

## EVOLUTION

***Improbable Destinies: Fate, Chance, and the Future of Evolution.*** By Jonathan B. Losos. 2017. Riverhead Books. (ISBN 0399184929). 384 pages. \$28.00.

Early in *Improbable Destinies*, Jonathan Losos introduces himself as a teenage reptile nerd, presenting a goofy photograph of his 13-year-old self. His author's photograph on the cover end flap portrays the continuity he feels with that teenager, as he smiles broadly while a bright green lizard crawls over his face. His *Anolis* studies, which he continues as a Harvard professor, began with an eighth grade science project.

Losos conveys excitement about the questions posed by living things, the way those questions are pursued by scientists, and the sheer joy of coming to a deeper understanding of the natural world. In the first three chapters, he poses the puzzle of convergent evolution, which the anoles exhibit spectacularly on islands throughout the Bahamas. Then Losos reminds us of the "opposite" of convergence with examples of idiosyncratic species. What's driving these very different results of evolution by natural selection?

The remainder of the book is divided into two sections, the first covering research in the wild, the second in the laboratory. Darwin and many others feared evolution research was all but impossible because of their assumption that the pace of change would be too slow, made of almost imperceptible steps. But field results began

to show that change could be rapid, measurable within a scientist's working lifetime.

With just enough detail, and in an easygoing conversational style, Losos introduces studies of the peppered moth, Galapagos finches, Trinidadian guppies, the anoles of the Bahamas, the amazing plants of the Rothamsted Experimental Station in England, sticklebacks in British Columbia, mice in the Nebraska Sand Hills. For each he tells the story of a scientist or team of scientists, emphasizing how they solved the puzzle of how to investigate a particular facet of convergent evolution.

The next three chapters take us into the long-running study of *E. coli* by Richard Lenski at Michigan State, Michael Travisano's study of yeast, and Fred Cohan's of *Drosophila*. It's a strength of the book that Losos has visited most of the sites of these research programs, both field and lab, and has had extensive discussions with most of the researchers.

Natural selection, as it turns out, leads to both unique adaptations and parallel adaptations.

If populations start exactly the same and experience the same environments, they usually evolve in more or less the same way. There is randomness in which mutations occur, and that randomness will cause populations to diverge, occasionally a lot, but usually just a little, as long as they remain in the environment to which they've been adapting. By contrast, if they start differently or experience different events through time, populations are more likely to diverge. (p. 282)

The advent of genomic science has permitted a deeper look into the mechanisms underlying these varying evolutionary outcomes, with intriguing results.

Even when populations evolve in parallel, the hidden differences that are accruing may steer them in different directions should they be exposed to novel conditions. (p. 281)

... once the first mutation changes the folding pattern [of a protein], the second mutation would cause disruptive changes in the new configuration, and thus the mutations, although individually favorable, cannot occur in combination. It's like origami: once you start down the path to making an elephant, you can't

change mid-course and make a goldfish. (p. 302)

... it is so hard to make a priori predictions of evolution at the genetic level. The genome is just too big and complicated ... (p. 303)

The book concludes with two chapters that build on the earlier themes. The first looks at implications of these understandings of evolution for our approach to infectious disease and to competition for resources in agriculture. The second speculates on the question of convergent forms of intelligent life in the universe. Detailed notes with references are presented in an engaging way, tied to the page of the relevant text, with useful comments about resources both primary and popular.

As a striking final image, Losos holds up *Ornithorhynchus* for our admiration. The duckbill platypus is clearly a one-of-a-kind species, yet each of its famous features, on deeper analysis, results from an episode of convergent evolution with a different group. *Improbable Destinies* advances our understanding of the mechanisms at the root of both these trends in evolving species. Losos has written tales of scientists at work, strategizing ways to extract secrets out of recalcitrant animals and plants, that will entertain and inform a wide audience for years to come.

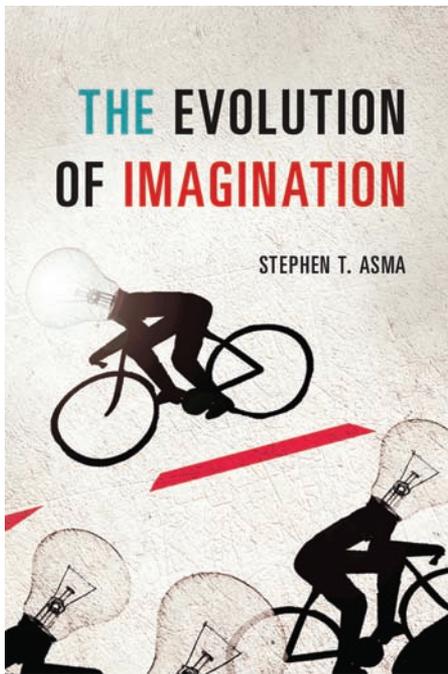


Mark Terry  
Northwest School  
Seattle WA 98122  
epatas@comcast.net

## THE HUMAN MIND

***The Evolution of Imagination.*** By Stephen T. Asma. 2017. The University of Chicago Press. (ISBN 9780226225166). 271 pages. Hardback. \$30.00.

