



Haeckel's Embryos: Images, Evolution, and Fraud

By Nick Hopwood

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Pictures from the past powerfully shape current views of the world. In books, television programs, and websites, new images appear alongside others that have survived from decades ago. Among the most famous are drawings of embryos by the Darwinist Ernst Haeckel in which humans and other vertebrates begin identical, then diverge toward their adult forms. But these icons of evolution are notorious, too: soon after their publication in 1868, a colleague alleged fraud, and Haeckel's many enemies have repeated the charge ever since. His embryos nevertheless became a textbook staple until, in 1997, a biologist accused him again, and creationist advocates of intelligent design forced his figures out. How could the most controversial pictures in the history of science have become some of the most widely seen?

In *Haeckel's Embryos*, Nick Hopwood tells this extraordinary story in full for the first time. He tracks the drawings and the charges against them from their genesis in the nineteenth century to their continuing involvement in innovation in the present day, and from Germany to Britain and the United States. Emphasizing the changes worked by circulation and copying, interpretation and debate, Hopwood uses the case to explore how pictures succeed and fail, gain acceptance and spark controversy. Along the way, he reveals how embryonic development was made a process that we can see, compare, and discuss, and how copying—usually dismissed as unoriginal—can be creative, contested, and consequential.

With a wealth of expertly contextualized illustrations, *Haeckel's Embryos* recaptures the shocking novelty of pictures that enthralled schoolchildren and outraged priests, and highlights the remarkable ways these images kept on shaping knowledge as they aged.

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Editorial Review

Review

"Hopwood's book is a richly illustrated and staggeringly detailed story of how Haeckel's embryo pictures came to be, how they were mobilised as resources in scientific and ideological causes, how versions of the grid picture were copied, recopied and modified, how their accuracy was vigorously disputed by some and defended by others, and how they continue to circulate—still relevant and still contentious—today....There is no more focused account of the subtle and complex relationships between scientific images and what they represent."

(London Review of Books)

"Rarely have images proved so incendiary as the embryo drawings of nineteenth-century experimental zoologist Ernst Haeckel. In this lavishly illustrated volume, Hopwood traces the chequered history of the sketches, which showed similarities between embryos of higher and lower vertebrates, including humans, at particular points in their development. Haeckel intended the images as support for Charles Darwin's evolutionary theory, but under attack revealed that they were schematics. Hopwood meticulously charts how, despite the controversy, the drawings took on a life of their own."

(Nature)

"Sumptuous. . . . Hopwood's excellent, thought-provoking book makes us ponder how these erroneous illustrations acquired their iconic status, and, above all, it shines a spotlight on the power of drawings to influence our thinking."

(New Scientist)

"Hopwood raises important questions (particularly pertinent to the modern era of viral memes) about the teaching of empirical science and the bringing of complex scientific ideas to the public, the 'boundary of popular literature and specialist work,' the relationship between the observer as accurate reporter and as artist, and the line beyond which schematization for didactic or rhetorical effect becomes deliberately misleading."

(Publishers Weekly)

"*Haeckel's Embryos* is a magnificent scholarly *tour de force*...an outstanding piece of work and a delight to study."

(Medical History)

"Detailed, well documented, and rich with illustrations. It is likely to be of most value to those with interests in developmental biology, embryology, the history of attacks on evolution, or the history of scientific publication."

(Library Journal)

"This book is fun to read, chock-full of exhaustive detail made palatable by entertaining turns of phrase, word pictures, and puns.... 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."

(American Biology Teacher)

"*Haeckel's Embryos* is a big book bursting with ideas about visuality, scientific images, evidence, hypotheses, objectivity, and controversy, with striking pictures...on nearly every page. An important contribution to the history of scientific illustration and visual culture, and a must-read for anyone wishing to form any substantive conclusion about the place of Haeckel and his contributions in evolutionary science and popular culture."

(*History and Philosophy of the Life Sciences*)

"Not only does Hopwood's book address a broad audience, it also proves engaging throughout its 388 pages due to its numerous images and clarity. Additionally, the book does not appear to be too technical, but in fact is a valuable scientific contribution to the literature on Haeckel's diagrams, and a very enjoyable one."

