Charles Darwin thought the graphical expression of his theory extremely important. In *On the Origin of Species*, he recognized the difficulty naturalists had “in describing, without the aid of a diagram, the various affinities which they perceive between the many living and extinct members of the same great natural class.” In spite of this awareness, he included just one diagram of species descent in the book, a very abstract one consisting of a series of bifurcating vertical lines labeled with letters and horizontal lines depicting indeterminate time intervals. Darwin’s abstruse usage might be contrasted with that of Ernst Haeckel, his German disciple and friend, whose two popular treatises on evolutionary theory—*Natürliche Schöpfungsgeschichte, 1868* and *The Evolution of Man* (1874)—were crammed with trees of descent and replete with illustrations of a huge variety of organisms at various stages of development. The number of pictures in Haeckel’s books grew relentlessly through the 12 editions of *Natural History of Creation* and the 6 editions of *The Evolution of Man*; these volumes were translated into most of the known—and many of the unknown—languages of the world. It is perhaps no wonder that more people by the turn of the century had learned of evolutionary theory through Haeckel’s depictions than even from Darwin’s own writings. Images have power.

Darwin lacked the artistic talent of Haeckel and deployed many fewer illustrations in his several books. Yet as Julia Voss shows in her quite original investigation, *Darwin’s Pictures*, in Darwin’s works visual representations were vital not only for readers’ comprehension but also for his working out on astronomy and cosmology. Unlike many other books in this very extensive genre, it offers a scientifically competent and impressively informative account of how astronomers and physicists have unveiled the secrets of the universe, in this case leading to the astounding insight that our universe can be traced back in time to an explosive event that happened 13.7 billion years ago. Although the book has much to recommend it, I find it somewhat disappointing when it comes to those conceptual and philosophical issues that are an integral part of cosmology in the wider sense. The concept of the age of the universe is not a purely scientific one, for it necessarily involves considerations of a philosophical nature.

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**HISTORY**

**Images of Evolution**

Robert J. Richards


Soon after learning that a crested macaque (*Cynopithecus niger*) that chuckled when petted had arrived at the Regent’s Park Zoological Garden, Darwin hired artist Joseph Wolf to draw these portraits of the creature and used them to illustrate his 1872 book *Expression of the Emotions in Man and Animals. From Darwin’s Pictures.*
of central arguments. Voss focuses on four iconic moments in the development of his theory: his sketches of finches’ beaks in the second edition (1845) of the Journal of Researches into the Natural History and Geology of the Countries Visited During the Voyage of H.M.S. Beagle Round the World; the diagram in the Origin (1859) and its forerunner in a notebook; a series of woodblock prints of the Argus pheasant’s tail feathers in The Descent of Man, and Selection in Relation to Sex (1871); and a drawing of a laughing monkey in The Expression of the Emotions in Man and Animals (1872).

Voss, who trained as an art historian at the Humboldt University in Berlin, considers these images in the context of many others and renders acute judgments about their features. For instance, she shows how, in the Journal of Researches, which contains no explicit mention of his new proposal, Darwin yet arranged the profiles of four finches so that their beaks suggested a graduated development. She catches him pulling the veil back a bit further from his nascent theory when, referring to the depiction of the finches, he remarked in the text that “one might really fancy that...one species had been taken and modified for different ends.”

Voss follows Darwin to the London Zoological Gardens, where he went to observe a laughing monkey—well, a sort of chuckling macaque—so that he could depict the animal antecedent of what might be thought a distinctly human capacity. In her treatment of The Expression of the Emotions, Voss spends some time describing Darwin’s innovative use of photography. He employed the new medium to display the variety of emotions—anger, surprise, sadness, joy—in children, in actors, in the insane, and in one fellow whose expressions were produced by galvanic stimulation of facial muscles. With the aid of photographs and woodcuts, Darwin visually demonstrated the roots of human emotional expression in animal forebears. Unlike contemporary behavioral biologists, however, Darwin denied that the emotions served a communicative function. In rejecting this plausible assignment, he was over-reacting to the claims of Charles Bell, an anatomist and natural theologian, who contended that the Creator had instilled the emotions in human beings as a common, natural language.

The most interesting parts of Voss’s examination are devoted to Darwin’s tree diagrams and to his study of the ornamental patterns displayed by the Argus pheasant. She briefly describes the diagrams of species systems formulated by several of Darwin’s contemporaries and indicates how he might have constructed his own figures in their light. The most telling of these graphic schemes is Martin Barry’s “tree of animal development” (1837), which Barry used to illustrate Karl Ernst von Baer’s conception of the embryological relations of various animal groups. The strong resemblance between Barry’s tree and the famous angular tree in Darwin’s Notebook B (1857) has hardly been mentioned in the historical literature.

