Book Reviews

Human Paleobiology. By ROBERT ECKHARDT. (Pp. xiii + 350; £52.50/$80 hardback; 0 521 45160 4). Cambridge: Cambridge University Press. 2000.

It would be frankly perverse for a biologist to limit the study of a living animal like the chimpanzee to the examination of a box of bones. However, a palaeobiologist who studies extinct organisms has little choice, with the added handicap that the bones in the box are usually fragmented. Palaeobiology is an umbrella term that embraces *palaeontology* (the study of preserved, usually fossilised tissues), *palaeoecology* (the study of how animals interact with their biotic [i.e. other animals and plants] and abiotic [i.e. the landscape and the climate] environment) and *taphonomy* (the study of the processes and biases that intervene between a population of living animals, and the eventual fossil sample of the same population).

There is now very good evidence from both traditional and molecular morphology suggesting that modern humans are more closely related to chimpanzees than they are to gorillas or orang-utans. Moreover, the 'molecular clock' (which has to be calibrated from the fossil record, but whose mechanism consists of neutral mutations) places the timing of the human-chimp split to the period between 8 and 5 million years. How much of this 5 or 8 million years of independent human evolutionary history can we access by studying the variation within and between living samples of the major world populations? The answer is disappointing. If we look at molecular variation, and specifically the variation within the genome, there is no more variation among all the major human populations of the world than there is among a geographically restricted sample of living chimpanzees from West Africa. For some reason (perhaps a drastic reduction in the effective population size on more than one occasion in the past 100–200 thousand years) it looks as if any 'deep' variation that had accumulated in the human half of the human-chimp split has been eliminated. This means that modern human molecular variation will only help us look back 100–200 thousand years into our evolutionary history. Thus, depending on whether one opts for the 5 or 8 million year estimate, we are dependent on fossils for information for c. 97% of our evolutionary history.

The human fossil record has grown dramatically in the past century. In 1900 just two fossil taxa were recognised, *Homo neanderthalensis* and *Pithecanthropus erectus*. By 2001 that number had grown to c. 18. There is a spectrum of opinion about how the human fossil record should be broken up into taxa. At one end are those who point out that the fossil record usually consists of just hard tissues, so that evidence about many of the ways that we recognise living species, such as coat colour, vocalisations, etc. are unavailable to palaeontologists. Thus these researchers surmise it is inevitable that the fossil record will be biased towards *under*estimating the number of species in the fossil record. They therefore tend to give more weight to discontinuities in morphology, using them as the boundaries of the 18 or so species. This is called the 'taxic', or 'speciose', end of the interpretative spectrum. At the other end are those who emphasise the morphological continuities between specimens, arguing that unless there is very clear evidence of a morphological discontinuity then taxonomies should be conservative. Some of these researchers have suggested that moving back from the present into the past the first discontinuity they are prepared to recognise taxonomically is the boundary between our own species *Homo sapiens* and *Homo erectus*. Other very extreme 'lumpers' are not prepared to recognize any 'fossil-only' species, thus they use *Homo sapiens* to accommodate a fossil record that spans more than 5 million years, which means including in the same species individuals with cranial capacities that vary by a factor of 3 or 4. It is fair to say that the 'taxic' interpreters are presently in the majority.

The author of this book, Robert Eckhardt, has long been a proponent of the view that researchers are over-eager to make new species, and *Human Paleobiology* is in essence a manifesto of the 'anti-taxic' movement. The book stresses that palaeoanthropologists have been too ready to seize upon small morphological differences, make inadequate assessments of their expression in comparative samples, and then use these trivial morphological differences to justify erecting a new species. He also argues that there is too little genetic distance between modern humans and chimps to justify accommodating more than a few species.

There needs to be a carefully argued case for lumping in order to keep the 'taxic hordes' (this reviewer included) in check. In many parts of the book Eckhardt provides an effective corrective, but in others he weakens his case by failing to understand, or to misunderstand, the inner workings of the taxic fraternity. This is not a book to recommend to students who are looking for an introduction to human palaeobiology. It is too idiosyncratic, and some mistakes render it unsuitable. However, it would make a fascinating basis for a challenging advanced graduate seminar. The world-view about human evolution that permeates this book needs to be heard and its arguments either countered or heeded. Robert Eckhardt's *Human Palaeobiology* should be read so that us 'taxic' folks appreciate that there is another way of looking at the world.

