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TWO GREAT BOOKS ON HUMAN OSTEOLOGY

Human Osteology, 2nd Edition, 2000 *by* Tim D. White (Images by Pieter Arend Folkens) Academic Press, Harcourt Place, 32 Jamestown Road, London NW1 7BY, UK. 563 pages, ISBN 0-12-746612-6. £46.95. Library of Congress Catalog Card Number: 99-61961

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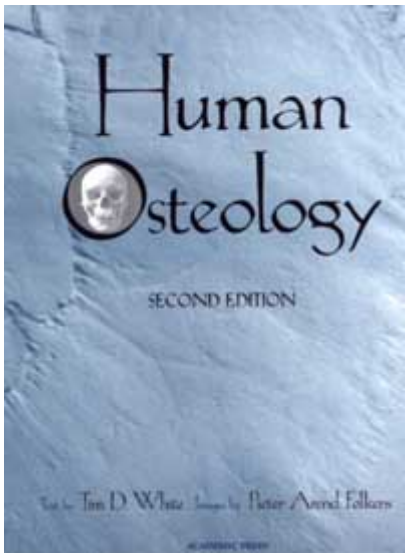

Study of bones form an integral part of every forensic expert. Every now and then, police officers call me to a forlorn site, where somebody has found bones and I am required to tell them not only whether the bones belonged to a human or an animal, but if human, a number of other parameters

such as age, sex, stature, and if possible even the cause of death of that person. Mostly I could satisfy the police personnel - and the court - but some cases admittedly have stumped me. And in such cases I have extensively relied both on Gray's Anatomy (for recognition of certain unidentifiable bone fragments) and the excellent classic by Krogman and Iscan.

While referring to these two books, I have often lamented why the information in the two could not be found in a single book. I fervently hoped somebody would put the information together in one book, but none was forthcoming, and I was getting resigned to using both of these books.....

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Till the book under review arrived one Friday evening. I looked at the title. No, not another book on osteology... I cried in my mind, till I opened the book and saw the contents - and thumbed through the pages. The more I looked at the pages, the more I began to get relaxed and convinced that this was just the book I was looking for. This is a very happy blend between *Gray* and *Krogman*. Krogman would avoid the anatomical details completely, tacitly assuming that the expert would somehow acquire and refer to some good book on anatomy, if required. Gray on the other hand - and quite understandably because it is a book on pure anatomy - would give a short shrift to forensic aspects. The book under review gives a fair weightage to both these aspects - just the thing a forensic expert needs. It starts easily with anatomical details of all bones and would gradually go on to forensic aspects.

One thing that was immediately visible was the extreme clarity of the photographs. They are much clearer and crisper than those in either of the books (I could even count the nutrient foramens at the back of the sternum given on page 159!)



The introductory chapter tells us that this book is not meant just for forensic experts, but even for archaeologists and even palaeontologits. It goes on to give us the URLs of several useful websites related to many different areas of osteology. As starting points, it gives us five sites, of which http://www.nitehawk.com/alleycat/anth-faq.html was particularly interesting. It goes on to give sites under as many as 16 different categories (several sites in each category). Take a sampling of sites: there are sites on careers on osteology (visit http://www.usd.edu/anth/handbook/hbjob.html), bone biology (visit http://www.lumen.luc.edu/lumen/MedEd/Histo/frames/h_fram10.html) skeletal anatomy, dental anthropology, forensics (All three sites given under this heading are very interesting), osteometrics, paleopathology and even mailing lists! The second chapter deals with

