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Reviews

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REVIEWS

D. MARIAPPA. ANATOMY AND HISTOLOGY OF THE INDIAN ELEPHANT. Indira Publishing House, Oak Park (Michigan), xiii + 209 pp., illustrated, 1986. Price $57.00.

The past few hundred years have seen a great increase in scientific research including the study of anatomy. Most of the zoological work has been done either on humans or on animals which are important in our society, such as for work or food. In the Western economy, where until recently most of the research has been conducted, the elephant is not held in a position that would warrant much research effort. Its size and the associated expenditure are obvious drawbacks for research. There have been, however, a few brave souls who have had the interest and skill to tackle the elephant. Dr. Mariappa is one of these people. He has combined his knowledge, along with that of others, into a much needed book on the anatomy and histology of the Indian elephant (Elephas maximus).

The book is organized as are most anatomy texts, starting with osteology and continuing through the other systems. The body structures are located and then described in plain language. Related systems, e.g., blood or nerve supply, are then given. The overall presentation is clear and appears to be correct. An interesting section at the end of each chapter is aptly called Comments. It is a list of interesting facts and relationships about the present material that does not fit into the formal structure of the chapter. For example, the author describes the 'stay apparatus' (p. 90), which, as in the horse (p. xi), permits the elephant to sleep standing by keeping the leg joints immobile. He also mentions the trachea-esophageal muscle (p. 110) which has been found by some investigators in a few but not all elephants.

This book has a few deficiencies. More pictures and illustrations in the book would have added a great deal. Those that are in the book suffer from their small size. Some of them, like that of the heart (p. 130, Fig. 8-1), should have been more complete, showing many more of the structures which the author describes in the text. In a few areas outside of anatomy and veterinary science, the author shares with us antiquated views. I agree with the comments of Shoshani [See Reference No. 2058 in Elephant, 2(2):247] on some of the technical errors, and that horses and elephants are not closely related (p. xi). But, as the author suggested, many of the similarities between the two are the "result of convergent evolution rather than one of ancestral relationship" (p. xii). Additionally, the idea of hexadactyl ancestry (p. xii) of the elephant has long been discarded. I also noticed that the numbers of bones in an elephant (Table 1-1, p. 3) differs significantly from that of Shoshani et al., 1982, in Elephant, 2(1):42.

Mariappa's book is a long-needed effort written from the point of view of a veterinarian, summarizing a great deal of information [Reviewer No. 1].

Additional comments on the **Female Genital System** in Mariappa's book: A general description of the female genital system is given in this text. No histology photographs of the reproductive tract is included. The dimensions

of each segment of the reproductive tract are those from the dissection of a single female elephant fetus. The uterus and the labia majora are the only parts for which adult dimensions are included. However, in the literature (some of which is referenced in this text), there are numerous references to reproductive organ dimensions in various elephants. Both Loxodonta africana and Elephas maximus should probably be considered together, as many authors have commented that their reproductive anatomy is similar [Reviewer No. 2].

Additional comments on the **Histology Chapter** in Mariappa's book: No one can hope to write the histology of an elephant with 11 photomicrographs! The value of this section is marginal and probably detracts from the main thrust of the book on which I am not qualified to comment. Magnifications and orientations of the photographs are missing, and no mention is made of the muscle mass or bone tissue. Nothing new is presented in the section on the skin, although the author confirmed previous observations, such as the lack of sweat glands in the skin. The description on the 'Prehensile finger of the proboscis,' including the "Ayer's nerve endings" (which the author also found in the clitoris and claimed to be "...unique to the elephants," and which were named after Dr. Ananthanarayana Ayer) are the best in this chapter. These findings, in my view, do not justify the inclusion of the word "histology" in the title of this book [Reviewer No. 3].

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CYNTHIA MOSS. ELEPHANT MEMORIES. William Morrow and Co., Inc. New York, New York, 320 pp., illus., 1988. Price $18.95.

This review is reprinted (with permission) from Natural History Magazine (1988), Vol. 97, No. 3, pages 80, 82, 84.

I, like so many others, saw my first living elephant in a zoological park and soon after was introduced to the spectacle of fifty performing elephants in the three rings of a major circus. As a child one is not only overwhelmed by the elephant's size but also amazed by its "trainability" and physical versatility. The trunk is a marvel of prehension and strength, a sensitive organ of tactile perception, as well as a versatile "limb" for this massive land mammal. As an adult I encountered my first wild African elephants in Tsavo National Park, Kenya, in May 1966. At the time I was interested in developing a project to investigate the social behavior of elephants. I felt that to better understand the selective pressures that resulted in the formation of complex social organizations found in higher vertebrates, a study of a long-lived, social herbivore was essential. The Tsavo experience was profound in its impact when for the first time I counted 110 elephants in a

single assemblage. Tsavo was followed by Amboseli, in Kenya, and then by Queen Elizabeth Park, in Uganda. I was hooked on wild elephants. On my return to the States, ready to set up a project on African elephants, I was diverted by an opportunity to work with wild Asian elephants in Sri Lanka, a task I undertook with great enthusiasm. In the last twenty years, research on the Asian elephant has increased dramatically, owing in part to the availability of large groups of domestic work elephants that are used to establish important data on physiological norms, diseases, and sensory physiology.

