

## EVOLUTION

***The Genial Gene: Deconstructing Darwinian Selfishness.*** By Joan Roughgarden. 2009. University of California Press, Berkeley. (ISBN 978-0520258266). 272 pages. Hardcover. \$24.95.

Sexual selection is the accepted scientific explanation for the origin of sexual reproduction and for the evolution of social behavior. However, rather than selfishness and individuality, is it possible that kindness and cooperation are the basis for biological interactions? Does our current evolutionary perspective misrepresent the true reality of life? Joan Roughgarden, a professor of biology at Stanford University, posits this alternative view, utilizing the mathematics of cooperative game theory.

In *The Genial Gene*, Roughgarden demonstrates, through a very convincing and scientifically rigorous argument, that identifying Darwinism with selfishness inaccurately describes the facts as we know them, especially in light of molecular and developmental genetics. She asks her readers to question the status quo and consider an alternative theory of social behavior that emphasizes cooperation. She challenges the “scientific validity of a world view that naturalizes selfishness and sexual conflict” and suggests one that is predicated on teamwork and collaboration.

This book takes the reader on a journey, starting with the underpinnings of sexual selection:

Male/female social dynamics... revolve around females as a “limiting resource” for males. Hence, males must compete with each other for access to mating opportunities with females, or for control of the females themselves, and females choose males to maximize the genetic quality of their offspring.

The narrative rapidly changes course to drive home the failings of this ideology by pointing out that the existence of female choice is not being questioned, but instead “Darwin’s view

of what females are choosing for.” The author believes that Darwin’s error was focusing on “quantity of mating” rather than “quantity of offspring successfully reared, which is the bottom line for evolutionary success.” The reader is then led down the alternative fork in the road: social selection.

This other path depicts reproductive social behavior as constituting an “offspring-producing system,” such that differences in offspring-producing success leads to evolutionary change. Interactions between males and females are “understood by how they contribute to building, maintaining, and/or controlling the social infrastructure from which offspring are produced.” The end result is “maximizing the quantity of offspring placed into the next generation.” The author goes on to explain how “evolutionary systems of sex, gender, and sexuality” can be addressed in the context of this social selection framework. What ensues is a stimulating ride for the reader when these two contrasting social systems are compared.

One section of the book is entitled “The Genetic System for Sex” and is divided into three topics: the gene, the cell, and the body. It concentrates on issues such as why sex has evolved, why there are two gamete sizes, and why some individuals are both male and female. With this foundation in place, Roughgarden proceeds to describe how the behavior that occurs during sexual reproduction (of vertebrates in particular), such as monogamy, extrapair copulation, and parental care, can be explained by social selection.

I am trained as a geneticist and cell biologist, and I have been teaching evolution at the undergraduate level for the past 13 years. I am by no means an expert in the field, but I have read extensively about Darwin’s contributions and must admit that I am very much in awe of the man’s intellect and ability to see the whole picture. But this book, and the argument that unfolds through Roughgarden’s pen, has me scratching my head and wondering if Darwin may have been a little off track about sexual selection.

As a scientist, I appreciate the author’s plea to develop ideas that explain the data and not vice versa. In the author’s own words, this “is

not a book of fact, but a book of theories, a book of ideas.” She implores you to test her ideas and to evaluate the “panoply of facts” about animal life unveiled in the recent past. I, for one, am glad I read this book and look forward to an ongoing discussion on the merit of its ideas. I plan to introduce social selection theory into my evolution class to drive home the point that although we accept that evolution has occurred, we must remain open to different and controversial ideas about its mechanisms and processes.



Amelia J. Ahern-Rindell  
Associate Professor  
Biology Department  
University of Portland  
Portland, OR 97203  
ahernrin@up.edu

***Darwin’s Lost World: The Hidden History of Animal Life.*** By Martin Brasier. 2009. Oxford University Press, New York. (ISBN 978-0-19954897-2). 260 pages. Hardcover. \$34.95.

Here are “just the facts,” to paraphrase Jack Webb in *Dragnet*. The book contains 22 figures (some drawn by the author), 16 color plates, 210 endnotes, and 9 pages of references to scholarly works. There are 260 pages describing the travels and field work of Martin Brasier, an Oxford professor of paleobiology, in many exotic and off-the-beaten-path locations. The text examines “Darwin’s dilemma,” the lost history of the origin of animal life in the Precambrian time.

To go beyond the facts: this is a highly specialized book that may not appeal to many high school and general biology instructors at the two- or even the four-year college level, because its utility in their classrooms is questionable. The author recognizes this, perhaps unintentionally, when he writes on page 165 (referring to paleontologists who dare to enter Darwin’s “lost world”): “Most of them suffered too, to be swallowed up by ridicule or, even worse, by obscurity.” The book’s readability suffers from frequent name-dropping. For example, in one 20-page stretch, Brasier mentions 25 names of

scientists, former students, and others, some of significant reputation that would be recognized, but most not. I found this distracting.

