THE SAMUEL GEORGE MORTON Cranial COLLECTION

Historical Significance and New Research

BY EMILY S. RENSCHLER AND JANET MONGE

Although few visitors to the Museum would know this, the Samuel George Morton cranial collection at the University of Pennsylvania Museum of Archaeology and Anthropology is one of the most famous collections of human skulls in the entire world. Its presence in Philadelphia is the result of the collecting activities of Samuel George Morton (1799–1851), a Philadelphian who actively participated in the vibrant medical and scientific community that spanned the Atlantic Ocean in the early 19th century.

At age 17, Morton began attending lectures at the University of Pennsylvania Medical School. Earning his medical degree in 1820, he became a member of the Academy of Natural Sciences of Philadelphia—an organization with which he would stay closely affiliated for the rest of his life. After returning home from a trip to Europe, Morton began his medical practice in Philadelphia in 1824. A sophisticated and esteemed young doctor, he soon rose to prominence in the local medical community and became a professor of anatomy at Pennsylvania Medical College in Philadelphia.

Morton's special interest in crania may have originated in 1830 during his preparation for an anatomy lecture titled "The Different Forms of the Skull as Exhibited in the Five Races of

Samuel George Morton (reproduced with the permission of the American Philosophical Society).

Men." Intending to present a lecture illustrated with examples of the skulls of the five racial categories recently developed by the German anatomist Johann Friedrich Blumenbach (1752–1840), he quickly realized he did not have sufficient examples to exemplify each group. This experience served as a catalyst for his lifelong desire to collect crania from all over the world in order to provide examples of as many geographic areas and different cultural groups as possible.

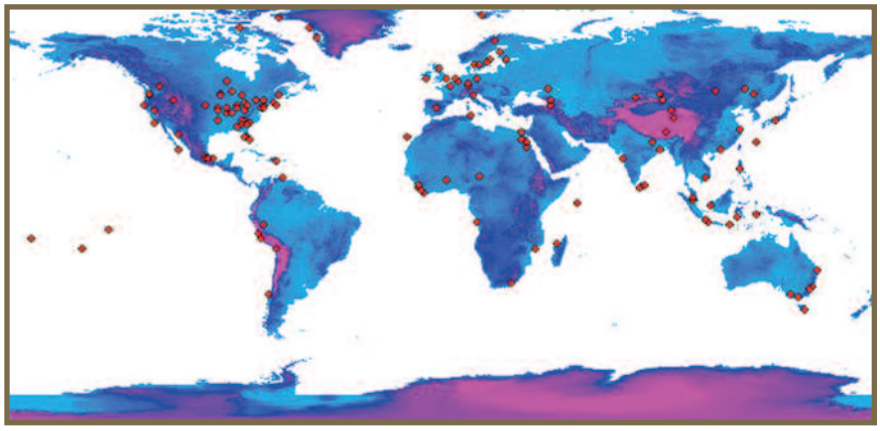
His letters reveal that in 1832 he sent one of his first inquiries to a scientific colleague seeking to obtain crania of various races for his collection. Just one year later, Morton remarked in correspondence that his cranial collection was nearing 100 specimens and included "peoples of many tongues." Thanks to his genial personality and stature as a member of the Academy of Natural Sciences, Morton was able to correspond with leading scientists all over the world—a key factor in the development of his collection and scholarly contributions.

Amassing the Collection

Morton's correspondence—now housed in the American Philosophical Society as the Morton Papers—indicates that his worldwide connections included as many as 138 contacts, from scientific colleagues to merchants, military figures, and missionaries. As William Stanton has observed, "His wide scientific correspondence, especially with army surgeons stationed at remote frontier outposts, brought him crania from every state, territory, and nation . . . ." His contributors were proud to be a part of an important scientific enterprise; one that gained increasing prominence as the years passed.

Morton's collection soon became the largest of its kind in the world and earned the nickname "the American Golgotha" in scientific circles. Indeed, the endeavor was so significant that army surgeons stationed in remote areas of the world would take great risks to obtain crania for Morton, and they were not above robbing graves in order to do so!

