LITERATURE REVIEWS

Readers are invited to submit reviews of current literature relating to origins. Mailing address: ORIGINS, Geoscience Research Institute, 11060 Campus St., Loma Linda, California 92350 USA. The Institute does not distribute the publications reviewed; please contact the publisher directly.

A CONVERSATION STARTER

Explore Evolution: The Arguments For and Against Neo-Darwinism. Stephen C. Meyer, S. Minnich, J. Moneymaker, P. A. Nelson and R. Seelke. 2007. Malvern, Victoria, Australia: Hill House Publishers. 160 p. Paper, $39.95; Hardbound, $49.95.

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Explore Evolution is written as a supplemental classroom textbook exploring the controversies surrounding neo-Darwinism. With inquiry as today's buzzword in science education, the authors have formatted the book to promote discussion, debate, and further investigation. Critical thinking is fostered by the presentation of multiple perspectives.

Each chapter tackles a topic common to high school biology evolution units, including fossil succession, anatomical homology, molecular homology, embryology, biogeography, and natural selection. Most chapters begin by describing the evidence for the neo-Darwinist argument, followed by a rebuttal. Each finishes by asking the reader to consider areas of the topic that need further investigation. In a reversal, the final chapter presents the arguments of Behe on irreducible complexity first, then the counter-arguments of Kenneth Miller on the co-opting of proteins.

This style of presentation is supported by the National Science Education Standards, in which teachers are encouraged to ask students questions such as, "How do we know?", "How certain are you of those results?", "Is there an alternative scientific explanation for the one we proposed?", and "Do we need more evidence?" (1996). The message delivered throughout is that the arguments both for and against neo-

Darwinism need more evidence. More importantly, students are led to believe they can contribute to the debate through research.

One of the strengths of this book is that students are encouraged to distinguish between fact and interpretation (p 35). In reading textbooks, many students get the idea that there is nothing left to be discovered regarding evolution and origins. They are led to the assumption that textbooks are filled with undisputed facts. *Explore Evolution* is an excellent supplement for a teacher wishing to highlight areas of debate that need more research. For example, in many textbooks, students are told that small-scale genetic changes over time gradually lead to large morphological differences, though this is not supported by the fossil record, or by molecular evidence. In *Explore Evolution*, students are reminded that small-scale changes, attributable to loss of genetic information, do not add up to the macroscopic change necessary for new phyla (p. 77).

Explore Evolution teaches students to avoid circular reasoning (p 49). If one uses homology as evidence of common descent, but also defines homologous structures as those that are similar because of common ancestry, circular reasoning has been utilized. This fallacy is also often committed in the use of molecular clocks. "Logically, you can't use a method that assumes the existence of a common ancestor to prove the existence of a common ancestor" (p 59).

Another strength is the emphasis placed on ongoing research, especially in the areas of molecular biology and genetics. For example, many scientists now agree that the fossil record is more accurately explained by punctuated equilibrium than by gradualism. Punctuated equilibrium postulates the rapid evolution of new taxa followed by long periods of little change. This accounts for the lack of intermediates evident in the fossil record. However, no known molecular mechanism rapidly produces the new structures that appear in the fossil record without apparent precursors (p 33). This discussion also highlights the importance of interdisciplinary cooperation in designing hypotheses. Paleontologists, geologists, taxonomists, molecular biologists, all need to contribute in order to propose valid arguments.

Explore Evolution's weakness, from a teacher's perspective, is a lack of hands-on activities and structured discussion questions. Only one hands-on activity demonstrating the importance of the diaphragm in lung function is included in the book (p 134). Several of the sections, such as the discussion of the "two-to-one" limb arrangement versus a "one-to-two" limb arrangement, could be better arranged on the page as a set of directions followed by a set of discussion questions (p 46-47). Some of these

weaknesses are addressed in a set of ancillary materials provided by the publisher to purchasers of 10 or more copies of the book. These materials include PowerPoint slide shows, a test bank, lesson plans and video clips.

Without knowledge of the authors' backgrounds and the argument presented in the final chapter of this book, one could assume *Explore Evolution* was simply an attempt to entice students into careers in origin-related research by highlighting areas that need further research. However, due to the authors' affiliations with the Intelligent Design movement and the court battles over teaching ID in public schools, teachers wishing to use this text in a public school classroom may face resistance in the adoption process.

Explore Evolution is a good starting point for a student, young or old, who is interested in discovering where the debate over neo-Darwinism currently stands. Though this textbook is too technical for most church settings, private school teachers will find it a good resource for their evolution units. The endnotes for each chapter are also useful for those who want to take a closer look at the arguments presented.

The final chapter finishes with the authors' statement, "It is our hope that some of you will be among the researchers that will shed more light on these questions in years to come. Or, maybe you'll help discover some bigger questions" (p 122). Ultimately, this is the strength of *Explore Evolution*. By leaving each of these topics open to debate, the authors invite the reader to join in the discussion on origins.

LITERATURE CITED

National Committee on Science Education Standards and Assessment, National Research Council. 1996. *National Science Education Standards.* Washington DC: National Academies Press. 272 p.