

# Human Ethology Bulletin

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## A Textbook about Evolution, for the General Reader?

### Book Review

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*The Tangled Bank: An Introduction to Evolution*, by Carl Zimmer, Roberts and Company Publishers, 2010, 394 pp. ISBN 978-0981519470 (Hardback)

The title of Carl Zimmer's *The Tangled Bank* is a reference to the final paragraph of Charles Darwin's (1859) *On the Origin of Species*. In that paragraph, Darwin muses about an entangled bank, one covered in different forms of life, each one of which must have evolved. Zimmer's book presents the rich and varied field of evolutionary science and introduces the unifying theory of biology. According to the [publisher's website](#), *The Tangled Bank* is a textbook about evolution that is intended for the general reader. In this review, we discuss whether and how *The Tangled Bank* accomplishes this goal and then focus on the final chapter because of its relevance to human psychology.

*The Tangled Bank* is a well-written book that deals with a number of popular topics in evolutionary science. These topics include the evidence for evolution and how the understanding of evolution has led to new advances in the fields of medicine, sexuality, and social interactions. Every chapter includes many research examples from the life sciences, from bacteria and viruses to whales and dinosaurs. For example, in chapter 4 ("The Tree of Life"), Zimmer discusses the evolution of modern appendages (hands and feet) from fins (pp. 64-68). Using evolutionary trees, Zimmer explains with concise and clear language the

establishment of these trees using the rich fossil record to fill in the gaps where modern species do not provide a clear picture of how hands and feet arose from fins. Accompanying this explanation is a colorful and useful illustration of the respective evolutionary tree (p. 67). One of the strengths of *The Tangled Bank* is the use of illustrations that give the pages a bright quality and provide extra information and clarity.

Zimmer devotes the final chapter to the mind (chapter 14, "Minds and Microbes"). Although discussing a number of interesting studies, Zimmer does not mention—much less discuss—the rich field of evolutionary psychology. This omission is unfortunate, given the remarkable empirical and theoretical contributions made by evolutionary psychologists over the past several decades toward understanding the mind (see, e.g., Buss, 2011). Another shortcoming of this chapter (and others) is the terse description of adaptation, especially given that adaptation is a key focus of evolutionary scientists. Zimmer mentions gene dispersal, the size of different anatomical features of the brain, and neuropeptides as key factors for understanding differences in intelligence between species. Although these and other factors help us understand how intelligent behavior occurs, the ultimate explanation for behavior is to be found in the

selection pressures of ancestral environments (Tooby & Cosmides, 1992). A more adaptation-focused approach allows for a richer understanding of how behaviors are produced from an evolved psychology. For example, in the final section of the last chapter of the book, “Uniquely Human (or, at Least, Uniquely Hominid)” (pp. 346-352), Zimmer discusses language as a distinguishing feature of *Homo sapiens*. Zimmer mentions that genes such as FOXP2 appear to facilitate language. He discusses Broca’s area, an anatomical feature of the human brain that functions to distinguish language. In chimpanzees, Broca’s area appears to function to distinguish between different calls made by other chimpanzees. In humans, Broca’s area facilitates understanding complex language. Although each of these factors is important for a comprehensive understanding of how language works, we would have appreciated more attention to psychological adaptations that facilitate language (see, for example, Pinker, 2007).

In Chapter 8 (“Adaptations From Genes to Traits”), Zimmer briefly mentions adaptations such as snake venom, beak size, and eyes. These examples are good, but they are used to showcase population genetics processes (changes in gene frequencies over time) rather than the features of adaptations, how they are built, or how to identify their design elements. For example, Zimmer discusses the evolution of the eye by comparing species with different types of eyes (p. 172) What Zimmer compares is the presence of opsin proteins. He notes that c-opsin is the primary protein found in all vertebrate retinas and which facilitates vision. Other bilaterians like insects, octopuses, and scallops have another form of opsin called r-opsin that does a job similar to c-opsin. When scientists traced the shared genes that produce r-opsins and c-opsins, they found several interesting results. Although it was once believed that c-opsin and r-opsin evolved after the two bilaterian branches split, recent evidence indicates that r-opsins are present in human eyes and c-opsins are present in ragworm eyes. This suggests that both proteins

evolved before the two lineages branched. In fact, there is now evidence that the opsin gene sequence is in use in species that do not have eyes. This further development suggests that the opsin genome sequences are very old. Zimmer also discusses crystallins at some length—which species have them, which species have evolved their own crystallins, and the implications for understanding how crystallins evolved. In contrast, in *Climbing Mount Improbable*, Dawkins (1996) explains the evolution of the human eye by discussing how the eye arose first as a patch of light-sensitive cells, became a depression that allowed for more detailed representation of the light patterns on the tissue, became a hollowed out cavity, and later evolved a lens that allowed for even more complex visual representation in the brain. Crucially, Dawkins’ discussion of evolution by natural selection focuses on adaptation. The way that Zimmer explains evolution is appropriate for understanding how traits propagate throughout a species, but gives less insight on how adaptations arise in the first place and their significance as a key product of evolution by natural selection.

Comparing *The Tangled Bank* to books by Dawkins is relevant because another issue is whether *The Tangled Bank* is a book that can be recommended to the general reader. In our opinion, *The Tangled Bank* is not preferable to several books by Dawkins (including *The Greatest Show on Earth*, *The Blind Watchmaker*, or *The Selfish Gene*) or to Jerry Coyne’s *Why Evolution is True*. Zimmer’s book is a well-written book that presents concise examples, includes wonderful illustrations, and covers many of the staple topics in evolution. However, *The Tangled Bank* does not provide a notably better introduction to evolution than others just mentioned. Neither is *The Tangled Bank* a good book for the “general reader.” Although broad in scope, the knowledge of biology required may be more than the general reader possesses.

*The Tangled Bank* excels in the sheer number of research studies presented and discussed. Zimmer accurately portrays evolution as such a

well-established scientific theory that it is appropriate for us to consider it a fact. He elaborates on how *not* to study evolution, as well. In chapter 8, he presents a section that discredits creationist arguments against evolution (pp.174-175). In this section, Zimmer presents young earth creationists as offering fundamentally flawed logic for “intelligent design,” the purportedly scientific argument that there is a designer of the universe and that the universe is no more than 6000 years old. Zimmer points out that creationists use a straw-man version of evolution that invokes randomness as the primary operator of natural selection and that claims the fossil record is so riddled with flaws as to be useless. These arguments, as Zimmer explains, are just not true. Zimmer concludes the section with a logical dismissal of creationism. He claims that creationism proposes a supernatural creator. If this is the case, then creationists cannot claim that studying the designer is scientific because science is not able to answer questions about things that are outside the realm of the natural. If the designer is claimed to be natural, then science should be able to test this claim. However, Zimmer points out that a specific tenant of creationism is that the creator is unknowable, which leaves us at a scientific dead end.

In conclusion, Carl Zimmer’s *The Tangled Bank* is a well-conceived and well-written book. The books’ downsides include the lack of a rich analysis of adaptations, the omission of evolutionary psychology in discussions of the mind, and a presumption that the “general reader” has some background in biology, particularly genetics. *The Tangled Bank* nevertheless is a book worth reading, first for the breadth and depth of research presented, and second for the clarity with which it is written.

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