

Our Bones: The Need for Diverse Human Skeletal Collections

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As a forensic anthropologist my job, career and reputation literally depend on knowing the human skeleton inside out. But my work requires more than simply being able to distinguish human from non-human remains, or a fragment of a radius from an ulna, to consistently and accurately estimating a person's age at death, ancestry, sex, stature, identity, trauma and disease by examining their bones and teeth. Becoming a skilled physical anthropologist, therefore, requires years of education, training, and experience studying known-identity skeletons, as well as documented examples of disease and trauma. The foundation for much of this training rests on the availability and accessibility of large and diverse human skeletal collections from around the world.

Although my degree is in physical anthropology I have worked in a morgue, a museum, and for the past 21 years a U.S. government laboratory tasked with finding, recovering and identifying American servicemen and women missing from past wars. To become a better practitioner and forensic anthropologist, I have spent much of my career in skeletal collections and university libraries reading about the history of medicine and anatomy and their founding luminaries. My goal has been to gain better insight into where we were 150 years ago, what we've learned in the interim, and how we as scientists have gotten to where we are today. I am fascinated by the scientific accomplishments of the 1800s and I use the early literature both as a measure of our past and as a resource of "what we already know, but may not be aware of," so to speak. Knowing what has been found many years ago may prevent us from thinking we've discovered some rare bone variant or skeletal anomaly that our forebears reported on long before we were even born. My guess is that many readers have "discovered" a new technique or rare skeletal variant only to find that it was developed or discovered and reported on decades or even centuries ago.

The literature, however, is merely one aspect of the resources available to researchers around the world. Becoming an expert in physical and forensic anthropology, for example, is based in great part on the availability and accessibility of large, diverse skeletal collections housed in public and private universities and museums internationally. It seems odd and not a little frustrating, therefore, that some skeletal collections are actually shrinking, not just in the number of skeletons available that are for study, but in their funding and space as well. This editorial, therefore, is my expression of the importance, utility, and necessity of maintaining skeletal collections, each of which imparts unique contribution to medicine, anatomy, trauma, genetic inheritance, and the many subtleties of human skeletal variation that make each of us different.

But enough of my background as an anthropologist, let's return to the focus of this editorial...the need for the availability and access to large, diverse skeletal collections. These skeletal collections hold the answers to untold questions of importance to clinicians and anthropologists. That these collections need to be both large and diverse geographically and temporally is critical if we want to better understand, interpret and document what I call the human skeletal triad: trauma, variation and disease.

We know, for example, that trauma and disease come in all shapes, forms and severity and that their frequencies vary from one region of the world to another. As a result, it is likely that every skeletal

collection reveals differing types and degrees of disease, trauma and minor skeletal variants that reflect the populations from which they were derived. One skeletal collection may have an abundance of trauma, while another may not. A skeletal collection in Thailand, for example, may contain the skeletons of many individuals who recently died of tuberculosis or leprosy, while the collections in the U.S. would represent these diseases affecting the population in the earlier parts of the 20th Century. Diversity, therefore, is an integral reason for establishing and maintaining large skeletal collections around the world. I learned just how diverse and invaluable skeletal collections are when I started writing my first book on bone disease in the 1980s. What I found, perhaps not surprisingly, was that some museum and university collections had specimens that I was looking for, while others did not.

Having laid a brief foundation for the importance of establishing and maintaining museum and university collections, I would now like to highlight a few examples of the composition of a few institutions that I have visited and the types of information they possess.

University of Tennessee, Knoxville (Department of Anthropology) - The William M. Bass Donated Skeletal Collection holds the remains of nearly 1,000 contemporary known-identity individuals, many of which are accompanied by detailed biographical information that includes health and disease, cause of death, ante-mortem trauma, occupation, socio-economic status, and habitual physical activities, among others. The skeletons, which include some infants and neonates, have been measured and the data entered into a large skeletal data bank (Forensic Data Bank) which most all the 20th-Century individuals are used in the FORDISC analytical software used to estimate ancestry, sex and stature. This data bank has become of the premier research tools for forensic anthropologists, anatomists, law enforcement and medical-legal authorities internationally. The University of Tennessee also supports the Anthropology Research Facility, sometimes referred to as the "Body Farm," the first of its kind devoted to the study of human decomposition. It is an ongoing research facility as well as a training center for anthropologists, law enforcement and medical examiner personnel.

Pretoria University, Pretoria, South Africa - The Department of Anatomy houses a large skeletal collection (1000+) of known-identity Africans, many of whom were victims of homicide, revealing a high frequency of healed trauma, such as to the nasal region (broken noses) and gunshot wounds and sharp force wound injuries. Although my research did not focus on femoral curvature, I quickly noticed that many of the femora were more bowed anteriorly than I had expected.

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I was surprised to see such bowing, given that the believed convention is that Blacks are usually reported as having straighter femora than Whites. This collection also contains excellent examples of burned bones, blunt force and combat trauma to the skeleton. The university also has the Forensic Anthropology Research Centre (FARC) which is devoted to and covers many aspects of forensic anthropology, especially cases involving violent crime and missing persons.

The Ditsong Museum, National Museum of Cultural History, Pretoria, South Africa – During my short visit to this museum I examined the skeletons of many San Bushmen (Khoisan), a group known for their small body size and short stature in both sexes. The collection, which contains many crania from the Ditsong Museum when it was known as the Transvaal Museum, and exhibited many examples of dental disease based on an abrasive diet. The museum also has an extensive archaeological collection of cultural artifacts including arrows, baskets, weapons, beadwork and pottery, among other items.

