

CONVERGENT EVOLUTION ON EARTH: LESSONS FOR THE SEARCH FOR EXTRATERRESTRIAL LIFE. *Vienna Series in Theoretical Biology.*

By George R. McGhee, Jr. Cambridge (Massachusetts): MIT Press. \$45.00. xiv + 317 p.; ill.; index of common names, index of species, and index of topics. ISBN: 9780262042734. 2019.

This book offers an ambitious catalog and exploration of hundreds of known convergences on Earth, both extinct and extant. The first line of the preface, “Why does a sea lily look like a palm tree?” (p. xiii) introduces one overarching theme: the fascinating convergence of terrestrial plant and animal lineages with much older marine invertebrate forms. The volume is organized into chapters focusing on particular types of convergences, ranging from convergent forms in the sea and the land to feeding forms, sessile forms, mobile forms, defense forms, and organ systems of the seas. Chapter 1 also includes some conceptual discussion of different types and causes of evolutionary convergence. Along the way, McGhee draws helpfully on the resources of functional morphology to analyze cases of convergence, such as the independent evolution of coiled shell forms in different ammonoid lineages. The concluding chapter explores what convergence on Earth might mean for the quest for extraterrestrial life.

The author highlights convergences one may never have considered and suggests they are much more common than we might think. For example, his catalog of photoautotrophic symbiotic relationships displays that this is a much more common relationship in the ocean than one might have suspected, and perhaps even more astounding is that approximately one-half of these symbioses are now extinct. Examples range from green mint-sauce worms to smooth cauliflower corals to extinct giant alatoconchid bivalves. The “go-to” examples of evolutionary convergence in so many popular discussions involve terrestrial vertebrates, such as powered flight in birds, pterosaurs, and bats. McGhee’s book highlights the lesser-known organisms of the ocean, such as the sea cucumber, sea grape, and sea hare, animals he notes were named after land organisms but were inhabiting the oceans long before a cucumber, grape, or hare ever existed.

The final chapter argues that a better understanding of evolutionary convergence on Earth might help us to predict the occurrence of other forms of life on distant planets with similar conditions. The volume’s subtitle, *Lessons for the Search for Extraterrestrial Life*, suggests that the main argument of the book will concern astrobiology. However, the search for extraterrestrial life receives little attention in the first 236 pages. This is primarily a volume about convergence, with a chapter appended at the end that draws some lessons for astrobiology.

As the discussion in the concluding chapter turns toward Life and Convergence as We Do Not Know It, it becomes a little less clear how thinking about convergent evolution on Earth might facilitate predictions about the shape of extraterrestrial life. Life out there on other planets—say, somewhere like Saturn’s moon Titan, with seas of methane and ethane—could be really strange. The specter of historical contingency also haunts the discussion in the last chapter. Variations in initial conditions on different planets—How strong is the magnetic field? Do the seas contain water or methane? How much iron is in the planet’s crust?—could make for significant differences downstream in the forms that life takes in different places.

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GENETICS

SHE HAS HER MOTHER’S LAUGH: THE POWERS, PERVERSIONS, AND POTENTIAL OF HEREDITY.

By Carl Zimmer. New York: Dutton (Penguin Random House). \$20.00 (paper). xiv + 656 p.; index. ISBN: 9781101984611 (pb); 9781101984604 (eb). 2018.

Carl Zimmer is a noted science journalist who has written many books on evolution and biology. He also teaches a science journalism course at Yale University. I much enjoyed reading *She Has Her Mother’s Laugh*. It is a hefty volume of 656 pages and well worth reading. Unlike the traditional science writing that uses a combination of review articles and scholarly writing, the author’s approach is that of the investigative reporter. He used a Guggenheim Fellowship and other opportunities to interview participants in current genetic studies and delved into biographies to gain insights into the personalities of the people and the work he describes. He also has a style of writing that is easy to read and sometimes poetic in expression. What impressed me was the depth of his scholarship and his capacity to take each case or novelty or discovery and rotate it through history, philosophy, and culture. He does not isolate science. He connects science to literature, pop culture, politics, social trends, and idiosyncratic personalities. He is not superficial in his treatment. I felt enlightened in reading his view of heredity. If I were not an emeritus professor, I would readily use at least a half dozen of his selections for lectures in my own genetics or biology classes.