bone biology and the third on anatomical terminology. Next ten chapters are completely devoted to anatomy. There are chapters on the anatomy of skull, dentition, hyoid and vertebrae, thorax, clavicle and scapulae and so on. Eager to get to the forensic part, I tend to thumb through the pages hastily, thinking I would return to them later till I am stopped at such entries as "Possible confusion" (page 138). Hey, it is not just Gray - I said to myself - it is more than that. Gray for instance would not tell us that Hyoids can frequently be mistaken for immature vertebral sections (incidentally I could not find this information even in Krogman!). This book not only tells us that they can be confused together but even how to differentiate between the two. On more careful scanning I find that "Possible confusion" is a regular feature in all chapters. It tells us how we can confuse two fragments of different bones and how best we can differentiate between them. Obviously the anatomy portion has been written with a forensic audience in mind, a fact which makes the book more useful to forensic people like me. It would for instance leave out unnecessary and irrelevant anatomical details, but at their expense would expand on other details more relevant to a forensic expert. I thumb further and am faced with a number of more similar juicy bits (page 160: fragments of sternum might be mistaken for fragment of pelvis or immature vertebrae and how to avoid this confusion; page 165: A fragmentary first rib might be mistaken for an inferior ramus of the os coxae and how to avoid it; page 169: the lateral end of the clavicle can be confused with the acromion of the scapula and how to avoid that - one could go on and on).

One of the several stunning photographs in this book. The author asks us the eerie question,"Is it right or wrong for this unborn individual's remains to be curated in a museum"?



By the time I am through with the anatomy portion, I am convinced that we have a vastly more relevant anatomical details here than I had desired in the first place. Several facts appearing in this section -like the ones just mentioned - are hard to find in a book on pure anatomy (or even osteology for that matter). Another notable feature in the anatomy portion is the preponderance of high quality photographs of all bones. Generally when studying bones, one has to sit with a bone in one hand and the book in the other. While thumbing through the book in my room, I did not need to go to my museum and bring any bone back to my room. The photographs are so many - and so clear - that you simply don't need an actual bone to study. Every bone is shown in almost every conceivable perspective. Take this - there are as many as 14 photographs of ulna alone (from pages 193-197), all in different perspectives. Even smaller bones as carpals have multiple photographs. Capitate for instance has five and hamate four (on page 207).

The 14th chapter relates to recovery, preparation and curation of skeletal remains and the 15th tells us how to report on the skeletal remains. These two chapters are particularly useful to a forensic osteologist. I looked at some of the tables which caught my attention. Take for example table 15.1 on page 307. It gives us an interesting method to calculate the average measurement error. An osteologist measures the same tooth at three different periods and comes up with different figures all three times (this frequently happens with us). By an interesting calculation the writer tells us that the degree of error is about 2%.

Vandalism of osteological remains in an archaeological context. The author shows us this photograph in the section on "ethics in human archaeology"



Table 15.3 gives us such exotic cranial indices as *Cranial module* (to the curious, it is cranial length, breadth and height added and divided by 3. I never heard of this before, but could immediately see its usefulness). There are several more interesting indices, and the reader -especially those working with skulls- would be particularly interested to go through them.

A topic often neglected in most osteology texts - even those dealing with forensic osteology - is that on ethics. Surprisingly I find a complete chapter (chapter 16) on this. We are greeted with a very interesting photograph in the beginning itself - that of a human hand holding a very tiny human skull. It belongs to an unborn baby. The author asks an interesting question - is it right or wrong for the remains of such an individual to be curated in a museum.

More practical aspects of ethics are dealt with later. Osteologists are advised not to overinterpret their findings merely to suit some situation. Now this is an ethical issue which is of a very practical relevance. An interesting example is given from the 1970s when US was involved in a bloody war with Vietnam. Sometime in 1972, an American C-130 gunship was shot down over Laos. Thirteen men were traveling in it, and they were all counted as MIA - Missing In Action. Over ten years later, some 50,000 pieces of bones were recovered from the crash site. Expert forensic osteologists examined these bones and concluded that the remains did belong to those thirteen men. The remains were given to the next of kin of deceased, but they were not convinced. They requested for a repeat examination, and it turned out that the former team had overinterpreted their findings. The pieces of bones were mostly 1 cm in size, and it was impossible to make such far reaching deductions from them.

