The ultimate ambition or “promise” of evo-devo is to achieve full conceptual continuity between evolutionary and developmental mechanisms and explanations—that is, to generate “a conceptually continuous narrative that connects the molecular processes which create genetic variation, the developmental processes which lead to phenotypes, their function, and the population genetic processes which ultimately effect evolutionary change” (Wagner, p. 539). But close examination of the canonical examples, such as Hox genes or vertebrate limbs, reveals critical gaps. We know a lot about limb development and a lot about the pattern of the fin-limb transition, but we still do not know exactly what embryological changes were directly responsible for evolutionary changes in morphology, and we lack direct “proof of the mechanistic efficacy of the identified molecular changes” (p. 532). More fundamentally, we are not in agreement on what would count as evidence for specific developmental changes serving as direct causes of particular evolutionary variations.

Especially challenging—Wagner suggests it may even be impossible—is combining the radically different timescales and conceptions of causality from evolutionary and developmental biology. The handful of beautiful examples we now have offers some hope that this synthesis is possible, and some models of how to go about it (I’d add finch beaks [Abzhanov et al. 2006] to Wagner’s list on pp. 530–531, which includes Drosophila microevolution, quantitative trait locus analysis of stickleback skeletal evolution, and angiosperm phytochromes). But we need more, and that is going to require a combination of groundbreaking ideas and extraordinary technical expertise.

It is also going to require people who are both trained and inclined to make connections well beyond the borders of their own traditionally defined field. Griesemer suggests that the reunification of evolution and development into a coherent whole depends most critically on “instigating [a] realignment of perspectives” (p. 414). This will require both individual polymaths and interdisciplinary collaborations. Even as we struggle to assimilate an overwhelming flood of new information from an ever-broader range of fields, any or all of which might turn out to be important for the evo-devo project, we need to maintain some space for serendipity—like Wallace Arthur’s pulling the wrong volume off the shelf and getting García-Bellido and colleagues’ work (1979) instead of Kimura’s (1979) (an incident described by Wimsatt on p. 333). And having the birds put in a word or two at the ornithology conference may be another way to open up the conversation.

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doi:10.1641/B580515
Include this information when citing this material.

SIX LEGS BEST?


Ants have a long history as the foci for research in a variety of disciplines. Because of their diversity and ecological dominance in many ecosystems, they are model organisms for ecological studies, and their advanced sociality makes them ideal for studies of behavior and cooperation. There are many scientific books about ants, ranging from treatises on individual species or closely related groups to Pulitzer Prize–winning reviews of their biology. Charlotte Sleigh has taken a novel approach in Six Legs Better: A Cultural History of Myrmecology by taking a historical perspective on the study of ants. Her previous book, Ant, focused on popular culture, whereas Six Legs Better examines the history of ants as study organisms from the perspective of a scientific historian. She concentrates on a period (the late 19th century to the mid-20th century) when biology was undergoing a renaissance with the growth of evolutionary thinking, the modern synthesis, and the birth of quantitative population biology.

The book has three sections, each of which highlights a prominent scientist who used ants as model organisms: Auguste Forel (1848–1931), William Morton Wheeler (1865–1937), and Edward O. Wilson (1929– ). These researchers came to the study of myrmecology with different perspectives—Forel as a psychiatrist, Wheeler as a natural historian, and Wilson as a sociobiologist with an interest in communication. Six Legs Better explores how these scientists have looked to ant biology and communities for parallels with social behavior in human societies. These views changed over the time period covered in the book from rather utopian to anarchistic without central control to self-organized and mathematical. The differences in scientific approach and in each scientist’s perspective on social organization stemmed from both their backgrounds and the social and scientific context in which they worked.

Sleigh provides great insight into the social and cultural contexts that motivated the approaches each scientist took and the type of research questions each one asked. She does so in part through her examination of correspondences and interactions among the focal scientists and their colleagues and other scientists. This unique perspective on the mindset of each researcher is a highlight of the book, with specific attention given to how cultural and scientific attitudes have changed over time. A
recurring theme is that many interactions among these scientists and their respective colleagues were fueled by conflict rather than cooperation—surprising, perhaps, given the taxa of interest.

Although the book was rich with information about these three scientists, I did at times find Sleigh’s prose unnecessarily esoteric, and the lay reader with an interest in ants might find the book inaccessible. I also found that an appreciation of how much these pioneers loved their study organisms was lacking from the chapters. One thing that all three myrmecologists held in common was a genuine passion for ants, studying ants for ants’ sake. This is evidenced in part by the taxonomic work each did. Their scientific descriptions of species and keys are still used today.

_Six Legs Better_ serves as a novel companion to previous publications on ants by taking a look at the ant researchers themselves (much more than their study organisms) and examining the motivation for their scientific inquiry. The book’s strong point is placing each of these people in the context of the science and culture of their day. I recommend this book to anyone who is interested in the history of science or who wants to learn more about some of the founding fathers of modern myrmecology.

**NEW TITLES**


*The Bridge at the Edge of the World: Capitalism, the Environment, and Crossing from Crisis to Sustainability.* James Gustave Speth. Yale University Press, New Haven, CT, 2008. 320 pp., illus. $28.00 (ISBN 9780300136111 cloth).


