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# Darwinian Populations and Natural Selection

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for researchers, a topic given little attention in previous decades, are also discussed, both with respect to caring for captive populations as well as preserving pinned specimens. But perhaps most importantly, the authors emphasize what to think about *before* embarking on an insect conservation-related project. This insightful approach, obviously based on their wealth of personal experience, may help others to avoid potential pitfalls and accomplish the best outcome possible relative to the specific conservation goals at hand. I heartily recommend this volume.

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## EVOLUTION

### DARWINIAN POPULATIONS AND NATURAL SELECTION.

By Peter Godfrey-Smith. Oxford and New York: Oxford University Press. \$49.95. ix + 207 p.; ill.; index. ISBN: 978-0-19-955204-7. 2009.

There is a long tradition of producing abstract characterizations of natural selection. The two focal questions are (1) *what is natural selection?* and (2) *what entities does natural selection act on?* The common way to approach these questions is to answer the first question before the second. However, the author holds that the two should be answered in tandem, and proposes a “Darwinian Population” (DP) as a framework to do so. For Godfrey-Smith, a DP is a “collection of causally connected individual things in which there is variation in character, which leads to differences in reproductive output . . . and which is inherited to some extent” (p. 39). Darwinian populations are best envisioned within a multidimensional space, whose core axes are *H* (fidelity of heredity), *C* (smoothness of the fitness landscape), and *S* (dependence of reproductive differences on intrinsic character). Thus, some DPs are paradigm populations, with high reproductive fidelity, smooth fitness landscapes, and fitness highly dependent on intrinsic character, while others are marginal, with organisms tending not to resemble parents, similar individuals lacking similar fitness values, or traits not strongly linked with realized fitness. Godfrey-Smith applies this framework to a variety of biological examples and theoretical debates, including the levels of selection controversy, the nature of the distinction between natural selection and genetic drift, and the applicability of natural selection to culture.

Although we see the DP framework as an advance, we have some reservations. Mainly, is it truly novel? A DP is defined in terms of variation, fitness, and inheritance—the conditions for natural selection classically described by Lewontin (1970. *Annual Review of Ecology and Systematics* 1:1-18). As an exercise in showing the difficulty in applying these conditions to the complexities of nature, the DP framework is novel and illuminating, but as a way of answering the first question mentioned above, we have concerns. For example, it seems that the DP framework loses the valuable distinction between natural selection and the evolutionary response to selection. Some of the dimensions delimiting a DP have to do with selection (e.g., *S* and *C*), while others have to do with responses to selection (e.g., *H*). Although we applaud the author’s critiques of how genetic drift has been understood, it is not clear that he provides a satisfactory understanding of drift. He defines drift as the occupying of one region of the DP space. Although he claims to define what drift *is*, we see this as merely answering the question of when drift is powerful. He mentions in passing niche construction and epigenetics, and spends one brief chapter on cultural evolution. Topics such as these, which should be test cases for a new Darwinian framework, were treated with too little depth.

The book may have fallen short of its goals on one level, but there is much to be recommended. For a volume principally devoted to philosophical thought, there is also a refreshing amount of interesting biology. For example, Chapter 4 is an excellent compilation of the variety of mechanisms by which organisms propagate themselves and explains well the impact this variation has on the efficacy of natural selection (e.g., the distinction between ramets and seeds). The discussion of individuality also emphasizes the way in which it can be misleading to view organisms with a one-size-fits-all mentality, justifying the proposal that both philosophers and biologists should become more self-conscious when considering evolutionary processes.

The strength of *Darwinian Populations and Natural Selection* is that it rightly warns us not to take for granted basic concepts in evolutionary theory, such as *individual* and *descendant*. The Earth is full of species, from aphids to aspens, which leave us wondering how best to carve the world at its joints. Godfrey-Smith gives us a framework in which to make sense of these cases; he encourages us to keep an open mind to Darwinian processes, cajoling us to “raise our glasses to mutations in ramets.

But we should raise them higher to mutations in seeds" (p. 107). And we say, "hear, hear!"

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#### ANCIENT BODIES, MODERN LIVES: HOW EVOLUTION HAS SHAPED WOMEN'S HEALTH.

