

New Titles

Source: BioScience, 62(7) : 694-696

Published By: American Institute of Biological Sciences

URL: <https://doi.org/10.1525/bio.2012.62.7.15>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

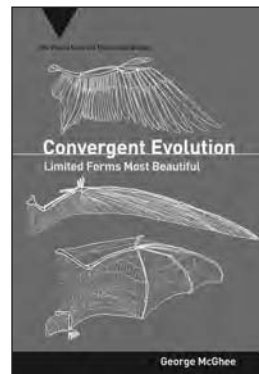
genealogical lineages often converge in both form and function. The similarity of evolved characters in different lineages reveals evolution's repeated paths.

Repetition of similar forms is easily understandable in terms of structure and function: Given the same function in similar habitats, evolution will produce a similar form to serve that purpose. The exemplar of convergence is that of the ichthyosaur and the porpoise. The two creatures have a fusiform body, snout, and fins that are remarkably similar. However, the former evolved from lizards some 240 million years ago, and the latter evolved from a mammalian lineage some 190 million years later. Indeed, McGhee surmises that if large animals were to be found under the methane seas of Titan, they would also have a fusiform body.

When the saber-toothed cat once roamed North America, Europe, and Asia, so too did its analog: a marsupial mammal of South America that looked morphologically almost identical. There are the retractable claws of both dinosaurs and cats and the raptorial beaks of diverse bird species. Flying squirrels have emerged independently all over the globe. The wings of birds and the wings of bats are a case of parallel evolution: The former developed from modified dinosaurian forelimbs, the latter from mammalian.

It was once thought that convergence was mainly a result of similar function, but developmental constraints also result in convergence. McGhee explains that some cases are based on a developmental bias or genetic channeling; others are caused by what he terms *deep homology*. For example, an ancient, highly conserved regulatory gene in the animal genome (the *Pax-6* gene) has been modified many times in evolution, resulting in convergent traits such as the many kinds of eyes in animals. As such, eyes evolved as 49 independent lineages. One of the most remarkable examples of convergence in animals is the evolution of *viviparity*—the development

of the embryo inside the mother, which results in a live birth of offspring. This convergent trait has also evolved many times in animals. There is ecological convergence—when different species play similar roles in different ecological communities—and the evolutionary convergence of various social behaviors, nest building, and tool use throughout the animal kingdom, as well as self-awareness evolved independently in various lineages, including primates, corvid birds, and cetaceans. Convergence in the evolution of plants is exemplified by the development of seeds and by various relationships that plants have with animals. McGhee also discusses the convergent molecular evolution of proteins, and he even includes conjectures on directed evolution of the genetic code. The scope and significance of convergent evolution (often resulting from horizontal gene transfer) in the microbial world is not explored in the book, however.



Taking issue with those who view evolution to be unpredictable, McGhee addresses the false dichotomy between the factors of contingency and chance on one hand and directed evolution based on supernatural forces on the other. In the history of evolutionary biology, it is chance, the struggle for existence, and contingency that have always been on the side of evolution; goal-driven physiological change was always on the side of supernaturalism and the antievolution movement. This dichotomy has been maintained by an

ongoing conflict between scientists and creationists, but life can be directional without being teleological. As McGhee observes, “Water flows downhill, from a state of higher potential energy to a state of lower potential energy under the influence of gravity. It is mindless” (p. 272).

Evolution does not involve an intelligent design toward a predetermined goal for McGhee any more than it does for other evolutionists. Still, he argues, one can speak of “improvement” in evolution: “Natural selection has a direction only in the sense that it will, in general, operate to move evolving organisms up the slopes of the adaptive landscape to higher states of adaptation” (p. 272). The phenomena of convergent evolution abundantly demonstrate that the environment does have a priori standards of overall value. “The laws of physics impose the functional constraints, the a priori standard, that fast-swimming organisms must be fusiform in shape and that flying organisms must have wings, and so on, for all the myriad examples of convergent evolution...” (p. 273). *Convergent Evolution* is a timely synthesis—an engaging book that will surely be widely read and discussed among evolutionists.

JAN SAPP

Jan Sapp (jsapp@yorku.ca) is a professor in the biology department at York University in Toronto. His most recent book is *The New Foundations of Evolution: On the Tree of Life*.

NEW TITLES

Advances in Fish Tagging and Marking Technology. Jeremy McKenzie, Bradford Parsons, Andrew Seitz, R. Keller Kopf, Matthew Mesa, and Quinton Phelps, eds. American Fisheries Society, 2012. 560 pp., illus. \$79.00 (ISBN 9781934874271 cloth).

The Bluebird Effect: Uncommon Bonds with Common Birds. Julie Zickefoose. Houghton Mifflin, 2012. 384 pp., illus. \$28.00 (ISBN 9780547003092 cloth).

The Brain: Big Bangs, Behaviors, and Beliefs. Rob DeSalle and Ian Tattersall. Yale University Press, 2012. 368 pp., illus. \$29.95 (ISBN 9780300175226 cloth).

Chimpanzees of the Lakeshore: Natural History and Culture at Mahale. Toshisada Nishida. Cambridge University Press, 2012. 340 pp., illus. \$50.00 (ISBN 9781107601789 paper).

The Economics of Ecosystems and Biodiversity in Local and Regional Policy and Management. Heidi Wittmer and Haripriya Gundimeda, eds. Taylor and Francis, 2012. 384 pp., illus. \$84.95 (ISBN 9781849712521 cloth).