Morton's success in collecting crania is particularly remarkable in light of his own frail health and limited travel within



Morton obtained crania from every continent occupied by humans. Using information from Morton's correspondence, Jason Lewis (a former undergraduate in the Department of Anthropology at Penn) spent many long hours identifying each specimen's longitude and latitude to produce this map.

Jason Lewis

Morton's *Crania Americana* contains hundreds of hand-drawn illustrations of human skulls from the Americas. The details are so accurately reproduced that areas of bone resorption around the back teeth are meticulously shown. This plate shows a relatively rare specimen from the collection since both the cranium and mandible (the two elements that compose the skull) of a single individual are depicted. The vast bulk of the Morton Collection contains only the cranium with no attached mandible (reproduced with the permission of the American Philosophical Society).

Europe and the West Indies. His personality, however, garnered him loyal friends, which was an important aspect of his collecting since the integrity of his collection ultimately rested upon their reports of the context from which each cranium came. As Stanton notes, Morton "had to rely upon correspondents for the circumstances of the discovery of a particular skull, its situation in the earth, the geological conformation of the site, and their opinion as to the tribe to which it belonged."

Each shipment of crania had its own unique story, often connected to dramatic historical events. In her essay, "The Curious Cabinet of Dr. Morton," Ann Fabian points out how forces such as war and disease helped Morton's collaborators obtain crania. For example, one man assigned to the U.S. Army in Florida picked over the dead of the Seminole war, sending Morton two "fine" Seminole skulls left unburied after the battle of Lake Okee-Chobee, while another contact happily forwarded Morton the heads of four of the 630 Mexican soldiers killed in 1836 during the battle of San Jacinto fought between troops of the Mexican General Santa Anna and the Texan Sam Houston.

Morton's Science

Like most of his scientific contemporaries, Morton was a scholar of diverse interests. In the course of a relatively short

A HISTORICAL OSTEOBIOGRAPHY OF THE AFRICAN CRANIA IN THE MORTON COLLECTION

by Emily S. Renschler

L-606-968. Negro, Born in Africa. This labeling system is characteristic of all of the Morton specimens. The original Morton Collection number is "968." The "L-606-" prefix was added after the collection was transferred to Penn in the mid-1960s (L = loan; 606 is a consecutive loan series number specific to the Morton Collection within the Penn Museum's cataloging system).

The African crania in the Morton Collection were especially important to Morton's original study since they constituted the majority of the "Native African" sample that Morton found to have the smallest cranial capacity of all the world groups he measured. Yet, despite the significant and lasting impact of Morton's conclusions regarding Africans, almost no attention has since been paid to the specific details of his African sample. Previously, little has been known about the identities of the people represented, their sex and age distribution, or even how these crania came to be a part of his collection.

To rectify this situation, I embarked upon a study of these crania in order to construct biographies of the individuals within this sample. Using an approach called "historical osteobiography" that integrates skeletal data with historical information, I hoped to learn more about the individuals represented in Morton's Collection and provide a richer understanding of his findings and their impact upon the anthropological community. Furthermore, since this sample is one of a small number of skeletal collections from the African Diaspora, I also hoped to provide important data for comparative studies with other contemporary skeletal populations.

Morton's catalogue reveals that his group of "Native African" crania—labeled as such by Morton and numbering 50 in total—was shipped to him in 1840. Archival research into his personal letters provides additional detail, highlighting the complex history of the slave trade and the role it played in creating Morton's Collection. Specifically, a letter to Morton that accompanied their shipping box described the crania as coming from Africans who had recently arrived in Havana, Cuba, as part of the slave trade.

Skeletal analysis of the crania indicates that the majority of the individuals in the sample were adolescents and young adults in their 20s at the time of death. This correlates well with general historical information about the Cuban slave trade—slavers targeted these ages because they attracted the highest prices in Cuban slave markets. Unfortunately, analysis pertaining to the sex of the individuals in the sample was inconclusive due to methodological issues.

