

## *Haeckel's Embryos: Two Reviews*

*Haeckel's Embryos: Images, Evolution, and Fraud.* By Nick Hopwood. 2015. University of Chicago Press. (ISBN 978-0-226-04694-5). 388 pp. Hardcover. \$45.00.

Flip through biology textbooks, old or new, and chances are that you will find an illustration of vertebrate embryos arranged in rows and columns (see cover). This particular image, an embryo grid, is traced back to the work of Ernst Haeckel (1834–1919) and remains the single most published illustration in biology texts; no other diagram has proved so prevalent and resilient. Nick Hopwood's *Haeckel's Embryos: Images, Evolution, and Fraud* takes us on a journey of rich historical insight surrounding the origin and evolution of Haeckel's embryo grid.

Hopwood is a professor at the University of Cambridge, where he studies embryonic development, the history of biology, and the visual culture of science. Having written a variety of scholarly articles about the history of embryology, Hopwood is no stranger to Haeckel's intriguing story, and *Haeckel's Embryos* presents a culmination (but not simply a repeat) of his previous publications.

Hopwood provides the context for us to understand how Haeckel designed his drawings

to mediate between a general theory and concrete data. For those not familiar with Haeckel's work, he believed that the comparison of different vertebrate embryos was paramount for the understanding of evolution. By integrating two processes – development of an embryo (ontogeny) and the embryo's evolution from its ancestors (phylogeny) – Haeckel formulated the Biogenetic Law in the 1860s. The law stated that the evolution of an organism was traceable by following the organism's embryonic development.

Haeckel's Biogenetic Law operated by the process of recapitulation, whereby a particular organism passed through the adult stages of lower organisms during embryogenesis. Haeckel used his famous lithographic plates, comparing embryos of different phyla, to illustrate his idea of recapitulation, but embryologists such as Ludwig Rüttimeyer and Wilhelm His publicly criticized Haeckel for mislabeling and for drawing his embryos too schematically. They charged Haeckel with scientific inaccuracy and fraud. The complicated scientific, religious, and political history of Haeckel's work is traced through the early chapters of Hopwood's book. While Haeckel's scientific appeal suffered from condemnation by scientific and religious communities, Haeckel's embryo grid weathered the storm and found its way into what has developed into a “contestable space” in many high school and college biology texts.

Labeling anyone's work as “fraudulent” is a serious accusation. In the late 1800s, supporters and critics of Haeckel at least knew of the vast amount of work that the embryologist had done in finding new species, writing monographs, and defending evolution. Today, generations removed from Haeckel probably have little, if any, knowledge of the man. But Haeckel's drawings have never gone away; nor has the notion, held by some, that the drawing represents such an appalling degree of fraudulence that anyone or any idea even associated with Haeckel is fraudulent too. Why do Haeckel's embryos cause such rage and criticism?

Certainly, there were many drawings of embryos around at the time that Haeckel worked, but Haeckel used his drawings to serve notice of and support evolution, and not everyone agreed with evolution. This is what's behind many current criticisms of the use of Haeckel's embryo drawings in biology textbooks.

*Haeckel's Embryos* is richly illustrated with diagrams and photos. The book is not quite coffee-table size, but neither is it the routine size that many university press books are. The large size, the thick high-quality paper used, and the publisher's attention to layout greatly contribute to the crispness and details of the illustrations. I have a few quibbles, though. The final chapters deal with textbook illustrations and have direct appeal to science educators. For the biology teacher who is keen to read about textbooks and embryo grids, these chapters leave one a bit disoriented. Hopwood switches from American to English to German books and jockeys between high school, college, and embryology texts quickly. This chapter might be easier to read if a few more headings were used to identify which type of text is being discussed and where it was used.

My other concern is with Hopwood's choice of the term “fraud” in the book's title. While Haeckel certainly took liberties with his schematic drawings, was he really committing a fraud? Hopwood provides evidence for why Haeckel was considered overzealous in his illustrations to support Darwin's theory, but labeling his work a fraud is an overreach – you have to give the book serious attention to understand this. When simply glancing at the title, one might jump to the conclusion that the evidence against Haeckel continues (as happened with M. K. Richardson et al.'s [1997] article in *Anatomy and Embryology*, “There is no highly conserved embryonic stage in the vertebrates”). But for anyone already familiar with life science history, this book is a refreshing overview, and I

believe that the many illustrations and diagrams alone are worth its price. For anyone who is new to the history of biology, *Haeckel's Embryos* will show you just what you have been missing and how applicable visual culture is to the teaching of biology.



Karen Wellner  
Chandler-Gilbert Community College  
Chandler, AZ 85225  
Karen.wellner@cgcc.edu

"Ontogeny recapitulates phylogeny." This dictum of Ernst Haeckel led to his creation of a series of diagrams showing the similarity of embryonic stages across phyla. In our post-Modern Synthesis world, it is hard to see why Haeckel's embryos should still raise hackles. But here we are, still discussing them.

Was Haeckel a villain or victim? Was he guilty of perpetrating outright fraud, in the spirit of Piltdown? Did he forge his embryonic grids with the intent to deceive and convince? Or did he innocently fill in gaps in his embryonic series because of the paucity of available material and "touch up" images produced by others? Or was he a bold pioneer, who fearlessly – but mistakenly – drew what he saw, as did Percival Lowell, Haeckel's contemporary, with his Martian "canals"?