Ethical Adaptation to Climate Change: Human Virtues of the Future. Allen Thompson and Jeremy Bendik-Keymer, eds. MIT Press, 2012. 336 pp., illus. \$26.00 (ISBN 9780262517652 paper).

Evolution in a Toxic World: How Life Responds to Chemical Threats. Emily Monosson. Island Press, 2012. 232 pp., illus. \$35.00 (ISBN 9781597269766 cloth).

The Feathery Tribe: Robert Ridgway and the Modern Study of Birds. Daniel Lewis. Yale University Press, 2012. 346 pp., illus. \$45.00 (ISBN 9780300175523 cloth).

Innovation, Dual Use, and Security: Managing the Risks of Emerging Biological and Chemical Technologies. Jonathan B. Tucker, ed. MIT Press, 2012. 356 pp., illus. \$27.00 (ISBN 9780262516969 paper).

How to Contact AIBS

BioScience

Advertising, print and online:
adsales@ucpressjournals.com

Classified advertising:
jwilliams@aibs.org
703-674-2500 x. 209

Online:
www.aibs.org/bioscienceonline

Permissions:
www.ucpressjournals.com/reprintinfo.asp

Publisher:
rogrady@aibs.org
703-674-2500 x. 258

Submission inquiries:
tbearsley@aibs.org
703-674-2500 x. 326

Subscriptions: Individual
admin@aibs.org
703-790-1745

Subscriptions: Institutional
customerservice@ucpressjournals.com
510-643-7154

AIBS

ActionBioscience.org:
tbearsley@aibs.org
703-674-2500 x. 326

Education Office:
smusante@aibs.org
703-674-2500 x. 311

Executive Director: *rogrady@aibs.org*
703-674-2500 x. 258

Meetings and Conference Services:
sburk@aibs.org
703-790-1745

Membership Records: *admin@aibs.org*
703-790-1745

Membership and Community Programs: *spotter@aibs.org*
941-923-6320

Public Policy Office: *rgropp@aibs.org*
202-628-1500 x. 250

Scientific Peer-Review Services:
sglisson@aibs.org
703-674-2500 x. 202

Web/IT Services:
jwagener@aibs.org
703-674-2500 x. 107

March of the Microbes: Sighting the Unseen. John L. Ingraham. Harvard University Press (Belknap Press), 2012. 336 pp., illus. \$16.95 (ISBN 9780674064096 paper).

Methylmercury and Neurotoxicity. Sandra Ceccatelli and Michael Aschner, eds. Springer, 2012. 373 pp., illus. \$209.00 (ISBN 9781461423829 cloth).

Moral Origins: The Evolution of Virtue, Altruism, and Shame. Christopher Boehm. Basic Books, 2012. 432 pp., illus. \$28.99 (ISBN 9780465020485 cloth).

Nature's Compass: The Mystery of Animal Navigation. James L. Gould and Carol Grant Gould. Princeton University Press, 2012. 320 pp., illus. \$29.95 (ISBN 9780691140452 cloth).

Oxidative Stress: Diagnostics, Prevention, and Therapy. Silvana Andreescu and Maria Hepel, eds. American Chemical Society, 2012. 438 pp., illus. \$175.00 (ISBN 9780841226838 cloth).

The Philosophy of Human Evolution. Michael Ruse. Cambridge University Press, 2012. 288 pp., illus. \$26.99 (ISBN 9780521133722 paper).

Sacred Species and Sites: Advances in Biocultural Conservation. Gloria Pungetti, Gonzalo Oviedo, and Della Hooke, eds. Cambridge University Press, 2012. 256 pp., illus. \$84.00 (ISBN 9780521110853 cloth).

Secret Chambers: The Hidden History of the Cell. Martin Brasier. Oxford University Press, 2012. 256 pp., illus. \$29.95 (ISBN 9780199644001 cloth).

doi:10.1525/bio.2012.62.7.15

The Social Conquest of Earth. Edward O. Wilson. W. W. Norton, 2012. 352 pp., illus. \$27.95 (ISBN 9780871404138 cloth).

The Three Failures of Creationism: Logic, Rhetoric, and Science. Walter M. Fitch. University of California Press, 2012. 194 pp., illus. \$24.95 (ISBN 9780520270534 paper).

Trees of Life: A Visual History of Evolution. Theodore W. Pietsch. Johns Hopkins University Press,

2012. 376 pp., illus. \$69.95 (ISBN 9781421404790 cloth).

The Value of Species. Edward L. McCord. Yale University Press, 2012. 184 pp. \$25.00 (ISBN 9780300176575 cloth).

Visualizing Climate Change: A Guide to Visual Communication of Climate Change and Developing Local Solutions. Stephen R. J. Sheppard. Taylor and Francis, 2012. 514 pp., illus. \$79.95 (ISBN 9781844078202 cloth).

Why Animals Matter: Animal Consciousness, Animal Welfare, and Human Well-being. Marian Stamp Dawkins. Oxford University Press, 2012. 224 pp., illus. \$24.95 (ISBN 9780199747511 cloth).

A World of Insects: The Harvard University Press Reader. Ring T. Cardé and Vincent H. Resh, eds. Harvard University Press, 2012. 416 pp., illus. \$19.95 (ISBN 9780674046191 paper).



For new titles in Natural History please visit www.ucpress.edu/go/naturalhistory
Join our eNews list: www.ucpress.edu/go/subscribe



UNIVERSITY OF CALIFORNIA PRESS