BOOKS: EVOLUTIONARY BIOLOGY

# Attending Marvels

Niles Eldredge

George Gaylord Simpson (1902–1984) is remembered today as perhaps the outstanding paleontologist of the mid-20th century—the person who almost single-handedly brought the discipline into the fold of the "modern synthesis" of evolutionary theory that began to take shape in the 1930s. Yet how he accomplished that task, what he actually said and did, is not as clearly recorded in the minds of contemporary biologists as, for example, the contributions of Simpson's colleagues Theodosius Dobzhansky and Ernst Mayr to speciation theory. Still less is known about the persona of the shy-yet-sometimes-arrogant individual that Simpson seems to have been. Léo Laporte's prime goal in his new book is to explicate Simpson's scientific achievements. Although Laporte announces at the outset that the work is not a biography, the book also illuminates some fascinating details of Simpson's life.

**George Gaylord Simpson**
Paleontologist and Evolutionist
*by Léo F. Laporte*

Columbia University Press, New York, 2000. 350 pp. $50, £32. ISBN 0-231-12064-8. Paper, $16, £10.50. ISBN 0-231-12065-6.

All twelve chapters have been published previously as separate articles, but Laporte has succeeded in weaving them into a coherent linear narrative. He begins by providing essential biographical information and discussing Simpson's early experiences as a student and fledgling professional. These accounts are followed by the meat of Laporte's analysis: chapters on Simpson's views on the nature and evolution of species, and, most critically, Simpson's tour de force, *Tempo and Mode in Evolution* (1944)—the work that established paleontology as a serious component of the multidisciplinary evolutionary synthesis.

What did Simpson actually accomplish with *Tempo and Mode*? How, in other words, did he demonstrate the relevance of stratigraphic sequences of long-dead animals to understanding the dynamic processes of evolution? Simpson's signal success (as judged, among other things, by the generally favorable reviews from his nonpaleontological peers, reviews which are ably summarized by Laporte) clearly derived from his underlying, though largely unspoken, premise that repeated patterns in the history of life are simultaneously the source of evolutionary insights and hypotheses and the potential test of all evolutionary ideas. In short, he taught us that evolutionary theory must be held accountable not just to the short-term patterns revealed in experiments on fruit fly genetics but also to the larger-scale patterns of the fossil record.

The core idea of *Tempo and Mode* was Simpson's concept of "quantum evolution"—a sort of "all or nothing" process in which a small population rapidly passes through three stages. The model borrowed heavily from the work of geneticist Sewall Wright (who criticized the effort in a review of *Tempo and Mode* published in *Ecology*). First, the population loses some of its initial adaptations, perhaps through the fixation of some mutations. A second, "preadaptive" phase, facilitated by these mutational events, ensues. That is followed by an "adaptive" phase, in which natural selection assumes importance and rapidly leads to a new adaptive equilibrium far from the ancestral condition. Most populations go extinct in the valley of inadaptive death as they abandon one adaptive peak for another, but the few that survive become the founding members of new taxa of higher categorical rank. Because natural selection plays an important role only in the third phase, in his later book *The Major Features of Evolution* (1953) Simpson essentially abandoned all but the adaptive phase of his model.

Today, quantum evolution is largely forgotten. What remains, though, is the epistemology underlying its development. Simpson noted that the evolution of many taxa of relatively higher rank—for example, orders of mammals such as Chiroptera (bats) and Cetacea (whales)—typically entails relatively abrupt appearances. In addi-

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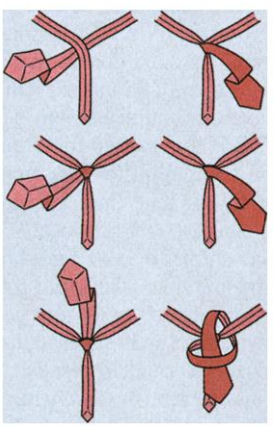
## BROWSINGS



**The 85 Ways to Tie a Tie.** The Science and Aesthetics of Tie Knots. *Thomas Fink and Yong Mao.* Fourth Estate, London, 1999. 144 pp. £10. ISBN 1-84115-249-8. Broadway Books, New York, 2000. $14.95. ISBN 0-7679-0643-8.

