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Darwin, Dover, and Intelligent Design

Darwin, Dover y el diseño inteligente

Kevin Padian
University of California, Berkeley
<kpadian@socrates.berkeley.edu>
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Abstract

The newest face of American creationism is "intelligent design", a sociopolitical movement that appeals to people's fear that evolution is atheistic. ID supposes that some biological structures are so complex that they cannot have been assembled by natural processes; therefore, when we recognize such "irreducible complex" features, they must have been achieved miraculously by an "intelligent designer". Although ID proponents insist that their view is scientific, it has no empirical evidence and is supported by no peer-reviewed publications; it has been rejected by the

Resumen

La cara más moderna del creacionismo americano es el "diseño inteligente" (DI), un movimiento sociopolítico que apela al miedo de la gente basándose en que la evolución implica ateísmo. El DI supone que algunas estructuras biológicas son tan complejas que no pueden ser el resultado de un proceso natural, de manera que cuando nos encontramos con esas características "irreductiblemente complejas", deben ser el resultado de la acción milagrosa de un "diseñador inteligente". Aunque los defensores del DI insisten en que su perspectiva es científica, no tienen

scientific community. Nevertheless its proponents have attempted to introduce it into school systems as an "alternative" to traditional evolutionary science. The attempt to do so in the schools of Dover, Pennsylvania in 2004 resulted in a Federal trial that rejected ID as science, labeling instead as religiously motivated. This has slowed but not stopped creationists. Their continuing strategies are to insist that we "teach the controversy" about evolution (where none exists scientifically), to teach "critical thinking" to students (by which they mean to criticize ideas they don't like), and to allow "academic freedom" for creationist teachers to introduce any materials they like into classrooms.

Key words: evolution, science education, intelligent design, Darwin, evolution education.

evidencia empírica que lo corrobore y no está apoyada por publicaciones arbitradas; es más, ha sido rechaza por la comunidad científica. Sin embargo, los defensores del DI han intentando que el tema se imparta como parte del currículo dentro del sistema educativo, como una "alternativa" a la ciencia evolucionista tradicional. El intento de hacerlo en las escuelas de Dover, Pennsylvania, en 2004 terminó en un proceso judicial federal que rechazó el DI como ciencia, tachándolo de estar religiosamente motivado. Esto ha ralentizado pero no detenido a los creacionistas. Su estrategia consiste en insistir en que la evolución que enseñamos es controvertida (cuando esto no es cierto en el panorama científico), enseñando "pensamiento crítico" a los estudiantes (cuando lo que realmente quieren decir es que se critica ideas que nos les gustan), y que es preciso permitir la "libertad académica" para los profesores creacionistas que deseen emplear cualquier material en sus clases.

***Palabras clave**: evolución, ciencia de la educación, diseño inteligente, Darwin, evolucionismo en la educación.*

This essay is about three interconnected things: the legacy of Charles Darwin, a trial in the small town of Dover, Pennsylvania (USA) in 2005, and a recent political and cultural movement in the United States called "intelligent design". But more than that, it is about the use of words – words that communicate ideas, words that seem to say one thing yet mean another, words whose meanings change through time, and words that are sometimes used to frighten people. It may seem strange that scientific words would become politically sensitive, or that some people would want to use scientific words to confuse and scare others. But we live in interesting

times. And if we, as scientists, want to be effective with the public, we will have to use words more clearly than we do now.

I write this because for thirty years I have been a scientist who works on macroevolution – that is, on the major changes in evolution. Specifically, I work on how major evolutionary changes – such as the origin of birds and their flight, and the beginning of the "Age of Dinosaurs" – get started. During this time I have had a continuing fascination with Darwin and his scientific age – what problems they faced, how they changed thinking, and what they had to work with. I have also been strongly involved with public education, particularly with respect to evolution and biology in general. I have written a number of articles on science education, I have served on panels and working groups that craft curricula and evaluate textbooks, and for many years I have been President of the National Center for Science Education, the American non-profit organization that explains science to the public and tries to clarify the creation-evolution controversy. The NCSE was strongly involved in constructing the scientific and legal arguments for the plaintiffs in the Dover "intelligent design" trial, and I served as an expert witness in the trial. And it seems to me that in this controversy, particularly as it happens in America, we are witnessing an intertwining of history, science, religion, and politics that is not always easy to understand, but is one of the most tragic phenomena of American intellectual and educational life, and so we have to keep trying to understand it, and with luck to make it better.

