BOOK REVIEWS

Pinhasi, R.& Mays, S. (eds.). 2008. Advances in Human Palaeopathology. – Hoboken, John Wiley & Sons, Ltd.

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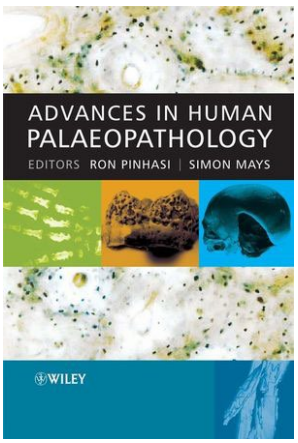

Paleopathology, as a science, has a deep and rich history, and most so for that which is focused on humans. Cases of pathologies in mummies, ancient buried skeletons, and even simply historical records are abundant, and have been praised not just for helping us understand the history of disease, but also in the role they play in humanizing history and historical figures. But this focus on cases has resulted in little available literature and direction in methods that are not simply the methods used by modern pathologists. While the interpretation of paleopathologies has had some very helpful standardization (Buikstra & Ubelaker, 1994), as well as discussions on theoretical limitations and opportunities in how they should be interpreted in animals in an evolutionary context (Beatty & Heckert, 2009, Beatty & Rothschild, 2009, Beatty & Dooley, 2010, Wolff, 2008, Wolff, 2009), methodologies used with modern technologies are largely relegated to the primary literature. In Pinhasi and Mays's recent edited volume, "Advances in Human Palaeopathology", we get a comprehensive collection of all the most up to date reviews on modern methods used in paleopathology of ancient humans. The book is organized in two parts: Analytical Approaches in Palaeopathology (chapters 1-9) and Diagnosis and Interpretation of Disease in Human Remains (chapters 10-16). Here I will review these chapters for their content and how they may be utilized by vertebrate palaeontologists.

Turner-Walker's chapter (1) on chemical and microbial degradation of bones and teeth should be especially interesting to palaeontologists, as it covers much of what is important in studies of taphonomy. Unfortunately, this chapter is focused so much on an archaeological context that techniques such as rare earth element (REE) analysis (MacFadden, et al., 2007)

and other methods for the study of exceptional preservation (Schweitzer, et al., 2008) are not covered.

In contrast, Pinhasi and Bourbou's chapter (2) on skeletal assemblages and how representative they are of ancient populations is a useful review of concerns that all paleobiologists should have about their interpretation of fossil populations, and coupled with some thoughtful studies of paleodemography of fossil populations (Mihlbachler, 2003, 2005), this should serve as inspiration for many more paleodemographic studies. This is especially true of their discussion of the "Osteological Paradox", a concept that paleopathologists have struggled with for years, yet one that rarely gets the attention of vertebrate palaeontologists in their interpretations of fossil animal populations. Epidemiological approaches are covered in Pinhasi and Turner's chapter (3), providing a solid review of how one can interpret the development and spread of disease in archaeological populations. Much of the same concerns brought up in Chapter 2 apply here, as do the benefits to vertebrate paleobiologists.

Grauer's chapter (4) on macroscopic analysis and data collection reviews the fundamental methods that have been used in paleopathology for decades, and the one that still dominates most current studies of paleopathology of fossil vertebrates. However, beyond a review of the methods used, Grauer does an excellent job of critically evaluating the disparity in how these methods are applied and provides significant advice toward how the field could standardize data collection so that studies are comparable. As simple as this may seem, because of the pervasive nature of macroscopic paleopathology in vertebrate paleopathology studies, the discussion included here has the most potential to have a profound positive impact on the field.

Radiography in paleopathology by Mays (Chapter 5) is a comprehensive review of the history and methods used for archaeological remains, including radiogrammetry and densitometry. The coverage of bone mineral density (BMD) is quite good here, though the dismissal of diagenesis as a factor makes it clear that use of the term "ancient" in this chapter is relative, and not meant to include fossils of significant age (older than Quaternary?). Lynnerup's chapter (6) on the use of computerized tomography (CT) is similarly thorough and up to date, yet also limited to human archaeological specimens. Turner-Walker and Mays's chapter (7) on histology of ancient bone is very inclusive of studies of other animals besides humans, and is equally as thorough and honest about limitations. The coverage of the interpretation of traditional histological methods is incredibly thorough in this chapter, and its prospectus on the uses of more advanced imaging techniques such as scanning electron microscopy (SEM), atomic force microscopy (AFM), near-field scanning optical microscopy (NSOM), and confocal laser scanning microscopy (CLSM) is insightful, though lacking in coverage of CLSM in the study of tooth wear (Scott, et al., 2005)as well as volume-rendering histological methods that have been mostly utilized by developmental biologists using software such as WinSURF (Smith, 2001). In general, these three chapters on imaging methods is a setoff criticial reviews on the strengths and weaknesses of these methods that most vertebrate palaeontologists would significantly benefit from reading.

The following chapters on molecular paleopathology of infectious disease (8, by Donoghue) and databases (9, by White), are less practically useful for vertebrate palaeontologists aside from parallels that can be made. Molecular paleopathology could be done more broadly on fossil and subfossil non-human animals, but has been limited thus far (Bathurst & Barta, 2004). The chapter on databases is thorough in its coverage of how archaeological specimens of paleopathology are curated publicly on or off the web, but this has little use to vertebrate palaeontologists other than as an example of what could/should be done with the paleopathological record of fossil animals. I personally feel that the growing movement to standardize available data on paleopathology collections described in this chapter is what should be done for fossil animal collections, without any forced nomenclatural acts of holotype designations as some have recently proposed (Beatty & Rothschild, 2009, Wolff, 2008, Wolff, 2009).

