

The Evolving Female: A Life-History Perspective. Mary Ellen Morbeck, Allison Galloway and Adrienne L. Zihlman (eds). Princeton University Press, 41 William Street, Princeton, NJ 08540, USA. 1997. Price not known. Pbk, xix + 332 pp.

A human female is born, lives her life in a particular way, and then dies. What is remarkable about this short few-decade-long three-act play is the fifty-million-year history of primate evolution that has quietly written the script for this play.

The Evolving Female, a volume based on a conference to mark the silver jubilee celebrations of the University of California at Santa Cruz in the United States ('Women Scientists Look at Evolution: Female Biology and Evolution', 1990), investigates a number of themes in the evolutionary history of the human female, touching upon some comparative studies of non-human primates and other mammalian species along the way. It recognizes the many layers of biological complexity – morphological, anatomical, physiological, behavioural and ecological – that together contribute to the uniqueness of the two sexes, and then decides to investigate the issues of female biology and evolution from a particular perspective, one that is unusual in arising from an interplay of all the above factors: life-history theory. Although many researchers have recognized these different facets of a species' life history and focused on their effects on individual survival or breeding, this book broadly defines 'life history' in terms of *both* survival and reproductive features with the self-confessed goal of examining the actual complexity of these interactions.

A definitive introductory chapter, 'What is Life History', comprehensively sets the stage for the rest of the volume, which consists of six sections, and briefly outlines the road that would be taken. In addition, each section also starts off with a short preface which highlights the outstanding questions that confront us and how the following chapters in that section propose to answer them. This, I think, is an extremely effective exercise and deserve to be followed by edited volumes which cover wider areas of knowledge.

The first section offers an overall perspective to the issues involved and con-

sists of two very well-written chapters. In the first one, M. E. Morbeck succinctly summarizes our current understanding of the multifaceted and multilayered nature of life-history evolution. She first defines life-history perspective as a biographical account, elicited from an individual, that however lays primary stress on the subject's rather than the author's view of what is important. Morbeck then goes on to emphasize the import of not only several relevant aspects of individual biology and behaviour in such a perspective, but also that of concepts derived from life-history studies of populations, the natural history of the species, and the life stages through which each individual passes. Finally, she stresses on the phylogenetic perspective that links the history of the individual with that of the species and contributes so much to that final understanding of individual life-history strategies. In the other chapter, L. M. Fedigan outlines the history of the concept of 'a life history' as it stands today, drawing upon the rich sources of both, the biological and the social sciences. She concludes with a description of the empirical applications of life-history studies with detailed reference to her own long-time longitudinal studies on a provisioned troop of Japanese macaques in the United States.

The next two sections deal with the contributions made by natural history studies to our understanding of life-history strategies in non-human mammals. In the first of these, K. Ono and J. Reiter discuss the relationship between life-history traits and reproductive success in two pinniped species, sea lions and elephant seals, respectively. The pinnipeds are most unusual among mammals in exhibiting highly modified anatomical and physiological features which allow them to live and feed in aquatic environments. Although these chapters are interesting in their own right and highlight the behavioural ecology and natural history of this group of mammals, this section is the weakest in this volume because of the nature of its specialization. It would have been far more appropriate if discussions of more representative terrestrial mammals were included. This would have served to better complement the next section on the life-history traits of non-human primates, and also to effectively illuminate the phylogenetic perspective on the evolution of life-history strategies

amongst the principal mammalian lineages, ultimately leading to humankind.

The crucial change that led to the evolution of primates within the mammals was the development, early in the life history, of a complex brain, large in comparison to the size of the body. This, in turn, facilitated the appearance of superior eye-hand-motor control in these species, a capability which could be rather effectively exploited not only when individuals interacted with the environment during movement and feeding or during predator-avoidance, but also when complex social behaviour finally evolved along with its associated abilities of individual identification and recognition, gestural communication, alternative reproductive patterns and superior infant care. Increasingly sophisticated individual and social intelligence also added a new dimension to the evolution of life-history strategies in primates; behavioural patterns were no longer under the simple controls of genes interacting with the environment. Individual choice had come to stay.

The third section, accordingly, stresses the influence of social relationships and social cognition on individual life-history traits in monkeys and apes. And who better to start off this discussion than B. B. Smuts who has spent so many years documenting the intricate social bonding patterns of savannah baboons in eastern Africa. In her chapter, Smuts discusses the salient features of inter-individual relationships in Old World monkeys and concludes with some observations on the development of human emotional attachment. A fine chapter, simply but elegantly written. In the next chapter, another stalwart in this field, M. Hiraiwa-Hasegawa, summarizes some aspects of the development of biological and behavioural sex differences among non-human primates. Although she discusses the nature of such differences and the effect that they may have on individual reproductive fitness, we do not come to know much about the mechanisms by which these differences emerge. This, in my opinion, is important if we are to fully comprehend the nature of proximal selective forces that act independently on the two sexes with their distinctly different life-history strategies. In the third chapter of this section, M. S. M. Pavelka focuses on her fifteen-year study of Japanese macaques in order to unravel the different aspects of macaque social life – kinship,

dominance, personality, and age – that have profound effects in shaping the life of an individual. Finally, in the extremely detailed concluding chapter of this section, A. L. Zihlman describes the natural life history features of the apes. This chapter is unique in the volume under review, not only for the wealth of the data that it provides on a species-by-species basis, but also for the completeness of its referencing of the current literature.