Darwin's words and their meanings

We begin with Charles Darwin, the greatest biologist of all time, a man whose legacy ranges from natural selection to sexual selection, coevolution, the web of ecology, and many other very important ideas. Darwin was born in 1809, and by the time that the young Queen Victoria ascended the throne in 1837, he had already had his basic education, two years at medical school in Edinburgh, and three years at Cambridge; he had spent five years on HMS *Beagle* collecting specimens around the world, and he had returned to open his "transmutation notebooks" – the first private writings that explored how species might change into other species. So

Darwin, in his upbringing and education, was *not even* a Victorian: he was a pre-Victorian, raised during the Regency period. The meanings of many words were very different in his time than they are now; even the kinds of problems in natural history were quite different. So, if we want to know what Darwin said, we have to know what he read, and we have to know what the words mean and why he used them as he did.

For example, Darwin did not use the word "evolution" in his book, *The Origin of Species*. The last word of the book is "evolved", but otherwise he avoids the term. The reason is that in his time, the word "evolution" had the connotation of predestination. For example, we know that a flower will open up in a predetermined plan. We would not use the term "evolution" to describe this today. But the term had teleological meaning in Darwin's time, and that is why he didn't want to use it. Instead he used the term "transmutation", which was more neutral.

As another example, when the *Beagle* landed on the coast of Chile at Concepcion, Darwin went inland to hunt for plant and animal specimens, as he usually did. A huge earthquake struck Concepcion at that time, leveling many buildings and killing and injuring many people. Darwin returned to the ship the next day and was surprised to see that a large section of the coastal cliffs had been raised several meters from their previous position. Looking down the coast, Darwin saw that this had happened over and over in the history of the cliffs, which accounted for their present position. Darwin described this in his diary as a "gradual" change. In English today this would make no sense. Gradual changes are slow and steady, the opposite of an earthquake. But in Darwin's day, the word gradual meant "steplike", following the Latin root word of *gradus*, or step. Darwin's "gradual" change was steplike. We can presume that he would have found little difference between the patterns of classic evolutionary "gradualism" and punctuated equilibria!

Today, when English-speaking people use the word "random", they tend to treat it as if it described an event with no predictable cause or reason for occurring. The word is often applied to evolution, even by scientists. But this is completely wrong. In science, the term "random" does not describe causes or even effects; rather, it describes *the distribution of possibilities of known outcomes of a situation*. For example, if you throw dice you have only eleven outcomes; there is nothing random about how the outcomes are reached (you throw the dice!); and we know the probabilities of each outcome in advance.

Over a series of throws, we could predict the distributions of the outcomes. However, we *cannot predict individual outcomes in advance*. (This is why people gamble). That uncertainty is called randomness.

It is axiomatic that nothing of any real importance in evolution is random in its cause or effects, with the possible exception of processes such as genetic drift, which still has predictable consequences. We know, for example, that a duck's head will not suddenly appear on a fish. Genetic changes can only do certain things, and each one cannot do too much. But as we have seen, evolution works by small steps. So there is a great confusion in the mind of the public about randomness, because normal people think of this term in very different ways than scientists do. It is the duty of the scientists to clarify this problem, for an important reason.

This problem results because there are a great many people in America who benefit by keeping other people confused about evolution and many other scientific concepts. These people do not want evolution taught in schools. They think that it advocates an unguided, purposeless existence, that it denies all possibility of God, and that to accept evolution will result in moral decay and the loss of ethics. Part of their strategy depends on using words such as "random", "unguided", and "unplanned". They have managed to confuse a very large percentage of the American public, judging from the results of some polls. A majority of Americans, it seems, do not accept evolution.

What kinds of people benefit by confusing others about evolution? In general they are fundamentalist Christians, and their tradition in America goes back a century. They take the words of the Bible literally, not metaphorically. They believe that evolution is atheism, and that it is not possible to accept God and evolution (and related sciences) at the same time. They do not accept the fact that millions of people all over the world have no trouble in accepting both. They do not accept the fact that science, including evolution, does not deal with questions that involve ultimate creation, supernatural beings, or miracles. And in general they have two strategies. The first and most prominent by far is to attack evolutionary science by distorting it and mocking it (because not everything is known about it, which is true of all sciences). The second is to pretend that they have an "alternative" to evolution, which in the past has taken the form of "Bible-science", "creation-science", or its newest version, "intelligent design".

