer writers did think something along those lines, it does not follow that those who supported the disclaimers were *believing* or *acting* irrationally. As for *belief*, I suspect that many disclaimer supporters were either misinformed or ignorant about crucial issues concerning how biology or science in general works; accordingly, they might have had reason to believe that evolution is considerably worse as a scientific explanation than are many other scientific explanations. And, given the political pressures placed on them by many of their constituents, it could be that the school board members who were responsible for the actual disclaimers were not *acting* irrationally, either. To find out whether their actions were rational, we would need to know what obligations school board members have to seek out information from the scientific community, what obligations school board members have to satisfy their constituents, and what obligations they have to consider the legal consequences of their behavior. Such issues go beyond the scope of this paper.

what Plantinga has called “stupid reasons” for rejecting evolution.<sup>30</sup> Although those disclaimers do not explicitly reject evolution, they seem to suggest that the scientific status of evolution is considerably worse than it actually is. The disclaimer writers may not themselves be stupid, but, it now seems to me, we should think that such reasoning is.

Second, I think that the sorts of evolution disputes going on in the culture at large reveal that there is a very large percentage of people in general, and a considerable percentage of educated people, including members of school boards, who do not understand the nature or methods of science, or who do not understand the nature of various forms of argumentation. I think that it is a travesty that a course in reason and argument, which teaches basic skills in deductive and inductive reasoning, is not required of high school students. If we really care about this stuff, we ought to try to do something about it.

Third, it seems to me that there is a substantial issue worth thinking hard about. That issue is the status of methodological naturalism. I frankly do not know what we should think about this issue, but I predict that it is going to be a hot topic in the future among the public at large.<sup>31</sup>

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<sup>30</sup> Plantinga directed his criticism to the early literature from so-called Creation Science. See Plantinga, Alvin, “When Faith and Reason Clash: Evolution and the Bible”, *Christian Scholar’s Review* 21:1 (September 1991), 8-33.

<sup>31</sup> I thank Keith Abney and Francisco Flores for helpful comments on an earlier version of this paper.