

Book Reviews

Allostasis, Homeostasis and the Cost of Physiological Adaptation. Edited by Jay Schulkin. ix + 372 pp. Cambridge, England: Cambridge University Press. 2004. \$100 (cloth).

Quite well established are the concepts of homeostasis and balance as well as biological and behavioral adaptation to maintain homeostasis. They may be traced to antiquity, both in the Western and Eastern traditions. Homeostatic concepts emphasize the interaction between brain, body, and environment. Concepts of homeostasis and adaptation have been a driving force for substantive research and theoretical discourse in the modern era, since Bernard (1865), Pavlov (1897), Cannon (1915), Selye (1956), and their disciples.

The current book illustrates the state of the art of the evolution of the concept of homeostasis to allostasis—which delineates longer-term biological and behavioral adaptation mechanisms that maintain internal viability amid the changing conditions of the external world as well as internal body changes. The coordinating regulatory processes of the central nervous system play a major role in the homeostatic and allostasic mechanisms. Therefore, the concept of allostasis is important in the attempts to understand the interactions between living organisms and their environment and between the mind and the body.

An important aspect of allostasis and adaptation is the effort required to adapt and maintain adaptation over time—the price paid by the organism in its efforts to survive and the wear and tear evolving over time, in other words, “the allostasic load.”

In *Allostasis, Homeostasis and the Costs of Physiologic Adaptation*, editor Jay Schulkin of Georgetown University assembled a group of distinguished investigators and thinkers in this emerging field, who provide a well-rounded intriguing picture for the non-initiated readers and food for thought for the quasi-experts. The history, evolution, and principles of allostasis are reviewed by one of the founding fathers of the concept, Peter Sterling, in Chapter 1. Sterling combines social observations with physiology into a coherent dynamic structure. He stresses the importance of rate of adaptation, multilevel, multidimensional organizations,

and the therapeutic implications of allostasic concepts.

The role of stress and adaptation in allostasis and allostasic load is reviewed in Chapter 2 by Bruce McEwen, who also illuminates the multiple aspects of the adaptation process and its disruption. The theme is further developed in Chapter 3 by David Goldstein, who merges the homeostatic theory with the concepts of allostasis, and in Chapter 4 by Burton Singer and colleagues, who illustrate the concepts with actual studies and methods for their analyses and measurements. This chapter is especially intriguing in the attempt to quantify social and physiological allostasic loads and risks over time. It moves the readers from theory to real-world applications.

The application of allostasic load theory to specific disorders is the subject of several chapters in the book. In Chapter 5, George Koob and Michael LeMoal review the role of adaptational mechanisms and allostasis in drug addiction, and in Chapter 6, Jeffrey Rosen and Jay Schulkin examine the pathology of anxiety and depression in a similar framework. Both emphasize the role of the hypothalamic-pituitary-adrenal (HPA) system and the regulation and interactions of catecholamines in the mechanism of stress response.

A chronobiological perspective is introduced in Chapter 7 by Ziad Boulos and Alan Rosenwasser, who describe regulatory and disruptive mechanisms ranging from diurnal and seasonal rhythms, sleep, menstrual cycle and reproduction, to long-term life-cycle maturation and aging. Shift-work provides for an excellent example of disruption in the circadian pattern, its load, and consequences, which are described later in the chapter. The multiple processes and systems involved in the disruption are eloquently analyzed. The longitudinal approach to allostasic load is further emphasized in Chapter 8 by John Wingfield, who examines the concept and its association with life cycles. Described from several complementary viewpoints are the various aspects of neuroendocrine systems in the maintenance of homeostasis and allowed adaptations and adjustments.

This edited, multiple authors' book provides a kaleidoscopic view of allostasis and adaptation. The same basic concept is reviewed by different authors from their own specific perspectives. Together they challenge the readers to view life as a dynamic process of a holistic interaction between the

environment and body, with the brain as the conductor and mediator.

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Testosterone Dreams: Rejuvenation, Aphrodisiac, Doping. By John M. Hoberman. 381 pp. Berkeley, CA: University of California Press. 2005. \$24.95 (cloth).

