

# nature structural & molecular biology

## Theory, fact and the origin of life

The latest in the fight over the teaching of evolution in classrooms across America is taking place in Pennsylvania, but local and state school boards in Maryland, Georgia, Ohio, Missouri, South Carolina and Kansas have wrestled with the issue as well.

Over the past 80 years states have attempted to either prohibit the teaching of evolution in public school science classes or counter it with references to the religious doctrine of creationism. In 1987, the US Supreme Court seemed to settle this issue arguing that the state cannot 'restructure the science curriculum to conform with a particular religious viewpoint.'

The latest argument against Darwinism is known as 'intelligent design.' Believers of intelligent design hold that life is so complex that it cannot be explained by the random workings of natural selection. Instead, if evolution occurred at all it could only have been directed by a creator.

The use of intelligent design to limit the teaching of evolution recently came in the form of a statement that school administrators in Dover, Pennsylvania are expected to read saying (among other things) that 'because Darwin's theory is a theory, it continues to be tested as new evidence is discovered. The theory is not a fact.'

The religious, constitutional, and political ramifications of intelligent design can and will continue to be debated but not here (at least not right now). Instead, there are two factual problems with the above statement that are worth considering. First, colloquial definitions of the word 'theory' are used to denigrate the place of evolution in the world of scientific knowledge. In science, an idea can be a theory and a fact at the same time. Stephen J. Gould put this well:

*In the American vernacular, "theory" often means "imperfect fact"—part of a hierarchy of confidence running downhill from fact to theory to hypothesis to guess. Thus the power of the creationist argument: evolution is "only" a theory and intense debate now rages about many aspects of the theory. If evolution is worse than a fact, and scientists can't even make up their minds about the theory, then what confidence can we have in it? Indeed, President Reagan echoed this argument before an evangelical group in Dallas when he said (in what I devoutly hope was campaign rhetoric): 'Well, it is a theory. It is a scientific theory only, and it has in recent years been challenged in the world of science—that is, not believed in the scientific community to be as infallible as it once was.'*

*Well evolution is a theory. It is also a fact. And facts and theories are different things, not rungs in a hierarchy of increasing certainty. Facts are the world's data. Theories are structures of ideas that explain and interpret facts. Facts don't go away when scientists debate rival theories to explain them. Einstein's theory of gravitation replaced Newton's in this century,*

*but apples didn't suspend themselves in midair, pending the outcome. And humans evolved from ape-like ancestors whether they did so by Darwin's proposed mechanism or by some other yet to be discovered.*

*Moreover, "fact" doesn't mean "absolute certainty"; there ain't no such animal in an exciting and complex world. The final proofs of logic and mathematics flow deductively from stated premises and achieve certainty only because they are not about the empirical world. Evolutionists make no claim for perpetual truth, though creationists often do (and then attack us falsely for a style of argument that they themselves favor). In science "fact" can only mean "confirmed to such a degree that it would be perverse to withhold provisional consent." I suppose that apples might start to rise tomorrow, but the possibility does not merit equal time in physics classrooms.*

*Evolutionists have been very clear about this distinction of fact and theory from the very beginning, if only because we have always acknowledged how far we are from completely understanding the mechanisms (theory) by which evolution (fact) occurred. Darwin continually emphasized the difference between his two great and separate accomplishments: establishing the fact of evolution, and proposing a theory—natural selection—to explain the mechanism of evolution.*

- Stephen J. Gould,  
"Evolution as Fact and Theory";  
Discover, May 1981

The second point is that Darwin's theory of evolution is silent on the 'origin of living things' – that is, how life on earth began. Darwin himself mused that life could have arisen 'in some warm little pond.' For much of the 20<sup>th</sup> century origin of life research has sought to understand how spontaneous interactions among relatively simple molecules in the primordial soup and the prebiotic world could have formed life's last common ancestor.

Origin of life research is built on three important findings: the basic small molecules of life can be made under plausible prebiotic conditions (the Urey-Miller experiment); phospholipids spontaneously form lipid bilayers, the basic structure of a cell membrane; and last, but certainly not least, random RNA molecules can be selected for the capacity to produce more of themselves (ribozymes).

So the next time you are asked about evolution and intelligent design you can avoid the more hot button issues—lack of objective scientific support and separation of Church and State—and instead take the philosophical highground and talk about the importance of knowing the difference between theories and facts and why Darwinism and evolution have nothing to do with how living things came to be, just what happened once they were here. ■