BERNARD WOOD

Body Explorer 2.0 An Interactive Multilingual Program on the Cross-Sectional Anatomy of the Visible Human. By ANDREAS BULLING, FLORIAN CASTROP, JENS AGNESKIRCHNER et al. (CD-Rom; DM 79, £29.52, $34.95; ISBN 3 540 14793.) Berlin: Springer. 2001.

This single CD-Rom based on the Visible Human Project originates from a Hamburg group. It is designed to offer non-experts, that is students and patients, an easily accessed system for studying cross-section anatomy. For this reason it works well on a personal computer and gives reasonable clarity with a standard screen, although at the highest magnification the view is fuzzy. The authors recommend a minimum of 800×600 pixels screen and 20 MB hard-disk space.

The system is very versatile; most of the functions are easily produced and the authors recommend learning how to use the program by trying them out. Initially nearly full length views are shown side by side of a sagittal and coronal section. Cross-wires can be moved to the desired level and with a double click on the mouse a transverse section appears that can be magnified or diminished. By placing the

arrow on a structure it is labelled and labelling can be selected to identify parts of any system. Moving up and down the body is easily accomplished. The single disk has 6 European languages, and this is useful in view of the cross-communication within Europe.

Cross-section anatomy is important because so much imaging is presented in this manner. The disk offers a valuable revision method for medical students and other students of anatomy.

R. M. KIRK

Wolf-Heidegger's Atlas of Human Anatomy vol. 1: *Systemic Anatomy*, *Body Wall*, *Upper and Lower limbs*. By PETRA KOPF-MAIER. (Pp. xiii + 319; 586 figures, 452 in colour; DEM 90, $78.25; ISBN 3 8055 6852 5.) Basel: Karger. 2001.

Wolf-Heidegger's Atlas of Human Anatomy vol. 2: *Head and Neck*, *Thorax*, *Abdomen*, *Pelvis*, *CNS*, *Eye*, *Ear*. By PETRA KOPF-MAIER. (Pp. xiii + 448; 866 figures, 677 in colour. DEM 90, $78.25; ISBN 3 8055 6853 3.) Basel: Karger. 2001.

These are attractive volumes. They are the successors to the 1953 first edition by Gerhard Wolf-Heidegger. The preface to the first edition is reprinted here and both it and the latest preface provide thought-provoking reading. Volume 1 covers general terms, a brief introduction to body systems, body wall structures and the limbs. Volume 2 deals with the head and neck, thorax, abdomen and pelvis, and CNS with eye and ear. Both volumes contain a complete index.

The volumes are all pictures; apart from labels and captions, there is no extended text. The illustrations take the form of photographs of sections (cross-, coronal and sagittal) of specimens, line drawings, more realistic artwork and a large number of excellent radiographs and scans, and it is useful to see these radiological images alongside relevant anatomical preparations. Curiously, there are no photographs of live people or of prepared specimens other than sections. Some of the artwork consists of sharply defined images, but some is more 'arty' with less clarity of outline. It is entirely personal, I know, but I don't like the latter. Also, I like bright 'play school' colours, but there you are. I'm with the late Johns, Betjeman and Piper, on this—the less 'ghastly good taste' in life, the better!

There is more than just topographical anatomy. Surface anatomy is here, and there are charts showing the surface projection of pain from various internal organs. The occasional clinical condition and some developmental anatomy are included, but the choice of these additional topics seems somewhat arbitrary. For example, testicular descent is included but not kidney ascent or thyroid descent. Inguinal and abdominal will hernias are illustrated, but not other equally common anatomical conditions. The autonomic supply to salivary glands is illustrated diagrammatically and yet it has to be said that this, however authoritatively taught, is almost irrelevant clinically, and of doubtful anatomical accuracy. The anatomy of the brain is included in great detail, but there is no mention of the main motor and sensory tracts as clinical entities.

I have said enough. I started to read these volumes thinking that I would like them very much and in truth they are wholly worthwhile and very useful indeed. And yet I have these little niggles, entirely personal to me. The price, by the way, seems a bit steep.

W. S. MONKHOUSE

Integrated Textbook of Anatomy. Gross Anatomy, *Embryology*, *Histology*. By S. G. MALWATKAR. (Pp. vi + 610; fully illustrated; £32.50 paperback; ISBN 0 19 564872.) New Delhi: Oxford University Press. 2000.