John Hoberman is a seasoned author who has written several books over the last 20 years on the topic of sport. In the current offering, he covers a wide range of topics tied together by the common thread of synthetic hormone "treatment" and framed effectively within a historical perspective. This book is timely considering current developments in anabolic steroid policy in professional sports and the recent United States congressional hearings on this topic. The apparent consensus is that anabolic steroids and other performance enhancements drugs should not be used by athletes, and steroid use over the last 10 years in American professional baseball has tarnished the game. The broader issue of hormone therapy as performance enhancement for recreational athletes and non-athletes alike is significant given the obsession many have with feeling and looking young. As I write this, my e-mail filter strains to prevent the delivery of advertisements promising improved sexual performance through pharmacology. In fact, this once-taboo topic is now commonplace, with pharmaceutical corporations pouring millions of dollars into television and print media advertising aimed at aging males.

With this as a backdrop, Hoberman asks what is normal with respect to sexual perfor-

mance, energy levels, and overall health throughout the human lifespan. How should we feel as we age, and if we could do something to feel better, should we? Most would agree that drugs are beneficial when they alleviate suffering or help to correct a pathological situation. Is aging a pathological condition? Is the self-inflicted suffering of elite athletics reason for medication? If it is possible to safely enhance one's work, parental, or even recreational performance, then should one attempt to do so? If so, at what cost and who stands to profit from our desires? These are some of the questions raised, but not necessarily resolved, in this thought-provoking book.

Many biological anthropologists will be disappointed by the lack of endocrine physiology in this text. For instance, there is no substantial discussion on circulating hormonal profiles, hormone action, feedback mechanisms, and up- or down-regulation, or how these are altered with aging and/or hormone supplementation. I was also disappointed by the absence of data, whether tabulated or displayed graphically. In fact, there is very little in the way of empirical evidence to support the arguments presented here. Furthermore, I was hard pressed to fully appreciate the author's position on many of the complex social and ethical issues found here.

Be warned, Hoberman is not an anthropologist and approaches this subject matter from a decidedly Eurocentric angle. The most interesting and disturbing section (chapters 1-3) of the book surveys the history of hormone supplementation in America and Europe during the last century. Hoberman's main sources of information are medical journals, where he quotes extensively from editorials and letters to the editors from practicing physicians. He also pulls quotes from public lectures and other formal addresses of prominent doctors and researchers of the past. The result is a terrifying glimpse at the state of medicine in the recent past as it applies to gender and the ghoulish practices inflicted on certain segments of the population. The frequent use of quotes is tiresome but effective in demonstrating how a lack of physiological understanding coupled with power and arrogance led to the mutilation of many "patients." This "physicians say the damnedest things" section would almost be funny if it were not so depressing, and it gives ample ammunition for criticism of biomedicine. This last statement holds for the overall

tenor of the book. Thus, particular chapters may work nicely as supplemental reading for courses of a critical nature.

Chapter 4 explores the ever-changing relationships between drug producers, physicians, and the public. Hoberman details a recent trend in patient-driven interests in pharmacological treatments best categorized as cosmetic and those willing to accommodate these wishes. We also learn of governments' role in attempting to regulate products and procedures and the invasive nature of parties with much to gain by unfettered access to potential consumers desperate to purchase medical procedures aimed at increasing fertility and fighting aging. This section also includes a comparison of synthetic testosterone and medical marijuana, which serves to illustrate how politically motivated officials enact and enforce laws that can interfere with physicians prescribing medicines to patients in order to relieve suffering. This chapter concludes with a section describing how some attempt to exploit the public's fears and ambitions by making false claims about the benefits and ignoring the side effects of certain therapies.

The last section (chapters 5–7) of the book deals with hormone therapy in athletes. This section is disconnected from earlier chapters, and many may find the analysis and discussion irrelevant compared to topics covered earlier in the book. This section focuses on the social implication of cheating in sporting events through creative pharmacology and traces the history of such practices. Personally, I wanted to know more of the physiological action of certain doping schemes and the short- and long-term side effects, and was disappointed that no such details were provided. Instead, Hoberman speculates about public opinion of cheating athletes in various sports in Europe and America. He also provides a treatment of nationalism and state-sponsored performance enhancement in international competition and more recent reforms and anti-doping policies. Some of this material is already dated as evidenced by new anti-steroid policies recently enacted by Major League Baseball and the National Hockey League and not covered in the text.

Although I enjoyed reading this book, I was hoping to gain insight into how testosterone operates throughout the lifespan. I was hoping to learn about the physiological and behavioral effects of therapy in older people and overuse in athletes and, in doing

so, perhaps gain a new understanding of this important steroid hormone. This was not the case. Because this book contains two major topics that are not well connected, I am hard pressed to recommend this book as a text for any particular courses, although segments of the book would work well as supplemental readings, e.g., "Anthropology of Sport, Bioethics." Finally, this book covers many important social and ethical areas with respect to aging and performance enhancement for everyday living. While most will enjoy reading this book, few biological anthropologists will find this book useful as a research or teaching resource.