“Intelligent design” and its implications

Intelligent design is not really such a new idea. Or, rather, as it was originally conceived in the 1700s it was quite a different concept than its present-day purveyors pretend. In the late 1700s, an English cleric named William Paley used intelligent design as a cornerstone of his concept of natural theology, or the search for God in Nature. Paley suggested that, just as the intricate design and precise function of a watch imply a watchmaker, so the intricate adaptations of organisms, with their precise functions, imply a divine Creator. This is not a philosophically strong analogy, but it was very persuasive in its day. It used the beautiful intricacies and adaptations, the regular, clocklike processes and laws of the natural world to glorify God.

Today’s “intelligent design” advocates are saying something quite different. They maintain that they accept most science. However, they claim, sometimes it is possible to identify a process or a function that is so complex that it is impossible to explain how it could have been assembled by natural means. In these cases, they say, one must accept that some very powerful Designer must have suspended the normal function of things to assemble it.

Of course, this is equivalent to accepting miracles, the study of which is outside the scope of science. Intelligent design (ID) advocates want super-natural propositions to be considered as part of science. This, however, is not likely, given that it has taken much of four centuries to get the supernatural out of science.

Most of the time, the ID advocates, like other creationists, simply attack evolutionary science on long-discredited grounds. But they do maintain that there is some real science to ID. One component of this is called “irreducible complexity”, and its main proponent is biochemist Michael Behe of Lehigh University. Behe says, in essence, that if you find a complex structure that, if you removed one of its parts, it would no longer work, then you must admit that this structure and its function could not have evolved by natural means. Of course, this is nonsense. In evolution we see all the time that a structure can gain a second function while the first function is still operating. Eventually the second function becomes more important, and the shapes of the parts of the structure change as well. Behe will not admit that this can happen; yet there is very good evidence from the fossil record (see below).

The second component of ID is called "specified complexity", and it is simply an attempt to quantify the unlikelihood of irreducible complexity. Its main proponent, William Dembski, is not a scientist but has a PhD in mathematics. He claims that if you can rule out the possibility that a structure evolved either by natural processes or chance, using probability theory, then you must accept that the structure was specially designed. One problem is that Dembski cannot reasonably assign probabilities for his events. He also does not seem to realize that they are not independent of each other, like throws of dice.

It is important to note that neither Behe nor Dembski has submitted or published his ideas in peer-reviewed scientific journals. This enterprise is the heart of science: it doesn't guarantee correct results, but when it works right, it at least ensures that qualified scientists have examined whether a manuscript follows the rules of science, cites the right literature, keeps to reasonable conclusions, and so on. So far, the ID proponents have avoided this process like the plague. They have even argued that it is irrelevant to them.

Moreover, they argue, they accept much of science, including evolution. But this is not quite true. Various ID proponents accept different things: some are very conservative and think the Earth is only a few thousand years old, whereas some will accept a limited amount of evolution (such as the divergence of dog breeds) but not common ancestry of humans and other apes, and so on. In other words, they tend to accept *microevolution* (change within populations) but not *macroevolution* (the origin of major groups and new adaptations). They also spend a lot of time denying that natural selection can account for much evolutionary change.

A look at some of their writings, intended for the public, reveals very quickly the attitudes that the ID proponents have about science. To them, the concept of homology, which is central to comparative biology, is not strongly founded. How one develops a classification of organisms is a "philosophical choice", rather than a scientific process; so, for them, the Tasmanian wolf could as readily be grouped with the placental dog and wolf as with the marsupials, as all qualified scientists accept. They maintain that there is no evidence for the evolution of tetrapods from aquatic ancestors, no evidence for birds evolving from reptiles, no evidence that whales evolved from terrestrial ancestors. Their "textbook", entitled *Of Pandas and People,* spends most of its time telling students that scientists really don't know much about topics that have been well established for years – even decades. It ignores the fact that we have

ever-increasing series of fossils that document the transition of features from water to land, and back again (in the case of whales), to say nothing of many other important evolutionary events.

There is a very strong conservative Christian bias behind the ID movement, but its proponents try to keep this hidden as far as possible. Although in public forums they maintain ignorance or indifference about who the "Designer" of irreducible complexity is, when they think they are only speaking to sympathetic ears, their words are quite different. William Dembski has described intelligent design as "the Logos of John's Gospel restated in the language of information theory", and the mission statement of the Discovery Institute (the organization in Seattle, Washington that sponsors ID), which was kept secret for some time, says that "[D]esign theory promises to reverse the stifling dominance of the materialist worldview, and to replace it with a science consonant with Christian and theistic convictions".

