EVOLUTION:

Fatally Flawed Iconoclasm

A review by Eugenie C. Scott*

Icons of Evolution Science or Myth? Why Much of What We Teach About Evolution is Wrong
Jonathan Wells
Regnery, Washington, DC, 2000. 352 pp. $27.95. ISBN 0-89526-276-2.

If someone were to charge that textbooks present atomic theory using evidence that is erroneous, misleading, and even fraudulent, and that we should therefore question whether matter is composed of atoms, eyebrows would be raised--at least at the accuser. If someone further claimed that distinguished physicists crassly participate in this fraud to keep the research dollars rolling in or to promote a materialist philosophical agenda, scientists would be angry at the attempt to besmirch the reputations of respected scholars. And if the same person proposed that citizens should encourage local school boards to insert anti-atomic theory disclaimers in science textbooks, discourage Congress from funding research in atomic theory, and lobby state legislatures to restrict its teaching, it is doubtful that such exhortations would receive much attention.

Such would be the fate of Jonathan Wells's call to arms in *Icons of Evolution* , if biological evolution were not substituted for atomic theory in the above scenario. But rather than being ignored, Wells's book has already inspired attacks on textbooks and at least one lawsuit against a local school board (1). Unlike atomic theory, evolution has obvious theological implications, and thus it has been the target of concerted opposition, even though the inference of common ancestry of living things is as basic to biology as atoms are to physics.

Wells claims "students and the public are being systematically misinformed about the evidence for evolution" because high school and college textbooks rely on invalid or misleadingly interpreted "icons": the peppered moth, the Miller-Urey experiment, vertebrate limb homology, Haeckel's embryos, *Archaeopteryx* , Darwin's finches, the tree of life, four-winged fruit flies, fossil horses, and the familiar fossils-to-modern-humans series of striding men. These are well-known and frequently repeated examples of principles or mechanisms of evolution, or episodes from the history of the field. Textbooks use them because they communicate these basics clearly to uninformed students. But Wells's premise that textbook examples are the best evidence for evolution is wrong; evolution does not stand or fall on whether a high school book simplifies an example of natural selection.

I examined the books reviewed by Wells and found that things are not always as he portrays them. For example, textbooks don't uncritically rely upon Haeckel or his drawings in their discussions of embryology. Only two of the ten books reproduce Haeckel's embryo drawings, although all of them present, in varying degrees of detail, the scientifically accepted inference that comparative embryology reflects common ancestry. Some of the other "icons" don't occur in most of his sample, and even when they do, they are often accorded only a few paragraphs (2).

Textbooks are, alas, far from perfect, but authors and publishers would do little to improve their wares by altering their texts to suit Wells. This is because Wells presents a systematically misleading view of evolution. Individual sentences in *Icons* are usually technically correct, but they are artfully strung together to take the reader off the path of real evolutionary biology and into a thicket of misunderstanding. The Cambrian explosion is supposed to be a "serious challenge to Darwinian evolution" because "phyla and classes appear right at the start." Wells is wrong to claim that the Cambrian appearance of major body plans supposedly puts paleontologists into a tizzy; actually, they regard it simply as a phenomenon yet to be explained. Unexplained is not unexplainable. More misleading to nonscientists is the implication that most modern phyla and classes occur in the Cambrian, which doesn't hold true for either animals or plants. Wells neglects to mention that insects, amphibians, reptiles, birds, and mammals are all post-Cambrian (and even Cambrian "fish" are problematic). Wells correctly notes that chordates appear in the Cambrian, and he correctly describes chordates as "tunicates, lancets, vertebrates." But a layman hearing "vertebrates" is more likely to think of lions and tigers and bears than of the very primitive, worm-like Cambrian chordate *Pikaia* . Here, and with the other "icons," what Wells leaves out of his discussion is often critical.

The author's discussion of the admittedly complex changes in populations of the peppered moth is both incomplete and incorrect. He excoriates textbooks for showing "fraudulent" photos of light and dark moths glued to lichen-covered tree trunks. Wells argues that moths don't rest on tree trunks and that lichens are not associated with moth color changes. But he ignores research showing that moths rest on all parts of trees (including the trunks) and that the color of the surface upon which moths alight is what counts in predation. Dark moths against light backgrounds get nabbed, whether or not lichens form those backgrounds. Textbooks show staged photos of moths affixed to trees to illustrate crypsis of dark and light moths against dark or light backgrounds; not unreasonably, photographers didn't sit patiently by waiting for the right combinations of moths and backgrounds. Researchers glued moths to trees to test whether birds differentially prey upon moths that contrasted against their surface, an experiment necessary to test the hypothesis of bird predation. This is not fraud, it's research.

Space limits a full treatment of the book's errors and misdirections, but as a physical anthropologist I must mention that Wells cites science writer Henry Gee on the paucity of human fossils from 5 to 10 million years ago. Yet he leaves out the abundance of such fossils over the last 5 million years, which is when humans evolved. Combining this deflection with a 20-year-old citation from another journalist about the scarcity of human remains, the lay reader may incorrectly conclude that the human fossil record is unusually weak. Wells also ignores the many significant discoveries of the past two decades.

Even more misleading, however, is Wells's steady drumbeat of accusation of fraud, misconduct, deception, and incompetence against evolutionary biologists and his claim that evolution is shoddy science maintained by ideology rather than evidence. Although his targets have treated the book with derision, *Icons of Evolution* has high potential to mislead the nonscientific public, and scientists should be prepared to respond.

Notes

1. Arkansas legislation HB 2548 (2001) would ban textbooks which included the icons. Patty Pulliam, a West Virginia parent, listed the "icons" in her lawsuit against Kanawha County concerning alleged textbook inaccuracies. Joe Baker, a senior at a Perkasie, PA, high school, is lobbying his school board to insert icons disclaimers into the textbooks.
2. The set reviewed by Wells is a miscellany of ten high school and college biology books, which curiously omits some best-selling texts and other titles with comprehensive treatments of evolution. It is unclear whether his results can be generalized. Wells's critique is discussed further in A. Gishlick and E. C. **Scott**, "Do textbooks mislead students about evolution? A look at *Icons of Evolution* ," *Reports of the NCSE* , in press.

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