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DNA and the Criminal Justice System: The Technology of Justice. Edited by David Lazer. xvii + 414 pp. Cambridge, MA: MIT Press. 2004. \$67.00 (cloth), \$27.00 (paper).

This edited volume is composed of 16 chapters arranged in four sections that discuss the impact of DNA identification technology on the operation of the criminal justice system. In contrast to the policy discussions of the period 1985–1995, there is little discourse in this volume concerning the admissibility and presentation of DNA evidence at trial. This is largely a settled question. DNA evidence is widely and routinely used in thousands of criminal prosecutions each year in both the United Kingdom and the United States. This volume explores three important topics: the use of DNA evidence to challenge the finality of cases which have led to conviction, the dramatic impact of DNA felon data banks on the investigation of crimes, and policy issues that are likely to arise in the criminal justice system if and when human behavioral genetics matures as a science. Many of the chapters include considerable discussion of privacy issues; in general, the overall tone is one of caution about the threat that DNA banking poses to personal privacy.

The first section (six chapters) is introductory in nature. Among them is a thoughtful essay (Chapter 2) by Supreme Court Justice, Stephen Breyer, about the impact of science and technology on the development of public

policy. Fred Beiber, a human geneticist, provides an easily digestible summary of various DNA identification technologies in Chapter 3, and Margaret Berger, a law professor, provides a fine chapter (6) on the impact of DNA evidence in post-conviction proceedings. As of 2005, more than 140 convicted felons have been freed because post-conviction DNA analysis has demonstrated that they could not have been the perpetrators. Such testing challenges the principle of finality in justice, but there must always be a path to exonerate the wrongfully convicted.

The second section ("Balancing Privacy and Security") contains six essays on privacy issues involved in the operation of DNA or tissue banks, of which only three take forensic banks as a central focus. Among the essayists are the well-known bioethicist, George Annas, and the communitarian philosopher, Amitai Etzioni (chapters 7 and 10, respectively). Chapters 9 and 12 hew best to the book's stated theme and are written by Barry Steinhardt (who raises important questions about the limits to be put on the use of DNA banks in the criminal justice system) and law professors, D.H. Kaye and Michael E. Smith (who offer a well-reasoned argument that the fairest use of DNA identification data banks would be to make them all-inclusive). The third section ("The Coming Storm: Crime and Behavioral Genetics"), which has just two chapters (13 and 14), is misnamed. Garland Allen, a well-regarded historian of eugenics, offers lessons from the past. Troy Duster, a persuasive gadfly of the societal misuses of genetic information, makes the case that racial discriminatory practices will inevitably flow into the operation of DNA felon databases. Neither chapter discusses the current state of human behavioral genetics.

The vaguely named final section ("Defining the Discourse") also includes just two chapters. Chapter 15 by Sheila Jasanoff explores the multiple uses of DNA evidence and the role of experts in a democratic society. Chapter 16 (the last) by David Lazer and Michelle Meyer, provides a comprehensive review of current policy issues (scope of crimes covered, impact of DNA evidence on statutes of limitation, procedures for post-conviction review). Bieber's chapter on the technology and this one probably offer the best return on the time investment of the general reader.

Although there are many well-written chapters in this volume, it suffers from

three problems. Several of the offerings really do not address the role of DNA in the criminal justice system. I regard them as tangential to the stated theme of the book. The material on privacy and security issues seems to me to be weighted on the side of those who would place sufficient restrictions on the use of DNA data banks that it would limit their use in criminal investigations. Perhaps most important, the book is based on a conference held in November of 2000. Almost four years elapsed between conference and publication. For anyone interested in the hard facts about the magnitude and operation of state-based DNA felon data banks in the United States today, the book is not helpful. Having made that point, this volume is not out of date in its policy discussions, few of which have been resolved by the legislatures.

The constitutionality of DNA criminal data banks has been challenged repeatedly in state and federal courts, and the state interest in criminal justice has consistently prevailed. DNA forensic data banks are here to stay. They will grow in scope of operation and in value both in identifying perpetrators and exonerating the innocent. Someday, we all may have a DNA profile in a state data bank. That is a pretty good reason to read the book.

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The Genesis of Animal Play: Testing the Limits. By Gordon M. Burghardt. xviii + 501 pp. Cambridge, MA: Bradford Books (MIT Press). 2005. \$50.00 (cloth).

