Icons of Evolution? Why Much of What Jonathan Wells Writes about Evolution is Wrong

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Introduction

The paradigm of evolution

Evolution is the unifying paradigm, the organizing principle of biology. Paradigms are accepted for their overall explanatory power, their "best fit" with all the available data in their fields. A paradigm functions as the glue that holds an entire discipline together, connecting disparate subfields and relating them to one another. A paradigm is also important because it fosters a research program, creating a series of questions that give researchers new directions to explore in order to better understand the phenomena being studied. For example, the unifying paradigm of geology is plate tectonics; although not all geologists work on it, it connects the entire field and organizes the various disciplines of geology, providing them with their research programs. A paradigm does not stand or fall on a single piece of evidence; rather, it is justified by its success in overall explanatory power and the fostering of research questions. A paradigm is important for the questions it leads to, rather than the answers it gives. Therefore, the health of a scientific field is based on how well its central theory explains all the available data and how many new research directions it is spawning. By these criteria, evolution is a very healthy paradigm for the field of biology.

In his book *Icons of Evolution* (2000), Jonathan Wells attempts to overthrow the paradigm of evolution by attacking how we teach it. In this book, Wells identifies ten examples that are commonly used to help to teach evolution. Wells calls these the "icons," and brands them as false, out of date, and misleading. Wells then evaluates ten "widely used" high school and college biology textbooks for seven of these "icons" with a grading scheme that he constructed. Based on this, he claims that their treatments of these icons are so rife with inaccuracies, out-of-date information, and downright falsehoods that their discussions of the icons should be discarded, supplemented, or amended with "warning labels" (which he provides).

According to Wells, the "icons" are the Miller-Urey experiment, Darwin's tree of life, the homology of the vertebrate limbs, Haeckel's embryos, *Archaeopteryx*, the peppered moths, and "Darwin's" finches. (Although he discusses three other "icons" — four-winged fruit flies, horse evolution, and human evolution — he does not evaluate textbooks' treatments of them.) Wells is right about at least one thing: these seven examples do appear in nearly all biology textbooks. Yet no textbook presents the "icons" as a list of our "best evidence" for evolution, as Wells implies. The "icons" that Wells singles out are discussed in different parts of the textbooks for different pedagogical reasons. The Miller-Urey experiment isn't considered "evidence for evolution"; it is considered part of the experimental research about the origin of life and is discussed in chapters and sections on the "history of life." Likewise, Darwin's finches are used as examples of an evolutionary process (natural selection), not as evidence for

evolution. *Archaeopteryx* is frequently presented in discussions of the origin of birds, not as evidence for evolution itself. Finally, textbooks do not present a single "tree of life"; rather, they present numerous topic-specific phylogenetic trees to show how relevant organisms are related. Wells's entire discussion assumes that the evidence for evolution is a list of facts stored somewhere, rather than the predictive value of the theory in explaining the patterns of the past and present biological world.

Textbook "icons": Why do we have them?

Paradigms and all their components are not necessarily simple. To understand the depth of any scientific field fully requires many years of study. It is the goal of elementary and secondary education to give students a basic understanding of the "world as we know it," which includes teaching students the paradigms of a number of fields of science. In order to do this, teaching examples must be found. It is this need to find simple, easy-to-explain, dynamic, and visual examples to introduce a complex topic to students that has led to the common use of a few examples — the "icons." Yet, with our knowledge of the natural world expanding at near-exponential rates, the volume of new information facing a textbook writer is daunting. The aim of a textbook is not necessarily to report the "state of the art" as much as it is to offer an introduction to the basic principles and ideas of a certain field. Therefore, it should not be surprising that introductory textbooks are frequently simplified and may be somewhat out-of-date. In *Icons of Evolution*, however, Wells makes an even stronger accusation. Wells says: "Students and the public are being systematically misinformed about the evidence for evolution" through biology textbooks (Wells, 2000: xii). This is a serious charge; to support it demands the highest level of scholarship on the part of the author.

Does Wells display this level of scholarship? Is Wells right? Are the "icons" out-of-date and in need of removal? And more importantly, is there something wrong with the theory of evolution?

In the following sections, each textbook "icon" is reexamined in light of Wells's criticism. The textbooks covered by Wells are examined as well, along with the grading criteria (given in the appendix of *Icons* [Wells, 2000] and on the Discovery Institute's website) that he used to assess their accuracy. What was found is that although the textbooks could always benefit from improvement, they do not mislead, much less "systematically misinform," students about the theory of biological evolution or the evidence for it. Further, the grading criteria Wells applied are vague and at times appear to have been manipulated to give poor grades. Many of the grades given are not in agreement with the stated criteria or an accurate reading of the evaluated text. Beyond that, *Icons of Evolution* offers little in the way of suggestions for improvement of, or changes in, the standard biology curriculum. When Wells says that textbooks are in need of correction, he apparently means the removal of the subject of evolution entirely or the teaching of "evidence against" evolution, rather than the fixing of some minor errors in the presentation of the putative "icons." This makes *Icons of Evolution* useful at most for those with a certain political and religious agenda, but of little value to educators.

References

Wells, J. 2000. *Icons of evolution: science or myth?: why much of what we teach about evolution is wrong*. Regnery, Washington DC, 338p.