

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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Acceptability of Risk from Radiation – Application to Human Space Flight. Symposium Proceedings No. 3, National Council on Radiation Protection and Measurements, 7910, Woodmont Avenue, Bethesda, Maryland, 20814-3095, USA. 1997.

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

with planned and unplanned extra-vehicular activity, risks of meteorite, asteroid and debris impact, as well as risks associated with the hostile environments of the moons and planets of the solar system.

One of the risks that confront astronauts and cosmonauts, is a much higher exposure to radiation in space. This exposure increases their risk of getting cancer at some stage in their life. This publication, based on a symposium organized by the National Council on Radiation Protection and Measurements (NCRP), is an update and review of the state-of-the-art knowledge on assessing and managing risks associated with radiation exposures of astronauts in space.

Various parties associated with space programmes such as governments, space agencies, occupational health authorities, astronauts and the general public, view these risks differently. In an ideal system, all of them should be used as inputs into the decision making process that sets standards and develops procedures for the operational management of the radiation risk. In the far from ideal real world, these different viewpoints rarely make a contribution. It is the technical expert who very often decides on what is appropriate and safe. What one likes about this book is that it breaks new ground about how differing views on risks can and have been used operationally for managing radiation risks in space.

This differing viewpoint is clearly seen in the part of the book that touches on the evolution of standards. Starting with fairly simplistic approaches during the early days, these standards have evolved in response to improvements in knowledge and changes in the perceptions of risk. The treatment of radiation exposure in space as an occupational hazard and relating it to the risks of cancer arising from similar occupations on the ground, provides a fascinating insight into how both societal and technical considerations can contribute to the setting and revision of standards.

The book contains a lot of recent experimental data on the nature and exposures to various sources of radiation

in space. People normally think of a solar flare as a major 'doomsday radiation event' from all the fiction that one has read. The data on actual exposures encountered by cosmonauts on the MIR station during one such event that occurred in 1989 is quite revealing. Clearly such intense short-duration radiation events can be managed safely through fairly simple operational procedures. The use of quality factors to extrapolate ground experimental data using proton and gamma radiation to space conditions, where heavier more energetic particle radiation is predominant, raises a number of very interesting technical issues related to assessing risks and setting standards. These are very well addressed. A strong case is made out for more experimental work that better capture the effects of space radiation.

It was interesting to find out that medical experiments performed on astronauts resulted in greater radiation exposures than contributions from the space environment itself. In the competitive world of astronauts, there is often a need for them to be 'willing' to take such risks. The ethical issues for both the manager and the astronaut that such approaches raise, is well discussed. Since exposure limits for women are lower than for men, the question of how gender equality issues should be addressed in setting standards makes very interesting reading.

The other thing that one liked about this book is the fascinating overview of public perceptions on the risks of radiation exposures *vis-à-vis* other hazards of a similar nature. Paul Slovic's review of the various psychometric surveys reveals differing perceptions of such risks between the 'enlightened expert' and various sections of society. Contrary to the view of many 'technical experts', it appears that the public is neither irrational nor misinformed about such risks in relation to their perceived benefits. Thus exposure to X-rays is acceptable not only because of its perceived benefit, but also because of trust in the managers of the technology—the medical profession. The same perception does not obviously extend to managers of nuclear power tech-

nology who are perceived as untrustworthy.

One would have thought that a Russian view on the question of standards, radiation risk and safety appraisal in space would have provided an useful alternate viewpoint. This is missing. The other issues, which only receive passing mention, are the risk and safety issues arising from the use of nuclear power sources on space flights. This could possibly be a greater risk than the radiation environment of space itself.

Though the data in most cases is well presented, there are minor typographical mistakes in relating the texts to the figures. Rems, sieverts and grays which are the normal units for measuring radiation exposures are never defined anywhere. Data comparisons in the tables are also not always made using the same base unit, making it difficult for the reader to quickly interpret and understand the results. These are minor blemishes.

After reading this book one cannot help asking oneself whether a similar conference and publication would have been possible in India. Of course since India has no immediate plans for human ventures in space, there may be no need for such a symposium. However, if one looks at the larger issues of occupational safety, especially occupational nuclear safety, there is a clear need for a neutral meeting ground under an Indian equivalent of the NCRP. The headlong confrontation between 'romantic' environmentalists and the 'insensitive' nuclear establishment could perhaps be avoided if such processes and institutions could function in India.

Policy makers in the space and atomic energy establishments, space scientists, environmentalists, people and organizations involved in the measurement and moulding of public opinion, occupational safety practitioners could all benefit from this book.

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