

# THE BUFFALO NEWS

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### DARWIN UNDER ATTACK

Why is his big idea so often disparaged as 'just a theory'?

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Daniel Zakroczemski/Buffalo News  
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Associated Press  
Assistant District Attorney Jack McCoy's (Sam Waterston) "theory" of how a crime played out in NBC's "Law and Order" is a whole different animal from a scientific theory.

Why does Darwin take such a pounding? Why do Darwin's ideas, in contrast to Einstein's ideas, Newton's ideas or Watson and Crick's ideas seem so vulnerable to fundamentalist criticism? Why have advocates of anti-scientific, religious notions like intelligent design, creation science and creationism, been able to make so much headway?

The state of Kansas, where I now only reluctantly admit to having done my graduate work, has set the stage for teaching religious alternatives to evolution in science classes in public schools. What is next? How can we have sunk so low as to allow proponents of the Judeo-Christian-Muslim version of creation to write policy for the teaching of science?

Part of the answer to these questions lies in one of the opening phrases that has become an integral part of any assault on evolution: "But it's just a theory." This trivializing statement indicates not only a lack of understanding of what evolution and natural selection are all about, but also a basic lack of understanding of the term "theory."

The public's familiarity with "theory" comes largely from, and is reflected by, the media and the law-and-order community. Law enforcement agencies, the courts and the legal profession apparently have always used the term "theory" to mean educated guess, speculation or supposition.

I am assuming this is the case because frequently on the many versions of the television series "Law and Order" or one of the "CSI" family of shows, some cop, DA or criminalist is often heard to say something like "OK, so what's your theory of how the crime played out?"

English-speaking Americans resonate with this use of "theory." However, in scientific lingo, and, after all, the theory of natural selection is a scientific theory, "theory" does not mean merely an educated guess; it means something far more concrete and factual.

In science, ideas start out as educated guesses based on observation. These are not theories, they are hypotheses. If a scientist were asking a cop, a DA or a criminalist about a crime, he or she would say something like "OK, what is your hypothesis of how the crime played out?"

Most scientists spend their time testing hypotheses about relationships, such as cause-effect relationships, between variables or factors or things. Each hypothesis is (usually) placed into an experimental context, in which the factors are systematically changed or controlled, in order to determine if the hypothesis has merit.

Hypotheses that pass such experimental tests are said to be "confirmed." When a set of confirmed hypotheses fits together systematically and explains the nature of relationships between variables or factors, we say that a theory exists about the relationship.

Essentially, then, a theory in science is based on a set of facts that have been assembled to form an explanation. In many ways, a theory is an explanation. Such an explanation, when developed, can be used for prediction. The more correct and complete the theory, the more accurate the predictions based on the theory; newly discovered information and newly confirmed hypotheses should fit neatly within the predictions afforded by the theory.

## First theories, then laws

The surprising thing about theories in science is that they are outranked only by "laws." A law in science stems from a portion of a theory in which all the details have been worked out, so that the law, as simply stated, is universal; a law applies to all instances in all places at all times.

Theories are considered factual explanations, but explanations in which some of the details are yet to be elucidated. There is not much doubt among Americans that Einstein's theory of relativity is a factual explanation of the relationship between time and space, yet Einstein himself had to differentiate between the theory of general relativity and the theory of special relativity. Because of this difference, and some other uncertainties, relativity is not regarded as a law. For the same reason, natural selection is not regarded, in science, as a law.

An issue that muddies the evolution water, or primordial soup, further is the fact that Darwin did not discover the phenomenon of evolution, but merely, so to speak, contributed the explanation of how it occurs. The existence of evolution was treated as fact for nearly 100 years before Darwin's "Origin of the Species" was published in 1859.

The mechanisms proposed, such as Lamarck's "Inheritance of Acquired Characteristics," did not stand up under scientific scrutiny. It took Darwin's observational genius to put the pieces of the puzzle together to develop the theory of natural selection, more precisely, the "theory of evolution by natural selection," as an explanation for the process by which evolution occurs. He showed that minor variations in traits could become more common if those variations gave the individuals who possessed them a competitive edge in the reproduction game.

Why is it a theory and not a law? Not because it was an educated guess, or a supposition, or a speculation, but because not all the details have been worked out yet: e.g., whether evolution proceeds slowly and continuously (continuous evolution), or whether it hardly proceeds at all most of the time, but then shows an occasional abrupt phase of rapid change (punctuated evolution).

Evolution, like gravity, is generally considered to be fact. The biological mechanism by which evolution is accomplished, and the physical processes that produce gravity, are still in the realm of theory.

## Why only Christians?

While we're at it, we might also ask why intelligent design, creation science and creationism are not scientific theories. First, each may be a hypothesis, but none is the result of many tested and scientifically confirmed hypotheses. Second, none provides the basis for even creating testable hypotheses - they cannot be used to form scientific predictions.

Third, they are all based on one particular cultural view of the creation: the Judeo-Christian-Muslim view of creation that derives from the Old Testament. Intelligent design, creation science and creationism do not take into account the creation beliefs of Hindus, Buddhists, Taoists, Animists, Pantheists and others too numerous to mention.

Science cannot be based on one set of cultural beliefs; science is culture free; science is like the Constitution, in that it does not favor one religion over others. Even the Vatican has recently released a statement pointing out that intelligent design should not be taught alongside evolution in science classes, because intelligent design is ideology, not science.

That the Vatican supports evolution and science and acknowledges the distinctions between science and ideology shows just how far the Vatican has advanced, intellectually, since persecuting Galileo in 1633 for advocating that the sun, and not the earth, was the center of the universe. The author of the Vatican's statement against intelligent design, in fact, points out that American creationists have returned the debate to the dogmatic approach of the 1800s.

Fourth, belief in scientific laws and theories is not an issue. They are true whether one believes in them or not. People who do not believe in gravity do not float off into space; people who do not believe that the world is round do not sail off the edge. For these reasons and others, intelligent design, creation science and creationism are beliefs, and therefore philosophical and theological, and while they may co-exist with scientific theories, are not legitimate alternatives to scientific theories in scientific contexts.

In science, therefore, a theory is not a starting point; it is not just a guess or a speculation. It is a polished, refined explanation based on tested and confirmed hypotheses. Does it explain 100 percent of the details? No, but it is working toward that goal.

Best of all, it is open to additional refinement, confirmation, falsification, testing and elaboration. So one shouldn't sell something short because it is a scientific theory, and one shouldn't confuse "theory" with "hypothesis." As for hypothesis, to paraphrase a famous expression, "hypotheses are like noses - everybody has one."

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