With this book, Burghardt fills in a much-neglected gap in the study of play behavior. Most recent journal articles and several recent reviews (e.g., Bekoff and Byers, 1998; Fagen, 1981) of animal play have focused on mammalian play with only brief dismissals of play in non-mammals, but Burghardt extends, perhaps controversially, his review and thoroughly covers the play of marsupials, birds, reptiles, fish, and even invertebrates. Mammals have been traditionally studied because of their extended juvenile period, which promotes play, and because of their behavioral familiarity to ourselves. Just because mammals are easier to identify at play does not mean that other animals do

not play or that we should neglect the study of play in those species. The evidence for much of the reptile, fish, and invertebrate play is anecdotal, but the reports generally come from experts in that particular animal's behavior. These reports certainly do not prove play in these species, but they provide a direction for further research.

The overall goal of the book is not just to survey play in nontraditional animals but also to postulate on the origins of animal play. In the quest to discover the genesis of play, Burghardt begins with an examination of people's various views of play as both a societal evil and the creator of future generations. He continues with a look at various theories of the purpose of play. Burghardt then defines play traditionally by using five criteria. The five criteria are (1) behavior is not fully functional; (2) play is spontaneous, voluntary, pleasurable, or autotelic; (3) play differs from serious performance of ethotypic behavior either structurally or temporally; (4) behavior is repeated but not stereotyped; and (5) behavior occurs when the animal is in a relaxed field (e.g., well fed, safe, healthy). The use of these criteria in identifying play is one of the most useful contributions of the book in a field plagued by definitions that are little agreed upon and difficult to apply to both humans and animals. These criteria seem to accurately identify play while excluding behavior such as stereotypies that are clearly not playful. More specifically, they allow researchers to identify and compare play in a variety of animals that it is difficult to "intuitively tell" when they are playing (e.g., reptiles and insects).

After defining play, Burghardt proposes his "surplus resource theory" to make predictions about when and why play occurs (p 172-180). His theory basically posits that play will occur when there is sufficient metabolic energy (an important condition for play among invertebrates), lack of stress from environmental demands, a need for stimulation (boredom), and a life style that includes behavioral complexity and flexibility (e.g., generalist foragers). Thus, animals with extended parental care in which they are protected from foraging demands are more likely to play than precocial young. Domestication, which is much like a life-long extension of parental care, is typically an area where high levels of play are found.

In the second half of the book, Burghardt looks at the phylogeny of play and examines whether animal play fits the surplus resource theory. By examining the existence of play in progressively earlier species (i.e., from placental mammals back to invertebrates), Burghardt hopes to discover a pattern in the evolution of animal play. Play seems to be present throughout the evolutionary progression even in fish (e.g., sharks) and invertebrates (e.g., octopi), but many of the linking species that would indicate play evolved once and was passed down through evolution seem to lack play. For example, Crocodilians, which are evolutionarily close to birds, exhibit little play while birds have extensive play. Similarly, although fish and reptiles play, the linking amphibians have little indication of play. Burghardt takes this as evidence that play is a heterogeneous phenomenon that has evolved independently multiple times. The common life histories that led to the evolution of play seem to be "active life styles, moderate to high metabolic rates, generalist ecological needs requiring behavioral flexibility or plasticity, and adequate to abundant food resources" (p 382) as predicted by the surplus resource theory. The purpose of play is still not well understood. It is likely that play was originally a primary process, not related to any direct action of natural selection, and then became adaptive and was incorporated into the behavioral repertoire.

Another great benefit to the play research community is Burghardt's careful notation of the research that has been done and the questions that still need to be answered. Not only does he point out the species that should be further studied, he also proposes experiments that would show the connections between play in different animals. For example, he notes that research examining the role of the cerebellum and the basal ganglia in the play of reptiles and placental mammals could indicate evolutionary continuity in the play of these animals (p 307).

This book was cohesive overall, but the final chapter did not seem to fit as well with the rest of the review. This chapter is an amalgamation of Burghardt's disparate final thoughts about play rather than a conclusion to the question of the genesis of play. Everything from the cruelty of play to dreams as "the ultimate play" is brought into this final chapter. Although interesting, they do not further the search for play's

origins. The several discussions of play as the cause of war and the collapse of civilization lack the careful analytic review present in the rest of book. Despite these tangents, the book remains a masterful work that is certain to advance and direct the field of play behavior.

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The Ape in the Tree: An Intellectual & Natural History of Proconsul. By Alan Walker and Pat Shipman. x + 288 pp. Cambridge, MA: The Belknap Press of Harvard University Press. 2005. \$26.95 (cloth).