In relation to the ancestry of the individuals, craniometric data supports an African origin, as well as a high degree of heterogeneity within the sample, which is consistent with historical information that indicates that the Africans brought to Cuba came from diverse cultures and geographic areas. Further insight into the African ancestry comes from the evidence from several individuals of modified teeth—a practice found throughout western Africa during the period of the slave trade. Similarly modified teeth have been found in individuals from the New York City African Burial Ground and the Newton Plantation in Barbados.

Turning to the health of the individuals in Morton's sample, paleopathological analysis indicates that they generally grew up (presumably in Africa) under conditions that were less stressful than those they would have endured if they had lived long enough to join the enslaved populations in the New World. In terms of disease and trauma, a number of individuals showed signs of some kind of infection (which may have resulted in their death), while others showed evidence of cranial trauma (which may have occurred during the process of enslavement).

Overall, my research provides a clearer understanding of the identity and the lives of some of the people whose crania found their way into the Morton Collection. Furthermore, as perhaps the only known skeletal sample of people who were born in Africa yet died under enslavement in the New World, this research provides important comparative information for the wider anthropological community and, in particular, has generated much interest among skeletal biologists interested in the African Diaspora. In the future, I hope to probe more deeply into the history and lifeways of all of the crania in the Morton Collection.

Emily S. Renschler

lifetime he published papers in the fields of anatomy, medicine, vertebrate paleontology, geology, and craniology. For example, his first scientific publication in 1834, *Synopsis of the Organic Remains of the Cretaceous Group of the United States*, described the fossils collected by Lewis and Clark thirty years earlier. This study was the first of its kind in the United States and solidified Morton's standing in the Philadelphia scientific community.

In 1839, Morton published his first craniometry book, *Crania Americana; or, A Comparative View of the Skulls of Various Aboriginal Nations of North and South America: to which is Prefixed an Essay on the Varieties of the Human Species*, which included 71 beautiful lithograph illustrations created by John Collins of Philadelphia. Beginning with an introductory essay on the various races of man, Morton then discussed the crania and customs of the Indian nations. His book concludes with an essay by the renowned phrenologist George Combe, clearly indicating (as Paul A. Erickson has noted) that Morton was heavily influenced in his thinking by the 19th century practice of phrenology (the now abandoned field of study which used the shape of the skull to determine personality traits) and the theories of hereditarianism (a school of thought that saw heredity playing a major role in determining traits such as intelligence and personality) and polygenism (a school of thought that saw human races as created separately and unequal).

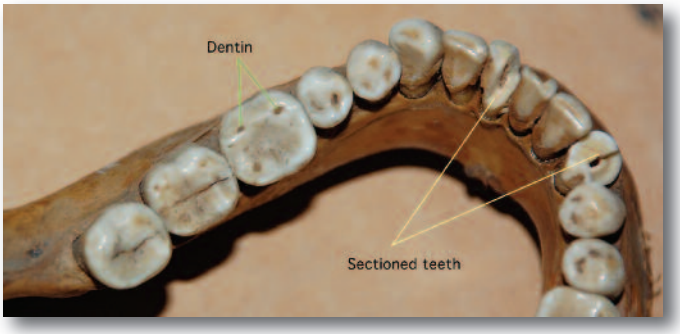
The second of Morton's major craniometry publications, *Crania Aegyptiaca, or, Observations on Egyptian Ethnography, Derived from Anatomy, History, and the Monuments*, was published in 1844. In this study, Morton extended his analysis of human races to ancient Egypt, claiming that the distinct racial differences shown in modern "Caucasoid" and "Negroid" crania were equally discrete in the past. Thus he advanced the thesis that the ruling elite of ancient Egypt had been "Caucasian," while the subservient class had been "Negroid."