This last statement is particularly telling, because it is clear from it that ID proponents are not just trying to get evolution out of public schools. They want to remove naturalism (by which they mean a philosophy with no particular view of God), which they incorrectly think is atheistic, from all aspects of American life. They want to change our secular institutions and make them Christian. Their goal is nothing less than a theocracy.

But what would this theocracy look like? The ID movement has attempted to construct a "big tent" for many kinds of conservative Christians, but there are sharp disagreements within this group about basic tenets and worldviews, as noted above. One source of real concern is the theological implications of ID, which do not seem to have been thought through very carefully by its proponents. For example, if one accepts their basic premise that some structures and functions are too complex to have evolved by natural processes, some disturbing theological questions are raised. First, this would imply that the Creator is not perfect, because He has to come back and create a miracle so that these complex features can appear; but some people believe that the Creator would not be so short-sighted as to create processes that don't work properly. Second, the idea that a Creator continually intervenes miraculously in Nature is very much a pre-Enlightenment theological view; it is not clear how such disputes are settled in the theological community, but this one would seem to be long out of fashion. Third, it opens the difficult question of theodicy: if a Creator is good, and

can intervene in His creation, why does He not do so more often to relieve pain, suffering, and injustice? This theological problem has been with us for millennia, and the ID proponents appear to have no answer to it. A corollary of this problem is the question: of what use is prayer?

ID proponents do not like to talk about the theological Pandora's Box that they have opened, and they say that students will not ask these questions merely as a result of considering the proposal that there are "alternatives" to Neodarwinian theory such as ID. But in fact, my students have asked me all these questions; so I don't think that the ID proponents have thought this through very far. Above all, scientists do not want to put theological propositions underneath the microscope. Nothing good can result from addressing statements about supernatural beings and their actions using the tools of natural science.

The Dover "intelligent design" trial and its aftermarth

Creationists who were members of the School Board of the public school district in Dover, Pennsylvania, wanted to replace the standard high school biology text – which they said was "laced with Darwinism" – with *Of Pandas and People*. For many months the science teachers in the district tried to explain to the school board that there was no controversy in science about the status of evolution, that the biology book that they used was perfectly standard and that they taught evolution in ways that respected different points of view that students may have. This was not enough for the school board. If the teachers would not replace the current text with *Pandas*, they said, then they would supply copies of *Pandas* to the classrooms. The teachers refused. The board then said that each year, when it came time to discuss evolution, the teachers would have to read a statement that essentially said that there were lots of problems with evolution, that there were other "alternative" ideas to evolution, and that "intelligent design" was one of them. The teachers refused to read the statement. The board then said that a school administrator would come to the classroom and read the statement, and then leave – but there were to be no questions and no discussions afterwards! (Surely this is unique as an approach to education).

It is important to stress the courage of the teachers who stood up for their professional convictions. They could easily have been fired or harassed into losing their jobs. At least one teacher left in disgust. They were contending with religious zealots who were not going to listen to any kind of scientific or educational authority, and who did not have the best interests of their students in mind. Sadly, there are no intellectual qualifications for such offices in the United States.

Eventually, it came time to discuss biology, the administrator came into the classroom and read the statement, and eleven parents brought a lawsuit against the district. This became the focus of a six-week-long trial in the Fall of 2005. It attracted national and international attention from the media, and has been the subject of at least four books and a television documentary so far. The judge's decision, released on 20 December 2005, was very long at 146 pages; but he stated in his decision that the actions of the school board had been a terrible waste of time and money, and that he did not want another district to go through the same difficult process. The judge accepted the request of the plaintiffs to determine three things: that the Dover school board had acted with religious intent (which is against the separation of church and state in the American constitution); that intelligent design was not recognized as science by the scientific community, and could not be taught as such in classrooms; and that discredited, misinformed creationist "criticisms of" or "objections to" or "alternatives to" accepted evolutionary biology could not be presented as legitimate.

Although the judge's ruling only applies to the Middle District region of Pennsylvania, it has been far-reaching: first, because the decision was not appealed to a higher court, and second, because unless another case elsewhere finds a different result, there is no legal challenge to the decision and it stands as legal precedent.