This book explores a unique feature of humans: our ability to imagine, to improvise, and to create the unexpected. Using examples from music, comedy, philosophy, religion, as well as exploring concepts from evolutionary biology, animal behavior, and neuroscience, Stephen Asma attempts to explain this exceptional human quality. In addition to being a philosopher, Asma is also a jazz musician, and most sections begin by describing some part of the process of creating music, which was both understandable, as improvisation is a cornerstone of jazz music and creating music for pure enjoyment is a rare trait to find in the animal world, but also slightly grating as it felt like an overused device. However, as I progressed through the book, I found myself looking



forward to the jazz descriptions, as they tended to be more relatable than several of the other “in-jokes” that permeated the tale. He explores early human and proto-human behavior and compares us to near and distant relatives. The presented information is guided by a diverse variety of disciplines, and makes for a tale that was different than what I had expected.

I was excited to read this book, as I have a PhD in evolutionary biology and have always been fascinated with “detours” that move us away from common topics, like how tool use evolved, and into the more esoteric realm, a realm dominated, if you will, by imagination. However, I struggled to remain engaged, primarily due to the author’s tone. The goal of this book did not seem to be to educate the masses, but instead to draw new connections in knowledge that already exists. This led me to feel as though I had been thrust into a cocktail party where everyone already knew each other, so there was no need to explain the jokes. In retrospect, the disconnect could be a result of my own expectations and perspectives, as I am used to reading about evolution from a more scientific perspective, and while this book was certainly guided by science, it did not follow the conventions that are typical of science writing. The ultimate joke may be on me, as Asma takes great pains to define and illustrate the concept of the “self,” which must be defined at least partly by our own experiences. Perhaps my own imaginative mind could not connect with the product of his imaginative mind due to the presence of the self.

Despite this, I finally found myself engaged in the fourth chapter, which was about the evolution

of language and storytelling. “When language emerged, imagination took off in a powerful way” (p. 147). I enjoyed learning about the dual functions of imaginative communication—social bonding and information transmission—and I was riveted by the idea of gossip, or social grooming, as a substitute for physical grooming. Asma presents the idea that gossip, as well as other forms of social communication, evolved as sort of “remote grooming” where people can share important information and develop bonds (in-groups and out-groups) at the same time. Then, in chapter five, I remained riveted as Asma described a theory of brain size evolution that may be related to prehistoric climate change, which would necessitate rapid adaptability. I found my own imagination devising various storylines for the future of humankind as we grapple with current climate-related pressures.

I would recommend this book to those interested in how creativity developed in humans, but I do not see this as a general use book. I teach AP Biology and weave evolution throughout the entire course, but aside from the occasional comment as I link seemingly unrelated topics together, I do not predict this book adding anything to my curriculum.



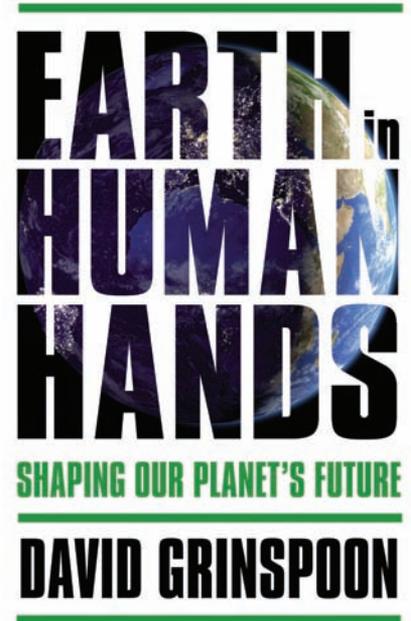
Sara Fox  
Science Teacher

The Academy of Science and Technology  
3701 College Park Dr.  
The Woodlands, TX 77384  
sfox@conroeisd.net

### THE HUMAN IMPACT

*Earth in Human Hands: Shaping Our Planet’s Future.* By David Grinspoon. 2016. Grand Central Publishing. (ISBN 9781455589128). 522 pages. Hardcover. \$28.00.

Dr. Grinspoon’s massive review of Earth’s past, present, and future begins with a nod to the *Anthropocene* and the idea that humans, with regard to the state of the planet, are “at the controls, but we’re not in control” (p. ix). Influenced by a host of planetary scientists like his “uncle” Carl Sagan, the author approaches the state of the earth in a truly evolutionary way. Grinspoon provides the reader with a detailed review of the natural history of our planet and other similar planets. He emphasizes that our understanding of how our planet has been shaped will give us the knowledge needed to better control the planet that humanity has impacted so significantly. His Darwinian approach to planetary change, coupled with his excellent writing style, make this massive text an enjoyable read.



With eight chapters, this book begins with a look at the origins of our solar system and the amazing circumstances that lead to Earth being a habitable planet. The book continues to expand upon the varied fields of planetary science, such as planetary geology, and reviews the natural cycles of planetary life. The book ends with a discussion of human impact on the Earth’s natural systems, the potential for life in the universe, and how humans could take a direct role in actually engineering Earth’s future.

Every chapter of the book contains a who’s who of some form of planetary science. Grinspoon does a wonderful job of not only discussing the contributions of scientists like Gerard Kuiper, Walter Alvarez, Lynn Margulis, and Charles David Keeling, to name a few, but he also humanizes these historic scientists by providing personal stories about his encounters with them or their students. It is the work of these scientists that the author uses to lay the groundwork for the final chapter of the book. He emphasizes that “the Anthropocene transformation of Earth marks us as distinct from other animals in being able to induce, for better or worse, this particular kind of change to our planet” (p. 415). Thus, a “global we” who were able to alter the Earth do possess the ability to create change in a positive way, albeit easier said than done.

*Earth in Human Hands: Shaping our Planet’s Future* is a must read for anyone who has a love for planetary science, geology, biology, the space program, science history, or environmental science. This book would be a wonderful addition to an undergraduate Earth Science or Environmental Science course. High school life science,