As Audrey Smedley has noted, this claim clearly resonated with Morton's contemporaries, who defended the practice of American chattel slavery. Morton's belief that enslavement of blacks by whites had roots in antiquity fueled the argument for a natural order of racial hierarchy. In fact, upon Morton's death in 1851, the *Charleston Medical Journal* published a memoir stating: "We can only say that we of the South should consider him as our benefactor, for aiding most materially in giving to the negro his true position as an inferior race."

While influenced by phrenology, Morton did not wholeheartedly embrace it, trusting instead to the scientific measurement of craniometry. For example, his *Crania Americana* and *Crania Aegyptiaca* used scientific measurements to provide direct support for polygeny, whereas many of fellow supporters of polygenism applied deductions from philosophy, politics, and religion. In contrast to them, Morton believed that the scientific method and objectivity alone could be used to understand human racial variations. Yet despite the popularity of his work during his time, it did not go unchallenged by contemporary scholars such as Fredrick Douglass.

Morton's Collection

Morton's scientific career ended in 1851 with his death at the relatively young age of 52. By then, he had amassed a collection of 867 carefully prepared and labeled human crania, as well as a number of non-human vertebrate skulls. Prior to his death, a number of his friends pooled funds to purchase his collection for $4,000 and then donated it to the Academy of Natural Sciences in Philadelphia.



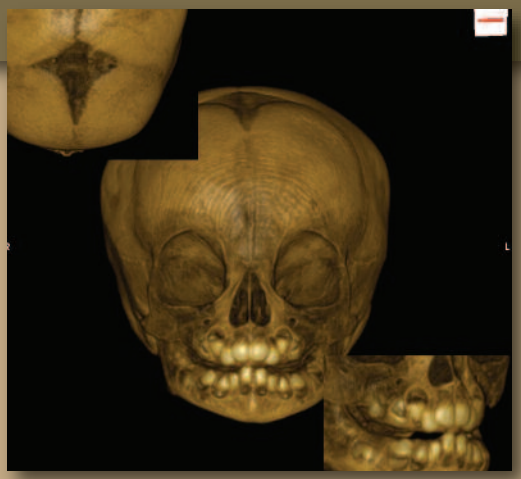
Close examination of some of the crania and teeth in the Morton Collection indicates that a series of "experiments" were preformed. Sectioned teeth, like the ones illustrated here, are relatively common. We have no idea when or by whom the samples were taken, nor have the results ever been presented in the scientific literature. Also illustrated here is the now rare phenomenon of significantly worn teeth. The darker pools of dentin are easily seen within the white mounds of enamel. People in the past wore down their teeth to a more significant extent than do people today. Many of today's researchers use dental wear patterns as a way to understand diet in the past.

James Aitken Meigs, a friend and fellow member of the Academy, continued collecting crania for the collection after Morton's death. By 1872 the collection numbered 1,225 human crania and Meigs published several editions of *Dr Morton's Catalogue of Skulls*, as well as a memoir of Morton.

Janet Monge

ORSA: THE OPEN RESEARCH SCAN ARCHIVE

by Janet Monge



This is a composite CT scan of one of the Morton Collection skulls. This youngster died at the time when its baby incisor teeth were erupting—approximately 4 to 6 months old. The inset at the bottom right clearly shows the details of the formation of each and every developing tooth. At this age, the soft spot on a baby's skull—the bregmatic fontanelle (shown in the detail inset at the top left)—is still large and open. It does not close completely until the child is about 2 years old.

In 2002 a small grant from the University Research Council of the University of Pennsylvania helped launch ORSA—The Open Research Scan Archive—a collection of high-resolution CT scans of human and non-human cranial (cranium and mandible) and post-cranial (everything bone from the neck down) remains. Now supported by a multi-year National Science Foundation grant (number 0447271) to Tom Schoenemann (James Madison University) and Janet Monge (Penn Museum), this online database (http://monge01.anthr.upenn.edu/~ctdata base/pennct) provides worldwide access to scholars interested in comparative CT scan data.