The authors, physicists at Cambridge University, investigated tie knots by treating them as persistent random walks on a triangular lattice. They blend topology, history (from the ancient Chinese to the present), fashion, examples from the movies, and practicality in their presentation of knots requiring three to nine moves. Of the 13 knots that survive their aesthetic constraints on symmetry and balance, they suggest the Kelvin (shown left) as the one most likely to threaten the prevalence of the four-in-hand.

**Encyclopedia of Biodiversity.** *Simon A. Levin, Ed.* Academic Press, San Diego, CA, 2000. 5 vols., 4899 pp. $1295, £810. ISBN 0-12-226865-2.

An international team of more than 425 authors provides a comprehensive survey of biological diversity across taxonomic groups and ecological regions, the services that humans derive from natural systems, and the measures that will be required to protect biodiversity. The 313 original articles are presented alphabetically but organized in 20 subject areas that encompass core disciplines (such as evolution and species interactions) and links to other fields (including agriculture, economics, and public policy).

**Precious Heritage.** The Status of Biodiversity in the United States. *Bruce A. Stein, Lynn S. Kutner, Jonathan S. Adams, Eds.* Oxford University Press, New York, 2000. 425 pp. $45, £32.95. ISBN 0-19-512519-3. A joint project of the Nature Conservancy and the Association for Biodiversity Information.

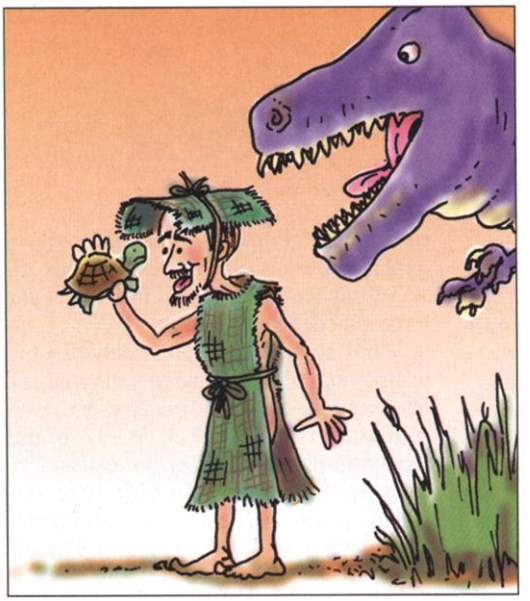
The authors, writing for professionals and the interested public, summarize and analyze patterns of species diversity in the United States. They identify several biological hot spots (from Hawaii to the Southern Appalachians) that present critical opportunities for preserving threatened fauna and flora. The volume also considers the scale of habitat conservation that will be required to protect not only individual taxa but entire ecological systems.

CREDIT: FROM *THE 85 WAYS TO TIE A TIE*

tion, many of the intricate adaptations (evolutionary novelties) that mark the new group (the echolocating ear mechanisms of bats, for example) are already in place at its first appearance. Simpson saw this repeated pattern as "real," that is, as a reflection of unusually high rates of evolution (through his quantum evolution) rather than as an artifact caused by gaps in the paleontological record.

Simpson's methodology has been expanded to embrace all manner of repeated patterns in the history of life. His approach now permeates all of paleontology and its allied disciplines. Only fringe groups like the ironically named "pattern cladists" still explicitly deny the feasibility of testing process hypotheses with repeated patterns in the data of paleontology and systematics (and they occupy perhaps the only corner of "science" to eschew causality in its work). Everyone else has managed to follow Simpson's lead, as the entire field of modern paleobiology attests. This is Simpson's living legacy.

