tion in domestic animals (from artificial insemination to cloning) and addressing clinical aspects in our own species (sexual dysfunction, sexually transmitted diseases, infertility, and the development of birth control methods). In these approaches, the reproductive system has been studied in isolation from the rest of the organism. *Reproduction in Context* represents a serious and most welcome attempt to consider reproduction as one aspect of whole organisms and thus as interrelated with multiple other facets and influenced by a wide range of environmental and social factors. To provide this perspective, Kim Wallen and Jill Schneider recruited authors from different backgrounds. Some are physiologists or neuroendocrinologists who incorporate evolutionary ideas into their studies; others are behavioral ecologists who integrate the techniques of neuroendocrinology and physiology into their research. The result is rather heterogeneous, but on the whole it is stimulating.

Most chapters elegantly illustrate how the incorporation of an evolutionary framework can shed light on the mechanisms that regulate reproduction. To understand which cues influence reproductive processes it is crucial to consider the types of environments that organisms inhabit. When organisms live in environments in which conditions favorable for raising young are highly predictable, cues that provide long-term predictive information (for example, day length) will usually be used to time breeding. When environmental conditions are less predictable, short-term cues (such as local temperature or food availability) will become more important. When favorable conditions are very unpredictable, gonads may remain continually developed so that no opportunities for breeding will be missed.

The social environment also affects reproductive processes and how the endocrine pathways work. For example, in species in which there is high male-male aggression and low parental care, males have high testosterone levels for long periods of time during the breeding season. And in species with low male-male aggression and high levels of parental care, testosterone levels are lower because high levels of testosterone are incompatible with male parental behavior. The historical perspectives included in some chapters clarify how our understanding has been influenced by the way in which experiments considerably altered, among other things, the social environment of the animals studied.

In his chapter on the relation between puberty and energy reserves, Franklin Bronson shows that life-history traits must also be taken into account if we are to fully understand reproductive processes. The notion that puberty in female mammals depends on the accumulation of a critical level of energy reserves is comfortably accepted by many. Consideration of the life cycles of most mammals, however, reveals what little sense that idea makes; most mammals are short- lived and small. Given the small mammals' short life-spans and their inability to store enough fat to support gestation and lactation, their most efficient strategy is to reproduce opportunistically as soon as conditions improve. Thus, small mammals tend to respond to changes in energy balance, rather than to changes in energy stores. Nor are energy stores critical in the case of large mammals because immediate conditions at the time of mating have little value predicting what conditions will be like months later at the end of pregnancy.

As the contributors to this volume demonstrate, even the most basic predictions derived from examining reproduction as an integrated aspect of the whole organism are proving very exciting. For example, consideration of the energetic trade-off between reproduction and immune function illuminates previously unexplained phenomena, such as the decrease in immune function during reproductive stages.

Another point illustrated in the volume is that the general principles arising from the evolutionary approach help us understand why cases that were formerly considered exceptions are, instead, the result of the same rules being applied to extreme circumstances. In contrast to most mammals, females are the dominant and more aggressive sex among spotted hyenas. As Kay Holekamp and Laura Smale discuss in their chapter, this may reflect the fact that hyenas are the only carnivores in which large numbers of females compete for rich and defensible food patches on a daily basis. Other contributors explain how our views have been constrained by the use of particular models in research and how we can broaden our perspectives by studying a greater range of species. Our understanding of sexuality has been limited, for example, by the focus on species in which sex chromosomes determine the type of gonad; we have much to gain from studies of species with other types of sex determination.

The volume has some minor shortcomings. The lengthy accounts of the results of series of experiments, present in a few chapters, are sometimes difficult to follow. Some fields of research that are currently very productive are only touched upon superficially, as in the discussion of the evolution of monogamous mating systems in primates (and how these relate to true genetic monogamy and, thus, sperm competition). Finally, the book deals almost exclusively with birds and mammals; innovative work done on other taxa is largely overlooked.

Despite these criticisms, I applaud the contributors for their efforts to make sense of a broad field of information. *Reproduction in Context* demonstrates that this tremendously complex and often chaotic topic begins to find a coherent form when organized within an evolutionary framework.

NOTA BENE: MATERIALS SCIENCE

The Nanotechnician's Baedeker

Handbook of Nanostructured Materials and Nanotechnology
Hari Singh Nalwa, Ed.
Academic Press, San Diego, CA, 1999. 5 vols. 3483 pp. $1300. ISBN 0-12-513760-5.

Nanotechnology, with its multidisciplinary nature and numerous potential applications, may be one of the most difficult fields in which to stay informed. Such a new area would typically have to wait several years for a disciplined, well-organized survey to appear, but Hari Singh Nalwa has already compiled a five-volume overview, *Handbook of Nanostructured Materials and Nanotechnology*. The first volume, "Synthesis and Processing," covers numerous methods of inorganic particle formation as well as nanostructured alloys and micromachined materials. "Spectroscopy and Theory" includes not only spectroscopy and scanning probe methods but also discussions of quantum-well lasers, atomic-scale friction, and nanometrology. Two volumes cover electrical and optical properties of minute structures ranging from molecular junctions and single-electron tunneling transistors to photonic band gap materials. The final volume treats organics, polymers, and biological materials as well as supramolecular chemistry and carbon nanotubes. The contributors have exerted considerable effort to include introductory material that will benefit readers who are crossing disciplinary lines. Anyone interested in learning how these materials can be made, how they can be characterized, and what they can and might be able to do will likely be well served by this reference.

—PHILLIP D. SZUROMI