(*British Journal for the History of Science*)

"In this book, Hopwood masterfully reconstructs a set of three related controversies regarding Ernst Haeckel's infamous diagrams comparing the embryos of different species. While there is a substantial literature on scientific controversy and a growing literature on scientific fraud, there is nothing quite like this book: Hopwood's is an exciting and original contribution that cuts across the history of biology, the study of visual representation, science education and the intersection of science, politics and religion."

(*English Historical Review*)

"*Haeckel's Embryos* is a well-balanced illustrative account offering a meticulous study of the history of Haeckel's embryo image and its controversies. A range of readers could benefit from Hopwood's engaging writing. For general readers who are not familiar with Haeckel or the debates about embryology and Darwinism in the post-Darwinian era, this book is a good reference work for understanding their context in modern Western society, especially in Germany and the United States. For readers who are interested in popular science or the visual culture of sciences, this book provides rich material for exploring how visualization plays a vital role in the dissemination of knowledge and the ways in which particular scientific images become persistent and even iconic."

(*East Asian Science, Technology and Society*)

"Hopwood's impressive exegesis of Ernst Haeckel's infamous embryo plates is a strong example of current research at the interstices of the history of science and visual culture. Moving deftly between scientific theory, cultural and political polemics, the radicalisation of public education, and the development of the scientific community and its methods of standardisation, Hopwood takes us on an intellectual tour not only of a key scientific period but also of some of the most highoctane moments in the political history of the late nineteenth century."

(*Metascience*)

"The book - a beautiful object, as well as a thought-provoking read - tells the story of how the Darwinist Ernst Haeckel's famous drawings of embryos shaped the course of modern science, despite contemporary and current accusations of fraud. Hopwood's research is wide-ranging, leading us confidently through the politics and practices of embryology as well as of book design, and raising pressing questions about the use and spread of images in print and manuscript. Rooted in the history of science, *Haeckel's Embryos* demonstrates the gains to be made by disciplines beyond our own when they turn to the tools of book history to ask big questions about the reproduction and dissemination of ideas."

(*SHARP DeLong Book History Book Prize Commendation*)

"Hopwood raises the discussion of Haeckel's embryos to a completely new discursive and iconographical level...in a wonderfully written and illustrated book. ... Hopwood's account is distinguished by the greatest possible completeness, exactitude and objectivity; he wants to understand Haeckel and also his enemies, not

accuse them. Every sentence, nay every word, is carefully considered and balanced. It is fascinating to see how, on the one hand, these pictures developed a life of their own independent of their author...and, on the other, the discourse of forgery gained momentum, so that Haeckel was frequently perceived as a fraudster...although he was never put on trial. Hopwood discusses significant questions in the history of biology in the last two hundred years, illuminates the various roles of scientific images in different contexts and does not ignore the question of morality in natural science. This broad spectrum of content, combined with Hopwood's restrained but at the same time masterly presentation, makes *Haeckel's Embryos* a standard work in the history of biology and a shining example for the analysis of scientific images."

(Berichte zur Wissenschaftsgeschichte)

"Through eighteen chapters of beautifully illustrated text, Hopwood lays out the unfolding landscape of scientific, social, and political factors that led Haeckel to create his images for public consumption, as well as the rounds of debates that have dogged these images since their first appearance in print. . . . Hopwood does a good job of giving his reader a glimpse into the manufacture of Haeckel's images, and in so doing, gives a fresh perspective on the controversy surrounding Haeckel's famous embryos."

(Studies in History and Philosophy of Biological and Biomedical Sciences)

"Hopwood expertly attends to the nitty-gritty of the story: printing technologies and conventions of drawing, university politics and personal networks. *Haeckel's Embryos* is one of the more exciting history books I have read for a long time. Hopwood is a scrupulous researcher and writer, and his use of images recapitulates that of Haeckel: the lavish visual materials (202 colour plates, 2 tables) serve not as illustrations to the story, but also as historical evidence. In *Haeckel's Embryos*, Hopwood's images show us something new, again and again."