Laporte's text brings these points out, though perhaps not always with the ringing clarity they deserve. The author also explores other facets of his subject's scientific life, such as the reasons underlying Simpson's preference for stable continents until after most of his paleontological brethren had accepted plate tectonics. In one particularly arresting chapter, "The Awkward Embrace," Laporte traces the often thorny relations Simpson had with both colleagues and administrators at the American Museum of Natural History, where he was employed for the vast preponderance of his remarkably creative and productive career. New to me was the story of Simpson's response to the intention of the then-newly appointed director Albert Parr to downplay evolution as a theme at the museum. Coming as that did in 1942, just when Simpson was about to publish his epochal *Tempo and Mode*, one can only imagine how Simpson felt. Though he was not to leave the American Museum until later disagreements with Parr over purely administrative matters, the earlier run-in probably set the stage. I can only be grateful that Simpson managed to stay there as long as he did.



**Time traveler.** The title character in the posthumously published science fiction novella *The Dechronization of Sam Magruder* (1996) appears to reflect Simpson's views of the purpose and meaning of life and of the importance of historical contingency.

Simpson the man will always remain something of an enigma. How, after all, could the author of *Attending Marvels* (1934), a travel journal of his first expedition to Patagonia that opens so colorfully with a burst of gunfire in the main square of Buenos Aires, barely acknowledge in the same pages the passing of his most important mentor, W. D. Matthew (news of whose death reached Simpson in the field)? But Simpson the scientist is another matter; his position in intellectual history is secure and is made the more so by the welcome publication of Laporte's book.

TELEVISION: ENVIRONMENT

## Fade to Black?

For three decades, David Attenborough and the British Broadcasting Corporation have awed television audiences with breathtaking images of the natural world, presented in series underpinned with solid ecological science. Through works like *Life on Earth* and *The Living Planet*, the silverback of the natural history documentary has invited us to share his vision of a planet bursting with living splendor and endless wonder, the usually unsullied products of millions of years of evolution. In *State of the Planet*, Attenborough sets out instead to portray the threats to all this.

Despite his undoubted conservationist passion, Attenborough's approach has sometimes been criticized for its lack of attention to the perils faced by many of his subjects. If this series is the director's response to such critics, it is a fine attempt. Condensing his customary grand, multipart sweep into just three 50-minute programs, he conveys a world launched on the sixth great mass extinction of Earth's history. His account is interspersed with clips from ecologists Jared Diamond, John Lawton, Tom Lovejoy, Robert May, and Edward O. Wilson. Attenborough first details the nature of the current biodiversity crisis. He then identifies five major causes of damage to the environment: habitat destruction, habitat fragmentation (here called "islandisation"), overharvesting, pollution, and invasions by alien species. In the final program, he points to some of the actions and conservation programs that might mitigate the disaster.

Attenborough builds his thesis in characteristic peripatetic fashion, dashing from continent to continent, tropical forest to British backyard, desert to coral reef. As ever, the imagery is splendid, and the scientific argument sound. But will the series hit the mark? *State of the Planet* is already finding its most avid viewers amongst those who already care and worry about the future of the planet, who think biodiversity is valuable in itself, and who are amenable to scientific argument. Attenborough's technique relies on a receptiveness in its audience: show me a beautiful image of any natural scene and I will say "conserve it." But for those whose priorities and sentiments lie elsewhere, an altogether more shocking approach might be required. (And in the United Kingdom last month, the first episode fell victim to ratings wars, billed as it was against independent television's showing of the death of *Inspector Morse*.)

**State of the Planet**
*David Attenborough*
*Director*

BBC1, November, 2000.
See: www.bbc.co.uk/nature/earth/state_planet/

The examples of hope for the future that Attenborough chooses—such as community seahorse farming projects in the Philippines, or butterfly farming projects in New Guinea—are indeed encouraging signs of the potential for sustainable development and an economic premium for conservation. But we also need more examples of such commitments from the developed countries. In the first of these programs, May invites the audience to consider whether it wants to live in the techno-world of the cult movie *Blade Runner*. By the end, and in the wake of the failure of last month's climate conference in the Hague, one wonders whether there'll be any option. Up to 50% of living species are now staring down the barrel of a gun and expected to go extinct in the coming 100 years. Why should the process stop there?

—ANDREW SUGDEN

CREDIT: JOE SUTLIFF