If you have already made up your mind on these questions, then you will be both thrilled and dissatisfied by Hopwood's careful recounting of the times and tribulations of Haeckel and his embryos, a story that spanned 140 years and the development of imaging technology that grew through lithography, woodcuts, photogravure, daguerreotypes, and halftones. Ten years in the making, *Haeckel's Embryos* is neither a plug nor a pan of Haeckel or his images, but rather a "most comprehensive history of a scientific image" (p. 3).

Larger than Haeckel's images, Hopwood's grander purpose is to explore "how pictures of knowledge succeed and fail, become accepted and cause trouble . . . . This book focuses on Haeckel's embryos . . . the most fought-over images in the history of science" (p. 3). *Haeckel's Embryos* is presented in a beautifully illustrated, cloth-bound, 8½ by 11 inch edition with over 200 historical plates and images. Many appear for the first time outside their original publications.

After an Introduction that describes the author's purpose and premise, chapters 2–4 recount the growth of embryological studies and the development of embryological and developmental images. They then trace Haeckel's rise to become the most prominent Darwinist in Germany. Chapters 5–8 track how Haeckel's embryonic images were made and disseminated,

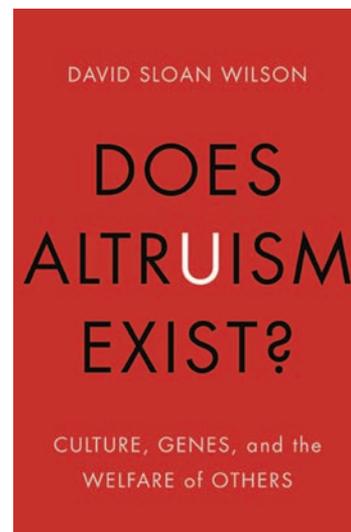
and end with the first controversy and accusations of forgery in 1875 by Rüttimeyer and His – claims exploited by antievolutionists and religious conservatives at the time. Chapters 9–13 follow the expansion of Haeckel's embryonic grids, his rise to celebrity status, and the social/political/religious polarizations that surrounded Haeckel and his embryos. These chapters record the ratcheting-up of vitriolic exchanges between Haeckel and his detractors.

The final chapters (14–18) recount the dust-up of the second controversy and accusations of forgery by Arnold Brass and the religious conservatives of the Kepler League that first brought the scandal of fraud before the public in 1909. Tarnished in Germany, Haeckel's embryos became widely disseminated in textbooks in the United States and Britain, where the forgery accusations were less well known. Interestingly, they were even included in the approved Tennessee biology textbook following the Scopes "Monkey" trial in 1925. The section ends with the "rediscovery of Haeckel's forgeries" by American biologist Michael Richardson in 1997, who declared them "fakes" (p. 286) – a claim that inflamed the Intelligent Design firestorm led by Phillip Johnson and the Discovery Institute. Hopwood also mentions Jonathan Wells's antievolutionary shot-across-the-bow in the *American Biology Teacher* in May 1999.

*Haeckel's Embryos* is not a stodgy tomb covered in archival dust, as are some histories of science. Hopwood's writing is not only clear but highly engaging. This book is fun to read, chock-full of exhaustive detail made palatable by entertaining turns of phrase, word pictures, and puns. But *Haeckel's Embryos* may not be for everyone. If your primary interest (or need) is simply countering creationist intrusions into your already packed biology curriculum, you may be better served by reading the short essays found on the National Center for Science Education (NCSE) website. But if you are curious to learn the definitive and nuanced story of Haeckel and his embryos, or have an abiding interest in the philosophy and history of science, then this book is for you. Many of my scientific heroes are woven into the fabric of this fascinating story. I found myself fully engaged and repeatedly chuckling over Hopwood's wordsmithery. Then, on practically every page, I was forced to loiter and savor the beauty of the historical plates and images. Through it all, I learned so much. *Haeckel's Embryos* is a wonderful book.



Larry Grimes  
Sierra High School  
Manteca, CA 95337  
lgrimes@musd.net



## ALTRUISM

*Does Altruism Exist? Culture, Genes, and the Welfare of Others.* 2015. By David Sloan Wilson. Yale University Press and Templeton Press. (ISBN 978-0-300-18949-0). 180 pp. Hardcover. \$27.50.

In all honesty, I found this book to be a slog. It is part of the "Foundational Questions in Science series" and, as such, is written by a well-respected leader in this field, David Sloan Wilson. He took the opportunity to reflect over the vast quantity of literature in this area and attempt to distill what is currently known or unknown and some of the implications of the field. Wilson's writing style, while lucid and concise, is very academic rather than grippingly narrative. He typically writes abstract philosophical arguments, illustrated eventually with a few real-world examples. The reader needs to be willing to really concentrate as she reads to watch the argument gradually build. Thus, the appropriate audience likely will be more students than lay readers. The book is predominantly human-centered, with few references to other species. I expected this to be a case-by-case examination of seemingly altruistic behaviors throughout the animal kingdom, so I was disappointed, but examining other species was clearly not Wilson's original goal. Why focus so intently on the human species in this book? Beyond the obvious self-interested reason, Wilson claims that "Alone among primate species, we crossed the threshold from groups of organisms to groups as organisms . . . . Our ancestors managed to suppress disruptive forms of within-group competition, making benign forms of within-group selection and between-group selection the primary evolutionary forces" (p. 49).