Another eye-catching photograph from this book. This one shows artificial cranial deformation by the prehistoric Peruvian people as a part of their cultural practice. The book contains many more such photographs



Now this is an ethical issue in osteology which has to be addressed. The chapter dwells on several such issues, and even on some relating to Human archaeology and paleontology. The issue of vandalism is discussed in some detail, as that of NAGPRA (Native American Graves Protection and Repatriation Act). The author says (on page 332),"In the face of this catastrophic and irreversible decimation of the past's only record, the reburial issue is a costly diversion for all parties."

Further chapters give us details on how to determine age, sex and stature of the individual from bones, osteological and dental pathology and how the skeleton can get modified postmortem.

Chapter 21 is very interesting, giving us details on molecular osteology. This is a portion which many of us are not very familiar with. We are told that DNA can now be extracted from bones, and such parameters as sex, diseases and species of the individual determined. At the end of this chapter we are through with anatomical, forensic, archaeological and paleontological aspects of bones. What do we see now? Perhaps the juiciest portion of the book - actual case studies. Next six chapters are devoted to case studies: There are two forensic case studies, two archaeological and two palaeontological. They were so interesting that I went through them in one go. Let me give you the details of the first forensic case study. A nightclub owner Chuckie kills his friend Harry Jones and puts him in an incinerator where animals are burned. The police get a whiff of it, and recover 163 human bone fragments from the incinerator. How do the investigators prove the guilt of Chuckie from these? Well, I won't spoil the fun. Perhaps one would like to buy the book and find out for himself. Moreover there are five more such case studies.

How would I rate the book? In one word - Superb.

This book is going to adorn my bookshelf for the rest of my life. And next time I am stumped in a case involving bones, this is the book I am going to refer to!

Developmental Juvenile Osteology, 2000 *by* Louise Scheuer and Sue Black (Illustrations by Angela Christie)
Academic Press, Harcourt Place, 32 Jamestown Road, London NW1 7BY, UK. 587 pages, ISBN 0-12-624000-0. £106.95. Library of Congress Catalog Card Number: 99-67565

In many ways, this books serves as a complement to the above book. While the above book stresses more on adult bones, this one stresses on those of the fetus and young child. An aura of erudition surrounds you when you open this book. As I thumbed through its pages, I came to the conclusion that this is one of the most comprehensive books ever written on Juvenile osteology. But the book gives you more - it goes on to describe bones even of the adult. This is done primarily for recapitulation, which is a good idea.

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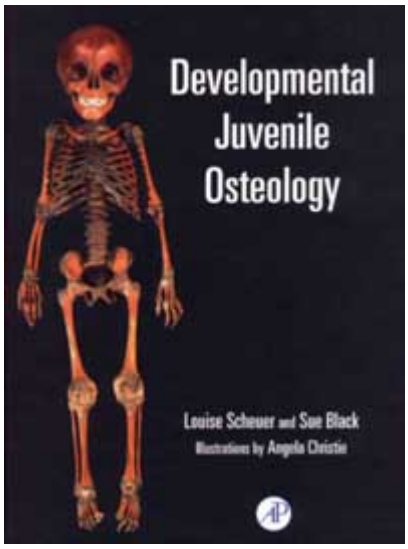

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The book has eleven chapters, the first four of which are introductory in nature. It starts with a chapter on "skeletal development and aging", in which concepts like chronological age, skeletal age and dental age are clarified. For instance clinicians such as those doing orthopedic surgery or those treating their patients with growth hormone would mostly be interested the skeletal ages of their patients irrespective of their chronological age. Chapter 3, is on bone development which is primarily intended for refreshing the memory. Chapter four is very small. It is on "Early Embryonic development", and is also intended for the same purpose.