Systematic nomenclature is often a hiding place for quiet tributes. In some cases, this may be a significant benefactor (as is the case with *Australopithecus boisei*), a favorite cartoonist (e.g., the owl louse *Strigiliphus gary-larsoni*), or a musical genius (the dinosaur, *Masiakasaurus knopfleri*, pays respect to the guitarist Mark Knopfler). Eventually though, the subject of the tribute may be forgotten. An example of this is the subject of *The Ape in the Tree: An Intellectual & Natural History of Proconsul*, the latest work from Alan Walker and Pat Shipman. This book focuses on an extinct African ape whose name, *Proconsul*, pays respect to the long-forgotten Consul, a dynamic, dapper, performing chimpanzee that captivated audiences in the late 19th and early 20th centuries. Consul was so well known during his time that his name had become synonymous with "chimpanzee" and thus was a reasonable suffix for a fossil considered to be a chimp ancestor.

The first part of *The Ape in the Tree* is a riveting description of the history surrounding not only the initial discovery and naming of the original *Proconsul africanus* fossils but also a critical period in African paleontology. There are many fascinating characters described, including a young, brash

Louis Leakey, the bookish Arthur Tindell Hopwood, and the unfortunate Dayrell Pigott. Of course, a major character in these early stories is the rough and wild African landscape. These stories capture the imagination and will remind many of the great tales of adventure that may have sparked a childhood desire to spend a lifetime searching for the next missing link. If there is any flaw to this book, it may be that these sections pass too quickly as there are clearly more stories to tell.

Early in the book, we are also introduced to the primary author, Alan Walker, first as a graduate student of John Napier's, then as an anatomy instructor in Uganda and at the University of Nairobi Medical School in Kenya. Napier, originally a hand surgeon, had laid the foundation for modern functional anatomy and produced (along with Peter Davis, in 1959) a classic analysis of *Proconsul* locomotion. Through Napier, Walker became interested in the *Proconsul* material and was interested in finding additional specimens. It is well known that he was extremely successful in this endeavor, but the stories surrounding these explorations are well worth reading. His discoveries range from the "excavation" of *Proconsul* skeletal fragments from museum collections mistakenly labeled as pig or turtle, to the mysterious "pothole" of Rusinga Island, to the truly unique Kaswanga primate site which produced no fewer than nine *Proconsul* individuals, some with largely complete, articulated limbs.

By the 1980s, the total collection of *Proconsul* specimens included a partial skeleton complete with forelimb and hindlimb elements, several vertebra, and cranial remains, numerous other partial jaws, and the remarkable collection of limbs from Kaswanga. With such a wealth of *Proconsul* material, it should be possible to address questions regarding systematic position, the functional anatomy of the limbs and back, and even questions regarding life-history parameters such as rate of development. The latter half of the book discusses these studies as conducted by Walker, his students, postdocs, and colleagues. While the details of these studies may not elicit the same sense of adventure as excavations under the burning African sun, they are an important part of the process and the work described represents state-of-the-art paleoanthropological research.

As could be anticipated, answers to even seemingly simple questions such as "did

Proconsul have a tail?" provoke some level of discussion from the anthropological community. Such disagreements are presented as a necessary part of the process ultimately leading to a better understanding of the question at hand. For the lay reader, these discussions may get a bit tedious within the chapter on systematics of Miocene hominoidea (Chapter 9: How Many Apes?), where the complex arguments over relationships are presented a bit too quickly. Fortunately, the copious crop of taxa described in this chapter has the ultimate effect of portraying Miocene as a time rich in a wide diversity of apes, putting the current paucity of ape species into an interesting context.

There are many interesting characters and stories throughout the book, but the true star is, of course, *Proconsul*. Sitting on the cusp of the transition from monkey to ape this genus, with its set of four species, has sparked the interest of many researchers. More is known about *Proconsul* than many of its fossil hominin counterparts. Some may think the transition from monkey to ape is less interesting than the transition from ape to human, but there are many rea-

sons to think the opposite is true. When presented with the opportunity, I was anxious to read *The Ape in the Tree: An Intellectual & Natural History of Proconsul* for two reasons. First, having spent some time searching for Miocene fossils, I understand how interesting this time period is, as well as the truly unique nature of the *Proconsul* collection. Second, as a postdoc of Alan Walker's in the mid-1990s, I had the opportunity to hear many of the stories presented and was looking forward to a few more. I wasn't disappointed.

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