(Archives of Natural History)

"Any biologist interested in Haeckel's comparative embryo illustrations will find this book an interesting read, and will discover, as I did, that they learn important new things about the history of science."

(Quarterly Review of Biology)

"Historically meticulous and acute...An accomplished book—handsome in design and impressive in execution."

(Isis)

"Highly recommended not only for professional studies but for the general enjoyment of Haeckel's and his contemporaries' illustrations."

(Bulletin of the History of Medicine)

"Nick Hopwood's book will certainly be welcomed not only by specialist historians of science, but also by a wider public interested in science. . . . [I]t maintains a fluent style, intelligible for readers with no background in the subject."

(H-Soz-und-Kult 2017-03-27)

"Hopwood's book capitalizes on recent trends in the historiography of science that move away from the traditional emphasis on scientific ideas and toward analyses of scientists' political and cultural interests, scientific practices and material culture, the history of the book and printing, and visual representation. He shows us the power of these approaches by bringing them all to bear on a puzzling historical case and a set of images with a long afterlife of changing meanings and uses."

(Sander Gliboff Journal of Modern History)

"This book masterfully reconstructs the controversies surrounding Ernst Haeckel's infamous diagrams comparing the embryos of different species. Hopwood's powerful and compelling narrative reveals how these images became enmeshed in fundamental questions about visual representation, scientific fraud, relations between science and religion, and interactions between scientists and their publics. *Haeckel's Embryos* is a transformative study of scientific controversy that should be required reading for every student of science."

(Michael R. Dietrich, coeditor of *Outsider Scientists: Routes to Innovation in Biology*)

"Ernst Haeckel, the best known German Darwinist of his day, was also the most controversial. For nearly a century and a half his widely circulated series of animal and human embryos, illustrating common descent, have prompted charges of forgery and fraud from scientific, religious, and political critics. Antievolutionists, especially advocates of intelligent design, have been among his most outspoken detractors. One can only hope that Hopwood's scrupulously researched and evenhandedly argued book will finally lay these longstanding controversies to rest."

(Ronald L. Numbers, author of *Galileo Goes to Jail and Other Myths about Science and Religion*)

"Hopwood has written a meticulous and engaging history that sets a high bar for future print and visual culture studies. *Haeckel's Embryos* shows the material, intellectual, and cultural conditions under which the hidden is rendered visible and the visible rendered standard, amidst contestation at every turn. Open it, and—after you have recovered from its spectacular images—read it, for this is history of science at its best."

(Lynn K. Nyhart, Vilas-Babitch-Kelch Distinguished Achievement Professor, History of Science, University of Wisconsin–Madison)

"Certain images in science capture the imagination and take on a life of their own. In this excellent book, surely the definitive account of the afterlife of scientific images, Hopwood examines the most iconic pictures of vertebrate embryos, those first produced by German evolutionist Ernst Haeckel in 1868. These images have been repeatedly caught up in anti-Darwinist debates and to this day have been subject to charges of scientific fraud. In tracking Haeckel's embryos, Hopwood restores the full sound and fury of history to the act of looking at what humans are and where we came from."

(Trevor Pinch, Cornell University)

About the Author

Nick Hopwood is reader in history of science and medicine in the Department of History and Philosophy of Science at the University of Cambridge. He is the author of *Embryos in Wax*, coeditor of *Models: The Third Dimension of Science*, and cocurator of the online exhibition *Making Visible Embryos*.

Users Review

From reader reviews:

Kevin Gans:

Why don't make it to be your habit? Right now, try to ready your time to do the important act, like looking for your favorite guide and reading a reserve. Beside you can solve your problem; you can add your knowledge by the book entitled Haeckel's Embryos: Images, Evolution, and Fraud. Try to make book Haeckel's Embryos: Images, Evolution, and Fraud as your good friend. It means that it can to become your friend when you feel alone and beside regarding course make you smarter than in the past. Yeah, it is very fortuned for you personally. The book makes you more confidence because you can know almost everything by the book. So , let's make new experience and knowledge with this book.

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Carla Heyward:

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