The second section, "Diagnosis and Interpretation of Disease in Human Remains", starts off with a chapter (10) by Ortner on differential diagnosis of infectious disease. Ortner's treatment of this topic starts off with two tables that summarize the challenges of macroscopic identifications in paleopathology – (1) recognition of diseases that can possibly affect a skel-

eton, and (2) a matrix of all the possible physical manifestations of these diseases, many of which occur from more than one disease. The key to differential diagnosis is that the identification be based on a co-occurrence of several physical manifestations. Ortner urges caution in these identifications, and considering the difficulty in finding adequate material of an associated individual, this caution should be especially heeded when considering fossil taxa in deeper and deeper time.

Mays's chapter (11) on "Metabolic Bone Disease" is focused on the four primary types of these diseases in humans: vitamin D deficiency (rickets and osteomalacia), vitamin C deficiency (scurvy), osteoporosis, and Paget's disease of bone. Mays likewise emphasizes the challenges of differential diagnosis here, especially with regard to the identification of such diseases in infants and elderly individuals.

Brothwell's chapter (12) on tumours and tomour-like processes is an excellent update on Brothwell's classic review of more than 40 years ago (Brothwell & Sandison, 1967). Being limited largely to tumours that affect skeletal tissues, Brothwell likewise cautions that "we are only viewing the skeletal shadows of past soft-tissue tumours." But this is not meant to discourage, and he finishes it with comments on some stimulating thoughts on the role of tumour paleopathology in other animals.

The chapter (13) "Advances in the Palaeopathology of Teeth and Jaws" by Ogden is perhaps my favourite of the book, though I am admittedly a bit biased toward dentition. His treatment of enamel hypoplasia is clear, and his thorough discussion about periodontal disease, including a new system for scoring it, is very useful. I found his description of the differences between granulomas versus chronic abscess causes of periapical voids to be handy as well, as well as his caution for a need for histological and radiologic examination of these features to confirm their identity and simply presence or absence. Lastly, Ogden finishes up with not only a summary, but suggestions for future work that could easily consume the research lives of many people for generations to come. Thank you!

Bennike's chapter (14) on trauma describes the nature of fractures, dislocations, trepanation, and decapitation, with a brief review of trauma in the earliest European populations. Though this chapter is clearly focused on details relevant to humans, including forensics to some degree, the initial couple of pages of description of the nature of bone fractures can easily be used for other mammals as well, though it is lacking in figures that convey the textural differences between green and post-mortem fractures that the author describes in the text. Of the entire chapter, perhaps the most useful statement for the vertebrate palaeontologist may be, "The most useful criterion for the identification of an ante-mortem fracture is the presence of bone healing." Considering the number of broken fossils in existence, it should come as no surprise that the study of trauma in fossils as one gets deeper in time makes the need for signs of healing even greater to be certain of ante-mortem trauma. Incidences like this are rare, but do exist (Beatty & Dooley, 2009).

The chapter (15) on congenital anomalies by Barnes treats abnormal patterns of ontogeny by skeletal element/region individually, starting with the skull. Though I would expect that a table listing known syndromes and their skeletal manifestations would have been important to human palaeopathologists here, no such review of this sort of information is comprehensively conveyed here. There are some great descriptions of common abnormalities such as cleft lip, bifurcated ribs, spina bifida, Klippel-Feil syndrome, sterna apertures, and clubfoot. The author finishes with some enticing comments on applications of morphogenetic approaches to congential anomalies and questions about whether the anomalies may simply cause pathology and are themselves non-pathological, something I see as a compelling and important distinction (Beatty & Heckert, 2009).

The last chapter (16) by Pinhasi on growth in archaeological populations is perhaps the least useful to the vertebrate palaeontologist because it so clearly focuses on matters relevant to Holocene specimens, such as how ontogeny can be affected by stresses within human populations. But, among all of these chapters this may be a model for how we should hope to approach palaeopathology in fossil taxa that we have in abundance, such as Pleistocene taxa. Pinhasi's morphometrics of human populations by age from different populations clearly shows groups that were under stresses that we can confirm from historical records. If the same could be done for fossil populations using the

abundant morphometric data vertebrate palaeontologists are already adept at compiling, perhaps one might get a clearer understanding of the stresses of fossil vertebrate populations during periods of climate change or exposure to humans. Perhaps this, moreso than a couple of ambiguous cut marks on some bones, may help answer questions about the causes of Pleistocene extinctions in North America.

Overall, the quality of the chapters is surprisingly consistent, with detailed discussions of methods and their interpretation and meaning that is appropriate for each subject. The subjects covered are vast, and though some specific discussion points might be most applicable specifically to humans, human culture, or Holocene studies, I found that almost all topics were treated in ways that one could be translated to non-human animal studies and to fossils. Aside from work that relies on historical records or culture, most everything discussed here can have at least some methodological relevance to work with zooarchaeological and fossil vertebrate paleopathology, or are at least useful for causing one to think twice about what data is missing or inappropriately interpreted when using similar technique for fossils. I highly recommend it for anyone seriously engaging in palaeopathology studies, whether of humans or other vertebrates.

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