The ID community expected the judge, the Hon. John E. Jones III, to rule in their favor, because he is a Republican who was appointed to his position by former President George W. Bush. But the judge has very strong convictions that the judiciary should be independent of politics, and he also had a very good education. The ID proponents found nothing to like in his decision. Since the trial they have been criticizing it in a variety of ways, mostly for their own political purposes. They have said that the judge should not have decided what science is and isn't; but the fact is that both sides asked the judge to

decide whether ID was accepted as science and should be taught as such. They criticize the "activism" of judges, which means that a decision has political bearing as well as legal bearing; but the judge did not decide anything that he was not asked to decide by both sides, and anyway the ID proponents have no problem with "activist" decisions when they favor their own cause. For a while, the judge was forced to have bodyguards, because his life had been threatened by people unhappy with his decision.

What is next?

The Dover trial decision was a landmark because it unequivocally rejected ID as science. Unless this is reversed in a higher court or countered by a different decision in another court, the ID proponents will find it very difficult to establish their ideas as respectable science that should be taught in classrooms. Instead, they are taking a different approach to science education. This approach has been used by other American anti-evolutionists in the past. It does not try to establish "Bible science", "creation science", or "intelligent design" as science. Instead, it asks for a kind of "fairness" for "other points of view", without specifying what those other points of view are, and without specifying whether or not they are scientific. This approach works because Americans have a very strong sense of "fair play". They think that all viewpoints should not only be tolerated but respected. Anti-evolutionists take advantage of this openness, even as they try to close down the accurate and responsible teaching of evolution.

One approach is to urge educators to "teach the controversy" about evolution. In the scientific community, of course, there is no controversy about evolution. But when scientists and educators say this, creationists respond: "You see? This is why you have to teach the controversy!"

Another approach is called "critical thinking", but it does not mean what educators mean by the term. By "critical thinking", we mean to teach students about the history and philosophy behind ideas, to provide the context of evidence, and to teach them to analyze the structure of arguments. The creationists simply mean that you should be free to criticize any idea that you don't agree with.

A third approach is “academic freedom”. In America, this term means different things. To university professors, it assures that you have the freedom to pursue your research in any direction it leads you, without fear of political reprisals. To a teacher in high school and lower schools, it means the assurance that you can teach what is in the established state curriculum without fear of pressure or harassment from people who do not agree with the curriculum. To creationists, it means that teachers can introduce any materials they like into the classroom, even if these materials are not in the accepted curriculum, and even if they contradict it! This idea recently became law in the state of Louisiana, and similar bills in other states are expected to be introduced soon.

Finally, there is the approach of “viewpoint discrimination”, by which creationists mean that their viewpoint that evolution is not science is being excluded, and therefore they are being discriminated against. They speak of the “viewpoint of the Christian child”, as if children had viewpoints about complex scientific issues, and as if creationists could speak for all Christians. In fact, they really want to discriminate against all views with which they do not agree.

All of these approaches are being used in various American states, and in hundreds of school districts around the country. It will not end anytime soon. Creationism evolves!

Conclusion

One may well ask why anti-evolutionism flourishes so in a place like America, where church and state are separated and where the opportunity for a fine education is great. The French statesman André Malraux once expressed it very well. He recognized that America is a country of two traditions. One is of the Enlightenment, with people such as Thomas Jefferson, James Madison, Alexander Hamilton, and Benjamin Franklin, people who wrote the great documents of democracy and liberty that have stimulated political thought around the world for more than two centuries. The other tradition is of the pilgrims, religious Puritans who came to the New World to escape persecution in their home countries – only to turn around in their new country and persecute everyone who does not agree with them.

Throughout American history, one or another of these traditions has had the upper hand from time to time. The situation has worsened in the past

century, partly as a result of the resurgence of religious, especially Christian, fundamentalism. The two developed countries with the poorest understanding of and acceptance of evolution are the United States and Turkey. The reason is that both countries have the highest proportion of religious fundamentalists of any developed countries. The difference is that they are Christians in the United States, whereas in Turkey they are Muslims. For this reason, despite the resurgence in both kinds of fundamentalism in other European countries, it seems unlikely that religious attacks on science will become as effective as they have been in the United States and Turkey. But to assure this, scientists and educators have to redouble their efforts everywhere to explain what science is and what it is not, and why this understanding is important to preserving free and well-educated societies that do not become theocracies.

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