The fourth section of this collection deals with the influence that variation in anatomy and physiology can exert on the life-history variables of Old World monkeys. The different topics that have been covered here are also extremely variable and include the contribution of teeth, bones and fossils to life-history parameters (yet another excellent treatise by M. E. Morbeck), the evolution of post-menopausal osteoporosis (a detailed discussion by A. Galloway on a fairly unusual theme), and the origins and biology of adipose tissue in non-human primates and in humans (two complementary chapters by C. M. Pond and R. McFarland). This section is arguably the one I found to be most interesting and informative; this stems not only from the fact that most authors investigating life-history variables have tended to concentrate primarily on behavioural ecology, but also because of the thoroughness with which each of these chapters have been written. I learnt much from them.

The fifth section of this volume focuses on what it means to be a woman in human society and begins with two general chapters which attempt to review some of the issues that may have been important in the evolution of the human female. A. Zihlman discusses some of the selective forces involved, choosing to illustrate these with the demands that locomotion and reproduction have placed on women's bodies and their lives. She reviews the fossil record and our knowledge of the anatomy and physiology of the extant primates and speculates on the patterns of evolution that finally led to modern *Homo sapiens*. The next chapter by S. M. Borgognini Tarli and E. Repetto beautifully complements this discussion by describing the sex differences, both in physical attributes and in social roles, that may have existed in human populations through the march of civilization, right from the Paleolithic age, about 10,000 years ago, down to the dynastic

Egyptians, about 2000 years ago. I found this chapter well-researched and extremely interesting since this was the time in our history that culture began to take roots and obviously would have begun to greatly influence the evolution of modern humans. Human history begins to integrate with primate biology.

The other four chapters in this section are more specific in that they deal with patterns of physical and social development of women in different kinds of communities; they, however, do not fail to highlight what our general lessons are from these painstakingly detailed studies. G. A. Morelli describes what it is like to grow up as a girl child in two strikingly different societies: the Efe foraging community and the Lese farming community, both in northeastern Zaire. P. Draper reviews her two-decade-long study of the anthropologically-famous !Kung tribe of the Kalahari desert in Botswana and examines the institutionalization of gender roles in these people. C. Panter-Brick investigates some of the behavioural choices and the consequent energetic demands that confront women, as well as the major ecological constraints that influence these choices, in the farmer-pastoralist Tamang community and among the low-caste Kami blacksmiths of north-west Nepal. And finally V. J. Vitzthum describes the interaction of biology, culture and the environment in regulating the reproductive patterns of the unbelievably hard-working Nuñoa women of the southern Peruvian Andes. Remarkable women all – those who have been studied and those who study.

What appears to be unique about this entire volume is that besides stressing the importance of natural selection in shaping many of the features that comprise life history strategies of females, it adopts a very refreshing approach in also examining the vagaries of individual life-history stories and their consequences for survival and reproduction. This is, again in my opinion, possibly the most important contribution of this piece of work and the editors must be complemented for accomplishing this very effectively.

The advent of a number of pioneering women primatologists and anthropologists in the fifties and sixties profoundly influenced the nature of our understanding of gender relations and the roles that females play in nonhuman primate and human societies. But a book on the evo-

lutionary history of women, edited by three women, and with all the articles contributed by women (20 chapters written by 19 authors) must surely be a unique enterprise. A remarkable book, also in this regard!

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The exploration and colonization of outer space and the planets of the solar system is one of the great challenges of the 21st century. There is no doubt that it will happen sooner or later. The major constraint that prevents it from happening 'sooner' is not, technology, but rather the global political will to invest collectively in this long-term effort. Even amongst the 'pro exploration' advocates within the scientific community, there are many who question the need for a human presence in space. They believe that unmanned robotic exploration, like the current Pathfinder mission to Mars, will provide a greater scientific return per dollar spent than the more expensive manned ventures.

Irrespective of the merits and demerits of these arguments, it appears inevitable, that at some stage, a permanent human presence in space will become necessary for colonization, manufacturing and mining ventures. The continuous presence of Russian cosmonauts on the Salyut and MIR stations, and the US-initiated and sponsored international space station are attempts at understanding the technological, biological and psychological problems associated with long-term space flight.

There are many risks associated with human activities in space. The major ones include risks associated with launch and spacecraft malfunctions, risks associated