The actual bones are described in chapters 5-11. Each bone is described under four sections: Adult bone, early development, ossification and practical notes. In the first section, the adult bone is described with several high quality diagrams. The idea is mainly recapitulation of key terms used in the study of that particular bone. The section on "early development" deals with the development of bone from the blastemal stage upto a point just before the commencement of the first ossification center. The third and fourth sections are perhaps the most informative, and contain information hard to find in other books. For instance in the section on ossification, you get to know of ossification details not only of large bones, but even of such small bones as hyoid, stapes, incus, malleus, distal phalanges and even inferior nasal concha!

Not long ago we ran an article on Age estimation (in a previous issue of this journal to be exact), and I had to do a lot of research for that, especially to find out the ages of ossification of various bones. Now I realize that if I had had this book at that time, I could have done a much better job (and much quicker!). The reason is that this book gives very vast and detailed knowledge of ossification centers of all conceivable bones of the body. This information is not easy to find otherwise.

...The main thrust of this book is on "bones", but the authors prefer to discuss the development of teeth too. I found this particularly interesting, since just like ossification centers, the information on the development of teeth can also be utilized for age estimation...

The book stops not just at bones. It describes every structure that can ossify. I was amazed to see a section on larynx (page 165-170). Its ossification is described in great detail, with many erudite references. We all know that laryngeal cartilages do ossify in old age, but most of us - certainly I -

do not know of the age ranges when they ossify. For the first time, I read such a detailed discussion on ossification of laryngeal cartilages.

The section on "practical notes" makes this book an excellent field manual too. These practical notes tell us how to side the bones, and how to orientate them to achieve correct identification of the skeletal element. There are also sections which tell us how we can avoid confusion amongst two different fragment of bones which are very similar looking. For instance, how do you differentiate metatarsals from metacarpals, especially when they are fragmented? What about manual and pedal phalanges? Answer: Metatarsals are usually longer than metacarpals, with straighter shafts that are compressed in the mediolateral direction. Heads of the metatarsals are also compressed in the mediolateral plane. The books goes on to describe several more differences between the two. After I was through with this section, I could easily differentiate the two without any difficulty. The book is full of such practical tips.

The main thrust of this book is on "bones", but the authors prefer to discuss the development of teeth too. I found this particularly interesting, since just like ossification centers, the information on the development of teeth can also be utilized for age estimation.



One of the features of this book that interested me very much was the derivation of various names of bones which are scattered throughout the book. As a lover of medical words, this feature had to interest me, but I believe even a non-initiated would find these very interesting. These are given as footnotes in a somewhat smaller font. Sample just one of these nuggets and you would know what I am talking about: Why a fontanelle is called so? Well, mediaeval surgeons used to treat brain and eye disorders by the application of cautery at the side of the fontanelle. They would keep the wound open by applying irritants over it. The blood from within welled up and brought forth all the "poison" from inside the body. This must have looked like a little fountain to several ancient doctors, and hence the name (Fontanelle in French means "little fountain" - Page 107).

The sketches are nicely drawn and very informative. The bibliography is very extensive and that is what makes it truly a scholarly book. It runs in 87 pages (from page 473-559). I did not count the actual references, but there must be thousands. And they are not just from contemporary authors. Papers as old as 300 years have been cited. This might appear strange to many, but at second thoughts it is not so. There are many interesting revelations in this too. For instance I did not know that someone as far back as 1836 had said that if the first permanent molar had not appeared, then the child is less than 7 years (for the curious, the reference is "Thomson A.T. (1836). Lectures on

medical jurisprudence now in course of delivery at London University. Lancet 1:281-286). This can serve as a very good historical document.

Who will benefit from this book most? I would heartily recommend this book to all practicing osteologists, anthropologists, archaeologists, anatomists, dentists, paediatricians, orthopaedicians and of course forensic experts. Research scholars doing research on bones and especially on ossification centers would find this book particularly interesting. In addition, bright medical students, who want to impress their faculty with their exhaustive knowledge on osteology would welcome this book too. This book should adorn the bookshelves of all these professionals.

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