More significant, perhaps, is Voss’s suggestion that in the very act of drawing Darwin revealed to himself three important aspects of species relations: (1) that evolution is genealogical in the way human family pedigrees are (as opposed to Lamarck’s assumption of independent rooting of every lineage); (2) that the nodes of the splitting branches of Darwin’s diagram could stand both for the common ancestor of several daughter species and for the morphology of the genus; and (3) that the gaps necessitated by the branching structure allowed application of the taxonomic categories of variety, species, genus, family and so on. Darwin modified the notebook diagram to yield that abstract illustration in the Origin. The manuscript of the Origin shows, however, that initially Darwin had placed the ancestor groups at the top of the diagram with the branching species trailing toward the bottom—so that the image would have depicted a real descent. For the published version, though, he flipped the diagram so that the tree had its ancient progenitors rooted at the bottom, with species ramifying upward toward the contemporary period. In this orientation, the figure subtly implied a progressive advance of organisms, which Darwin’s theory embraced from the beginning. Voss doesn’t explicitly note the impact of this turnabout, but it’s one of the many aspects of Darwin’s theory construction clearly suggested by her rich descriptions.

The obvious comparison for Darwin’s single tree image in the Origin is Haeckel’s forest of trees in his technical and popular monographs. Here Voss falls prey to certain dogmatic presump-

Ernst Haeckel included this “family tree of the mammals, including man” in his 1866 book General Morphology of Organisms. Humans are in the upper right corner beside the gorillas, at the same height as Felina (the cats) further to the left. From Darwin’s Pictures.
tions resident in the secondary literature. Along with scholars such as Stephen Jay Gould and Peter Bowler, she casts Haeckel as the degenerate follower of the master, not really an authentic Darwinian. She observes that Haeckel’s early trees of vertebrates and mammals in General Morphology of Organisms (Generelle Morphologie der Organismen, 1866) show human beings in no central location; rather, they are cowering in a top branch (indicating recent appearance) off to the side of other contemporary groups, from sea mammals, great cats and bears to monkeys and apes, as in the “family tree of the mammals, including man” (see facing page). But she contends that Haeckel succumbed to a kind of teleological mania a few years later when he drew a systematic “stem-tree” of man (“Systematischer Stammbaum des Menschen”) in 1874 and included it in The Evolution of Man. That illustration, at right, has man perched centrally at the top of a mighty oak, a tree that has stunted side branches, to indicate an apparent teleological trajectory with man as the end point of evolution. A few moments of reflection on Haeckel’s disdain for orthodox presumptions about the privileged place of human beings in creation ought to have counseled restraint in adopting this interpretation. Haeckel, rather, regarded these two types of diagrams as having different purposes. The first represented, as he said in Natural History of Creation, a proper stem-tree, one highly branched. The latter diagram simply looked back from a given organism—in this case man—to its lineal progenitors. It’s as if one began with the first kind of tree and traced back the series of man’s direct ancestors—and this would result in that second kind of tree. Haeckel had not precipitously regressed, within the space of a few years, into a dogmatic teleologist. The later editions of his popular works show trees so complexly branched that it seems as though a wild pasta chef might have concocted them.

There is little doubt, however, that Haeckel thought the Indo-German races had reached a summit of intelligence and culture. But Darwin believed no differently. Both naturalists regarded man’s gradual ascent from animal antecedents to have left a trail of smaller-brained early humans, whose anatomical characteristics and culture were recapitulated by contemporary “savages,” a view that Darwin expressed in The Descent of Man.

Voss displays her analytic best in portraying Darwin’s clever recovery from a potentially potent objection to his theory. As she tells the story, the Duke of Argyll, George Douglas Campbell, advanced in his Reign of Law (1867) an array of different kinds of evidence against the new conception, and he made his case with elegance and sophistication. One objection seemed particularly condign to his aristocratic tastes. It was based on the “useless beauty” of the ornaments on the tail feathers of the male Argus pheasant. The bird can spread its tail in a perpendicular fan so as to display along the primary feathers a series of trompe l’oeil images. They seem like strings of little balls in their sockets, each delicately colored to produce an illusion of solidity. The artistic beauty of these images, Argyll argued, could only have the purpose to raise the mind to the author of all beauty.

With curiosity piqued, Darwin traveled to the Zoological Gardens to study the pheasant. To answer Argyll, he had to show that these “little eyes,” as they were called, could have gradually arisen from the arbitrary selections of many generations of female pheasants. As he slyly admitted in the Descent of Man, it would be as though “chance daubs of paint” made by a long line of artists had, without their intending it, eventually formed one of Raphael’s Madonnas. Darwin himself performed the trick by showing, in a series of sketches, that the layers of the pheasant’s secondary feathers displayed markings that graduated from mere blotches to something approximating the little eyes. That progression in space, he maintained, could thus have emerged in time.

Voss, with considerable ingenuity, has produced a volume rich in suggestion about and insight into Darwin’s achievement.