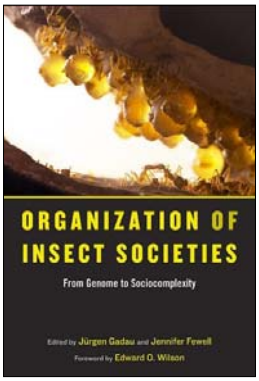
Book review

GADAU, J. & FEWELL, J. (Eds.) 2009: Organization of insect societies: from genome to sociocomplexity



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The study of social life has long had an identity problem within evolutionary biology. For some, it is a special interest topic outside of the mainstream, while for others it has been central for generating and testing key ideas on the nature of selection. A new book that underscores social insects as models in the study of adaptive complexity will go a long way towards shoring up this latter personality. *Organization of insect societies: from genome to sociocomplexity* is a substantive collection of original, peer-reviewed chapters that address recent progress and nuances in our understanding of how selection can "organize" individuals into functional societies. Moreover, the book pays due attention to how this understanding is changing as we traverse into the post-genomic era.

At one level, the volume provides a timely up-date on a range of important topics, from the phylogenetic origins of conspicuous social traits, to deciphering of sophisticated communications among nestmates, to the intense theory that surrounds the study of cooperation and competition. The book's 26 chapters thus provide a hefty and lively dispatch from the front lines of social systems research, and it often does so through new or renewed terms of engagement that reflect the field's growing integration with neighbouring fields such as molecular and developmental biology.

At another level, the editors, both from Arizona State University, do well to marshal individual topics into four themes, each prefaced by an introduction to further establish context. The first of these themes, *Transitions in social evolution*, springs from the idea that increases in adaptive complexity are often driven by shifts in the way genetic information is transmitted from one generation to the next. Social insects constitute a good test of this hypothesis because their social complexity is presumably driven by shifts in the way genes for sociality are transmitted – namely, from an ancestrally direct route (personal reproduction) to an increasingly indirect route via non-descendent kin. This section addresses some of the most intriguing transitions in social complexity: from single to multiple queen colonies in ants, from solitary to communal societies in bees, and from subsociality to eusociality in termites, among other phylogenetically flavoured curiosities.

The subsequent two sections, *Communication* and *Neurogenetic basis of social behavior*, dissect the rules of social signaling and the mechanics of social function. Chapters here are successful at meshing mechanistic with evolutionary analyses. For example, the reader can learn not just about how nestmates recognize each other but why these mechanisms function as they do, and why they vary from one context to another. This integrative approach is applied to dozens of outstanding questions from the role of chemical cues in fertility signaling, to how head-banging and other sources of vibration can promote caste differentiation (in wasps), to how trade-offs between individual food hoarding and group information flow may have shaped the supremely organized foraging behaviour of ants.

The final section, *Theoretical perspectives on social organization*, addresses the underlying theme of "complexity" head-on. Here, we learn that the seemingly guided processes governing the emergence of social complexity can be reduced through biologically realistic modeling to simple, but blind, behavioural rules and algorithms. Further insight to the emergence of complexity can be gained by recognizing functional "modules" in behaviour, and then using these modules to focus any practical attempts to uncover the molecular basis of specific "bite-sized" behavioural phenotypes. It is interesting to think that while many of us were schooled in the gene-centered theory of social evolution, and are thus aware of the potential role for genetic variation in shaping evolved aspects of behaviour, it is only now that we are beginning to put names to these genes, as well as to the regulatory networks through which they interact with each other and with the outside environment.

One minor quibble I have with the book stems from what I gather was an editorial decision to promote the resurgent superorganism concept and the importance of colony-level selection. At times, this promotion seems too enthusiastic whereby it is implied that colony-level (read *group*) selection is all-important to our understanding of social life and that gene-level (read *kin*) selection is somehow no longer regarded as important. This miscommunication is infrequent enough, however, that it does not detract from the clear thinking that otherwise pervades the book.

Organization of insect societies is aptly dedicated to a luminary figure in insect sociobiology, Bert Hölldobler, and is endorsed by another, his colleague and friend, E.O. Wilson, who writes the book's compelling forward. Hölldobler's contributions to his field are numerous, persistent and significant. He has influenced the thoughts and careers of many of us in the field, and the dedication is wholly fitting. I am sure he will delight, as we all should, in what is one of the very best and far-reaching volumes in insect sociobiology to have ever been assembled.

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