By Wenda Trevathan. Oxford and New York: Oxford University Press. \$34.95. vii + 260 p.; ill.; index. ISBN: 978-0-19-538888-6. 2010.

Recognizing the human species as a product of evolution, anthropologists have come to approach modern diseases in an area of inquiry now formally labeled "evolutionary medicine." Trevathan's perspective on women's health incorporates medical anthropology and human biology. Through eleven chapters, the author analyzes growing up and puberty, hormonal cycles and ovulation, pregnancy, birth and the neonate's first hour, breastfeeding, and menopause; the concluding chapter addresses women's health in the 21st century. Issues are analyzed at several levels from the physiological to the cultural. The strength of the book is its integration of results from many fields of research that any reader will find informative, along with an invaluable bibliography.

Mother-infant interaction receives discussion in two chapters that deal broadly with breastfeeding. The dyad of female lactation and infant suckling, which started over 100 million years ago with the origin of placental mammals, has shaped both human females and their extremely dependent infants. Breastfeeding promotes the infant's immune system, reduces infections, and lowers the risk for asthma, type 2 diabetes, and the potential for becoming overweight. For women, life-long health benefits include lower rates of breast cancer, infection, atherosclerosis, and type 2 diabetes. Postmenopausal women as "grandmothers" can continue to contribute to the younger members of society. Trevathan discusses variation in cultural practices that reflect the flexibility of the human species. The success of the species can be traced to mother-infant interactions that give offspring a good sendoff, so they may survive to maturity and have a healthy life, while at the same time contribute to the mother's well-being. The lesson is plain why all societies and cultures need to heed women's health, for it translates into long-term survival and well-being for all of its members.

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#### HOLOCENE EXTINCTIONS.

Edited by Samuel T. Turvey. Oxford and New York: Oxford University Press. \$99.00. xii + 352 p.; ill.; index. ISBN: 978-0-19-953509-5. 2009.

Although much media and scientific attention focuses on ongoing extinctions and on those of charismatic megafauna at the terminal Pleistocene, less appreciated is the scope and magnitude of extinctions during the intervening time period. The Holocene (the past 11,500 years) is an epoch characterized by widespread, ongoing, and accelerating extinctions. In just the past 400 years, at least 485 animal and 585 plant species have vanished (F. D. M. Smith et al. 1993. *Nature* 364: 494-496); a rate some argue approaches the "big five" geologic extinctions when temporal scale is considered (J. H. Lawton and R. M. May. 1995. *Extinction Rates*. Oxford (UK): Oxford University Press). Although there have been several excellent books that deal with either end of the Holocene (e.g., P. S. Martin and R. G. Klein. 1984. *Quaternary Extinctions: A Prehistoric Revolution*. Tucson (AZ): University of Arizona Press; R. D. E. MacPhee. 1999. *Extinctions in Near Time: Causes, Contexts, and Consequences*. New York: Kluwer Academic/Plenum Publishers; T. F. Flannery and P. Schouten. 2001. *A Gap in Nature: Discovering the World's Extinct Animals*. New York: Atlantic Monthly Press), *Holocene Extinctions* is the first comprehensive treatment that focuses on extinctions during this underappreciated epoch.

The volume includes theoretical and synthetic, ecosystem, and taxonomic-based approaches. It starts with an excellent overview of late Quaternary climate and environment (An Introduction to Late Glacial-Holocene Environments) by Mackay that includes a concise but good discussion of environmental proxies and methodologies. This is followed by arguably the most valuable contribution—tables compiled by Turvey and Tyrberg (Chapters 3 and 4, respectively), which provide a comprehensive global list of extinct mammal and birds with last occurrence dates. This is a first, and will be of considerable use to both paleoecologists and conservation biologists. Of course, estimating the time of extinction from last occurrence data is not trivial; along those lines I found a later chapter by Collen and Turvey (Probabilistic Methods for Determining Extinction Chronologies) to be a helpful review of the literature on Signor-Lipps effects and a pointed reminder that most taxa have too few radiometric dates to estimate their actual extinction chronology with confidence. A minor quibble: there is considerable variation in whether radiometric or calendar dates are used within a given chapter or table (sometimes which is reported is unclear). It would have been much pref-