Aside from a small domesticated group of elephants in Zaire, domestic herds are not accessible to researchers in Africa, who have to undertake the painstaking tasks of field experiments and long-term observations. The members of the research team must develop a sense of identity with the animals' habitat and an empathy with the annual cycle and seasonal productivity of the land. To study a population of animals demands a commitment and dedication uncommon in academic circles, where, for example, a three- to four-year study is the norm for a dissertation. And those having custodianship of long-term projects must also seek helping hands and sympathetic funding agencies.

In her book Elephant Memories, researcher Cynthia Moss gives an account of her thirteen-year study of elephants in Kenya. She has overcome all hardships, financial and otherwise, and I admire her perseverance. Elephant Memories is not a monograph on African elephant biology. It is Moss's very personal account of an elephant population inhabiting one of the more spectacular regions of the world, Amboseli National Park. Her accounts are laced with beautiful vignettes describing individual elephants as they are born, mature and die. Moss offers a glimpse into a marvelously complex society where kinship is the thread connecting the lives of elephants.

Today the emerging consensus is that two extant elephant species, Asian and African, are remarkably similar in behavior and physiology. This statement may seem trite, yet twenty-five years ago there was considerable academic controversy over such a simple matter as the sexual behavior of male elephants. For hundreds of years mature Asian elephant males had been known to experience an annual period of sexual readiness termed musth. At the time of musth they secrete a dark viscous substance from the temporal gland, situated between the eye and the opening to the ear, they urinate frequently, and are very irritable. The dark secretions are unknown from the females. The situation with male African elephants was more difficult to ascertain. All agreed that olfactory signals were important in the social life of an elephant. Temporal gland secretions clearly had some role in communication. The data from Asian males were derived from captives, supplemented with observations in the wild. But very few mature male African elephants had been closely studied in captivity, let alone allowed to breed. A confounding fact concerned the capacity of both male and female African elephants to secrete a clear fluid from the temporal gland when excited. By recognizing individual males, Cynthia Moss (together with Joyce Poole) was able to establish beyond doubt that the temporal gland of African elephants secretes two substances:

the clear, watery secretion common to both sexes, and the dark, viscous substance secreted by mature males when in their annual rutting period.

But Moss's account of the elephants of Amboseli does much more than clarify some arcane points concerning the reproductive biology of African elephants. It places in perspective a species that has had a long history of successful existence as an herbivore. The lives of humans and animals have an age-old, intertwined destiny, and elephants have figured prominently in human history. There is no doubt that elephants have been actively hunted for the last 50,000 years. Elephants have been domesticated and used as sources of traction and in military operations. They have been both venerated and ruthlessly exploited. We have only lately come to appreciate the lessons that long-lived, social animals can teach us. We, too, are potentially long-lived and exhibit generational overlap.

Both the African and Asian elephants have similar social organizations. The females are organized into groups of related individuals. Half-sisters and their progeny move either as a large group or subdivide along kin lines to forage independently, only to come together again at some time in the future. Individual recognition is manifest in all phases of interaction. Indeed, the author's first task at the beginning of the study was to develop an accurate photographic record whereby she could identify individuals. The male elephants, when they reach maturity, depart from the matriarchy and either form loose groups or move in a solitary fashion. A male, after his twenty-fourth year, tends to come into breeding condition on an annual basis. During this time he has a very high status and actively seeks out cow groups in order to mate with any female that happens to be in estrus. Clearly, the older elephants know the topography of the region and can actively seek out preferred feeding areas during times of stress. Thus the kin unit passes down information concerning availability of water and food to the younger members. The author takes us through the drought when water and nutritious food are limited. At these times individually acquired information becomes critical to survival. As if drought were not enough to contend with, there are incidents of poaching. We read with amazement about how the older females cope with human intrusion. Moss makes a point of the flexibility in social structure. Kin groups can subdivide in a variety of combinations only to reassemble again. The overriding fact here is that they remember and recognize one another. Thus the matriarchy can be the core unit and yet exhibit astonishing adaptability to varying environmental circumstances.

I was deeply moved by Moss's book. Upon reading this account one is forced to consider the parallel between human social organization and that displayed by elephants. Humans stand at the point of global domination as a species. We strive to maintain a decency in our conduct toward nations, cultures, and tribes. We attain the best in ourselves when we reach models formed during our upbringing as part of a kinship system. How far do we extend the feeling of kin and community? How much time is left for wildlife?

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