In 1969–72, when I was struggling to get to grips with the various elements of structural human biology, I found myself using several books: Hamilton for anatomy, Haines and Mohuiddin for embryology (although my supervisor might have been appalled to know that) and some vast tome for histology that was neither memorable nor useful, despite the assertions to the contrary of the staff. In bringing together between 2 covers anatomy, embryology and histology, the *text* of the book under review might, therefore, have been useful. I am not sure how useful this approach would be today. Embryology has disappeared in many places, and knowing about theories of origin of epiblast does not feature highly in most schools (I could go on about the sadness of this decline, not so much regarding epiblast, but certainly regarding trophoblast and its relevance to disease and immunology). Furthermore, integration to many of us now means something much more holistic than that implied by use of the word in the title of this text.

The text begins with separate general introductions to these 3 topics, after which they are presented side by side for each particular structure. The anatomy content is dry and descriptive: unremarkable except that the idiomatic usage of the authors is not always the same as that current in Ireland, or even, I daresay, Britain at the moment (there is nothing wrong with that). I found the introductory embryology text very difficult to come to grips with, and I suspect that a first time student would be bewildered unless he was prepared to settle for rote learning (what's the point of that?). Similarly, I found the introductory histology dry and uninspiring with text such as 'The epithelial cells are coherent amongst themselves' and 'Stereocilia is another structural specialization for absorption. It is unique for the cells of pseudostratified epithelium of the epididymis.' Whatever this says about copy-editing and proofreading, it really is time we stopped conning our students that this kind of tripe matters, even if it's true. Within what might be called the integrated text—integrated, that is, as far as the structural sciences go—things are a little better. For example, the development of the ureter is followed immediately by its anatomy and microscopic structure, and finally in the 2 pages devoted to the ureter the section 'Clinical Correlation' deals with ureteric calculi and renal colic. Despite these clinical sections, however, there is no attempt to distinguish anatomy that matters clinically from anatomy that does not.

So far, then, the text is at best unremarkable. The general feel of the thing is that it is someone's detailed lecture notes put together without any attempt at analysis or consideration of pedagogical effectiveness. The pictures are quite another story: they are simply unacceptable—consisting as they do of amateur line drawings and very poor photographs. It says something about OUP that it is prepared to give its imprimatur to a production like this, and expects us to pay £32.50 for it.

W. S. MONKHOUSE

Evolution of the Human Mind: *Modularity*, *Language and Meta-Cognition*. Edited by P. CARRUTHERS and A. CHAMBERLAIN. (Pp. 331; illustrated; 0521 789087 paperback; £14.95.) Cambridge: Cambridge University Press. 2000.

The view that the human mind is at least partly the product of natural selection has attracted biologists since Darwin. This volume presents arguments which in the main support 'evolutionary psychology', broadly defined in the opening chapters as the view that human cognition is subserved by innate 'modules', each chosen and retained by natural selection, 'whose operations are largely independent of, and inaccessible to, the rest of the mind' (Carruthers). This concept is described as the 'Swiss army knife' model which sees the human mind as a set of separate, biologically useful mental tools assembled by natural selection. This way of looking at the human mind comes down firmly on the side of biological determination in the current ferocious debate about the origins of human consciousness.

The concept is burdened with acronyms and extrapolations which do not help the non-aficionado of evolutionary psychology: a 'Massive Modularity Hypothesis' (MMH) proposes, with little obvious supporting evidence, that a modular structure characterises virtually all of human behaviour; while a concept of 'elegant machines' is advanced which the Reverend William Paley would have been proud of. At worst, the approach seems to be to pin a pattern of evolutionarily significant behaviour onto an undefined 'brain module'. Structure is implied in the argument for 'computational', 'Darwinian' and 'innate' modules. However, suggestions about the relation of modules with the functioning human brain are strangely few and far between. Despite these difficulties, some substantial questions are raised.

Most of the authors are agreed that a crucial development in the evolution of the human mind is the capacity to reconstruct the beliefs and desires of other individuals within the social group. 'Mind-reading', as this capacity is described, is justifiably considered a prime example of an adaptive behaviour which has obvious selective advantages in determining reliable and safe outcomes of complex social interactions. It is believed to have evolved from the less sophisticated capacity of many social animals to 'read' the behaviour of others which has been analysed in depth in primates (see, for example, de Waal, 1996). Even social insects such as termites and bees have to be able to 'read' each others' behaviour patterns (Wilson, 1975). Mind-reading (as demonstrated by the uniquely human ability to succeed in false-belief tasks—the crucial test of mind-reading ability) is considered a qualitative advance on behaviour-reading. That natural selection has contributed to the consolidation of mind-reading within the human mind is suggested by the genetic linkage thought by several of the contributors to underlie conditions such as autism and Asperger's syndrome which are associated with an inability to interact socially. The notion is developed by Carruthers, amongst others, that consciousness develops as a behavioural consequence of mind-reading, but without being itself selected for. The exponentially rapid development of human consciousness during the last 100000 years lends further support to the view that consciousness has developed independently of natural selection.