Also distracting was the constant use of hundreds of unpronounceable scientific names (e.g., *Chancelloria*, *Okulithcyanthus*, and *Kotuycanthus*). Page 134 has seven such references. Trite and forced metaphors and similes abound. One metaphor takes up the equivalent of a full page. Another reads, "Sponges consist of colonies of cells that are strangely casual in their connectedness and they appear largely disinterested in body symmetry." Did you detect the anthropomorphism? Or a section in chapter three, headed "Worms in Drag," where he also describes a fossil as looking like "a novelty condom." Another section is called "The Circus of Performing Worms."

The last few chapters finally get to the discovery of microfossils in the phosphate-laden beds of the northwestern Highlands of Scotland. Plates 14 and 15 show what appear to be intact preserved cellular material of Precambrian origin. Brasier acknowledges that these fossils may or may not be what they appear to be. He describes a trap that he calls "Mofaotyof," which means: my oldest fossils are older than your oldest fossils.

These plates (14 and 15) do capture the imagination when envisioning what the origin of animal life in Precambrian time may have looked like. It must be pointed out that Brasier's explanation for why there are so few Precambrian fossils that might fill in the gaps of the fossil record is both compelling and well explained.

I am neither a paleobiologist nor an Oxford professor, and this review may be too harsh. But enter *Darwin's Lost World* at your own risk.



Mike Battaglia  
Assistant Professor  
Greenville Technical College – Greer Campus  
Greenville, SC 29606  
michael.battaglia@gvltec.edu

***The Tangled Bank: An Introduction to Evolution.*** By Carl Zimmer. 2010. Roberts and Company, Greenwood Village, Colorado. (ISBN

978-0981519470). 385 pages. Hardback. \$59.95.

*The Tangled Bank* is a detailed, thorough look at the theory of evolution, from pre-Darwinian contributors to recent (2009) discoveries. It is written in layman's terms and flows well, yet the content is not oversimplified for scientists. It is a pleasant read, with many sidebars, diagrams, sketches, cladograms, graphs, and other visual aids on most pages and in full color. Interesting facts are scattered throughout the book, such as how scientists determine the diets of fossilized organisms, how the molecular clock of neutral mutations can determine the time elapsed since a split from common ancestors, the evolution of complex adaptations (venom before fangs, and probably before snakes), the development of feathers from genes that originally produced scales, and the evolution of the complex eye, to name a few examples. This text gives answers to the questions students ask – either out of curiosity or because they are trying to debunk evolutionary theory. For those students who don't appreciate the in-our-lifetime evolution of bacterial traits, a vertebrate example (the lizards of Pod Mrčaru in the Adriatic Sea) demonstrates natural selection on an uninhabited island over just 33 years!

There are a few minor details that could have clarified certain ideas for laymen, such as a traditional Punnett square to help illustrate crosses more clearly, simplified definitions (a phenotype is defined here as "a manifestation of a genotype," which isn't a very clear definition for the layman), and a better explanation of dominance/recessiveness, for example. But these are minor shortcomings, and only a problem for those unacquainted with basic biology. The majority of the text constitutes an interesting addendum to basic evolutionary theory in easy-to-follow descriptions. For example:

The difference between a smooth pea and a wrinkled pea is determined by a single gene that encodes a protein to help break down sugar...without [this gene], a pea can't break down sugar

effectively, and so sugar levels go up. A sugary seed absorbs extra water as it develops...when the pea begins to dry out, it shrinks...forming wrinkles.

There is a whole chapter on sexual selection, which most high school texts mention briefly, if at all. Evolutionary medicine and the evolution of behavior get their own chapters as well. In addition to the glossary and index, there are 14 pages of referenced works – a valuable resource in itself.

This book is a great reference text for instructors, both high school and university; it uses everyday concepts such as bowling, bowls of jelly beans, and investment funds to explain more complex evolutionary processes. These explanations, along with literally hundreds of examples illustrating evolution, as well as sidebars on why creationism/"intelligent design" is not supported by science, what a theory is in science, and many other topics, should give instructors a great tool for presenting the facts of evolution in a very interesting, thorough, and nonconfrontational way. For students of evolution or scholars who want to know the specifics about particular evolutionary processes, this is an excellent read. The fact that it is understandable to beginners and fascinating to scientists makes this book truly unique and valuable.



Shelley Mitchell  
NBCT/Biology and Extension Associate  
Oklahoma State University  
Stillwater, OK 74078  
shelley.mitchell@okstate.edu

ELIZABETH COWLES teaches freshman biology, biochemistry, and entomology at Eastern Connecticut State University. She has taught at the undergraduate and graduate college levels for over 20 years. Her interests include insect toxicology, protein characterization, and astrobiology. Cowles holds degrees in biology and biochemistry from Cornell University and Michigan State University. Her address is Department of Biology, ECSU, 83 Windham St., Willimantic, CT 06226; e-mail: cowlese@easternct.edu.