Smithsonian Institution, National Museum of Natural History, Washington, D.C. – Large, diverse skeletal collection of about 30,000 individuals from around the world. This collection was recently moved to the Museum Support Center (MSC) in Suitland, Maryland, a move from its historic “home” at the Natural History Museum on the Washington Mall. The unique aspects of the Smithsonian’s collections are many and unparalleled. For example, the Robert J. Terry Anatomical Collection (cadaver series from the 1920’s through 1960’s from the St. Louis, Missouri region) crosses the discovery and use of penicillin, the advent of dental treatment by fillings and reconstructions and fillings, the advent of surgical prosthetic implants, before and after the atomic bomb for isotope analysis (this is also found in the Mildred Trotter hair collection). The George Huntington Anatomical Collection (1893 through 1921+) a cadaver collection which derives from immigrant populations coming to New York City, reflecting high rates of trauma and the health and disease effect of dense, overcrowded living conditions. The physical anthropology division houses skeletal assemblages amassed by Ales Hrdlicka during the first part of the 20th Century focusing on his research in the peopling of the Americas (from the northern Asiatic steppes) Mongolia and Siberia) to the furthest ends of South America (Peru, Argentina and Terra del Fuego) as well as assemblages from Egypt, western Asia and eastern Europe (many of these the only collections of these types found in the U.S.), There are diverse population groups of North American Indians (approximately 14,000) from excavations done in the 1920’s through the 1960’s. There is a Fetal Osteology Collection (approximately 300 known specimens) affording researchers the rare opportunity to examine fetal remains of all ages in pristine condition. The physical anthropology collections have many examples of interpersonal warfare, ethnic/ancestral variation, and cultural modification (trephation, cranial modification and dental modification). Because of the Smithsonian’s vast natural history holdings there are comparative skeletal anatomy collections of all species of animals from around the world, for anthropologists, other anthropoid species of greater and lesser apes and old and new world monkeys and animals found in zoo-archaeological assemblages.

Khon Kaen University (KKU) Medical School, Khon Kaen, Thailand – The university holds more than 700 known-identity contemporary Thai skeletons obtained through the medical school’s donated body program. Most of the donated bodies are of individuals from the Issan region of Thailand. Many individuals exhibit untreated and advanced stages of cancer, as well as trauma from motor vehicle accidents. Many of the skeletons, primarily middle-age and elderly and including Thai monks and some faculty members are accompanied

with patient records and ante-mortem photographs. This is an excellent study collection for documenting skeletal variation in Thais.

Chiang Mai University (CMU) Medical School, Chiang Mai, Thailand – This collection consists of more than 1,000 contemporary, known-identity Thai skeletons, primarily from northern Thailand. Like the KKU osteology collection, there are many examples of individuals who died of untreated or advanced stages of cancer and motor vehicle accidents as well as normal skeletal anatomical variants . Many in the collection are accompanied by patient records and ante-mortem photographs; most in the collection are middle-aged and elderly skeletons, including Thai monks and previous university faculty obtained through the CMU donated body program. The KKU and CMU collections are superb resources for comparing the skeletons of Thais from Central and Northern Thailand.

Hamann-Todd Osteological Collection, Cleveland, Ohio – This collection consists of more than 3,000 cadaver skeletons of lower socioeconomic Whites and Blacks, primarily middle-age and older, from the Cleveland area who died in the early 1900s. There are many examples of trauma and untreated or advanced stages of infectious and tumorous disease. Due to modern preservation treatment done in the 1980’s, the skeletons are in an excellent shape, and most are free of any greasy residue that sometimes accompanies osteological cadaver specimens. The museum also houses a large collection of mammalian and non-human primate skeletons.

National Museum of Health and Medicine, Washington, D.C. – Established in 1862 as the Army Medical Museum and Library, this museum contains an extensive collection of bones exhibiting battlefield trauma sustained in the American Civil War (1861-1865). There are many pathological specimens and skeletons that serve as an excellent resource for studying infection and healing rates in bones, battlefield (primarily Civil War) trauma and skeletal fractures in young males, as well as soft-tissue pathology. One unique aspect of the skeletal specimens from the Civil War is that there are records revealing the date the soldiers were injured and their limbs were amputated, as well as when they died, often from infection. The museum also houses the Otis historical archives and military medicine and holds a vast collection dealing with the history of military and civilian medicine and pathology. This is a unique source of battlefield trauma, amputations, disease and a plethora of medical oddities collected over the years by donations by U.S. medical schools.

Mütter Museum of the College of Physicians, Philadelphia, Pennsylvania – Opened in 1863, this private museum has an extensive collection of pathological specimens, many with patient histories and records. The museum also houses the Hyrtl collection of 139 human crania, an extensive collection of medical instruments, anatomical and medical oddities, birth defects and developmental anomalies, prostheses, examples of unusual and rare bone disease and trauma, soft tissue disease (some in wax models), wet-tissue examples and samples, anatomical teaching specimens, amputations, an extensive vintage medical library and much more.

University of Pennsylvania Museum of Archaeology and Anthropology, Philadelphia, Pennsylvania – This university collection houses more than 10,000 skeletons from around the world, including an extensive collection of crania from Peru and Chile, the Samuel Morton Collection of more than 1,500 crania and more than 250 skeletons from Iran. There is a CT scan database of many crania in the collection and numerous examples of artificial cranial deformation. The university houses a fascinating collection of early human crania.

[What about some of the other collections you have visited such as Vienna, those in Germany? and what about collections like Coimbra or Spittalfields or others, have you been to them?]

I hope this editorial provides you readers with a brief overview of the holdings of what they may expect to see in these collections, as well as their importance to anthropology, medicine, anatomy and the many

other disciplines that help us better understand the human condition. What I've presented is a mere thimble full of what these museums and university collections house and the kinds of information they may impart to researchers and my search at other institutions continues. The bottom line is that to lose any of these skeletal collections would be an irreplaceable and tragic loss both to science and the world. Thank you.

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