The role and position of the development of language in human consciousness is another central but controversial question. The circularity of arguments about the selectability of a 'language faculty' in the absence of language itself are clearly identified by Origgi and Sperber, who are also dissatisfied with Chomsky's concept of a language faculty. Arguments in support of a 'language module' can point to the enthusiasm, possibly innate, with which children explore and develop their early attempts at language. However, language development in children runs roughly parallel with their ability to succeed in false-belief tests and is therefore not a prerequisite for mind reading. Another line on the evolution of language capacity has been provided by Deacon (1997) who suggests that enlargement of the prefrontal cortex and enhanced connectivity with other brain structures provides the anatomical substrate for the development of language. However, this remains speculative and the door therefore remains open to arguments which favour cultural and ontogenetic induction of human language.

The relationship between brain size and emergence of the human mind is discussed by Dunbar who presents interesting evidence for a positive correlation between the size of social groups in ape and human societies, and brain size. The conclusion is that mind-reading and social group size are intimately related through structural changes in the brain. More specific modifications of brain structure are speculative: for example, graphing size changes in the VI area of the visual cortex during primate evolution shows an increasing volume of this area which flattens out in the apes and does not increase further in hominids. Dunbar argues that further increases in brain volume in hominids after this stage represent selection for enhanced integrative or associational areas of the neocortex, rather than perceptual functions. The latter argument receives further support from Mithen (see below) who argues that changes in brain structure other than size, including increased cross-linking, may give rise to the characteristic 'cognitive fluidity' of *H. sapiens*.

However, arguments attempting to correlate brain size with the development of human consciousness face major problems: for example, *H. neanderthalensis* has the same large brain size as *H. sapiens* but, in the opinion of most authors, lacks many of the attributes of the human mind, particular sophisticated language and symbolism. Furthermore, although the architectural record does not give clear answers, it does suggest that group sizes in *H. neanderthalensis* were smaller than those of *H. sapiens*, putting a spoke in the wheel of Dunbar's hypothesis. A further problem is that maximum brain size was achieved about 200000 years ago, i.e. considerably before the human 'cultural revolution' of 100–30000 years ago. So why the delay?

The chapter by Steven Mithen, not generally supportive of the modular concept of mind in modern humans, suggests an interesting approach to this question: he argues that the human mind achieved its full extension only through the linked exploitation of language and material and social culture. Mithen believes that 'extension of mind beyond brain' by these means, without changes in brain size, was the major achievement of the 100–150000 years leading up to the emergence of the human mind:

> The new types of material culture and behaviour—notably art, ritual and symbolism— … have been seen as no more than the *products* of a new type of mind. This is, however, only half the story: the material culture, social structures and economic patterns were fundamentally *part* of the new mind, they themselves were as much the cause as the consequences of new ways of thinking.

Human culture—in particular the capacity to use symbolic representations—became therefore a key influence in the development of consciousness. And how was this achieved? Just as apes have learnt to use and passed on new tools and

tricks, so, Mithen considers, our ancestors discovered the trick of using material culture to develop the human mind. The acquisition of these cultural achievements could reasonably have occupied the period between reaching maximum brain size and the development of mind. In this context, trading groups represent an effective increase in group size, not mentioned as a contributor to Dunbar's figures about group size, that may well have contributed to social complexity and therefore to the need to mind-read across relatively distant social groups.

Thus while theory of mind and language undoubtedly both include innate elements (and this is scarcely an original observation); the evidence suggests that the genetic predispositions towards, in particular, mind-reading and language, only achieved their flowering in the human mind through historically developing social and cultural interactions. As for broader evidence of innate 'massive modularity' in the human brain, it remains so far unconvincing outside of those areas governing, for example, reproductive, homeostatic and fight or flight responses, where the selective advantages of inherited patterns of behaviour are certainly not restricted to humans.

I should point out that the views expressed here are personal and not those of the Journal of Anatomy.

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