Since its inception, our CT scanning project has generated over 3,000 scans of the Penn Museum's skeletal specimens, including two dozen full scans of mummified remains in our Physical Anthropology collections. The project has also scanned numerous CT images of prosimians, monkeys, and apes from the collections of the American Museum of Natural History and Columbia University, and between 2002 and 2007, all 1,200 cranial specimens from the Morton Collection were CT scanned and entered into ORSA. Scholars can now access information about the geographic location from which each cranium was obtained, the identification of the person who collected each specimen and donated them to Morton, and the exact technical specifications of the CT images available.

Yet, besides providing an easily accessible comparative digital archive, what benefits arise from analyzing these CT scans?

One major benefit results from the fact that CT scans give accurate renditions of not only the external surfaces of a bone, but also of the internal bone structure and morphology. For example, recent studies on the origin of bipedalism (walking on two legs) have concentrated on the relationship of this form of walking and the bones found in the region of the middle ear (the malleus, incus, and stapes). These bones, as well as many other structures in the ear, relate to the ability of an individual to maintain their head balance during changes in body position. Since these bones are not visible externally on the skull, scholars must rely on high-resolution CT scans in order to analyze the nature of these bones in different specimens and thereby generate new hypotheses and interpretations about when and how bipedalism developed in our human ancestors.

Another major benefit derived from CT scans is their compatibility with mathematical analysis. Using easily available software, multiple kinds of linear and more complex measurements can be applied to the internal and external features of the CT-scanned bones to generate contours, calculate volumes, and develop even more complex understandings of the geometry of the skull. An example of the latter can be seen in Tom Schoenemann's work with the Medical Imaging Group that forms part of the Department of Radiology at the Hospital of the University of Pennsylvania. Applying techniques developed in clinical research, they have been able to compare numerous skull specimens to each other, identifying those characteristics that exist as individual elements of human variation from person to person, and then generate a complex 3D model of a 'generic' human skull that provides researchers with a baseline from which to compare future specimens. The usefulness of this generic baseline is particularly important when dealing with research questions that focus on how the skulls of males and females differ from each other. Besides providing useful comparative baselines for addressing human evolutionary studies (e.g. are we looking at two different species or are these individuals from one species but representing different sexes), this work also has important applications in forensic anthropology, where the goal is often to factor out individual differences in skulls and to identify broader patterns that might help identify the group to which a specimen belongs (e.g. male or female or this ethnic group or not).

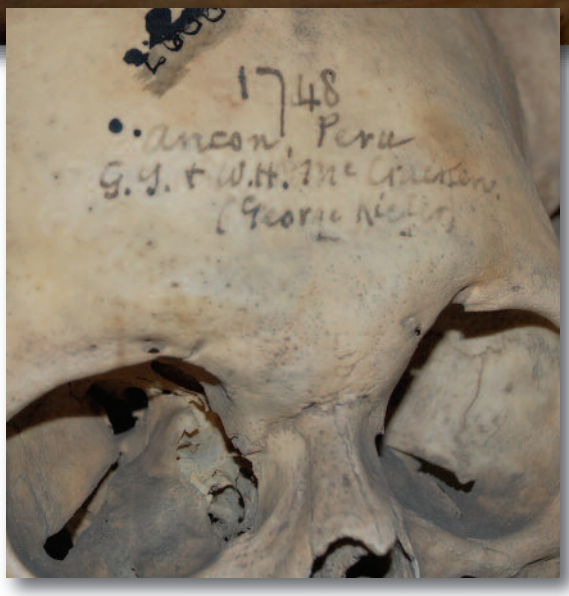
Finally, a third major benefit of CT scans is that they are digital and can be sent electronically to researchers all over the world with the press of a button. This greatly expands the number of researchers in Anthropology, Evolutionary Biology, and the Forensic Sciences with access to the Museum's Physical Anthropology collections—ORSA is thus a virtual museum of skeletal collections!

Samantha Cox

The Morton Collection has been stored in the Physical Anthropology Section of the Museum since the mid-1960s. The skulls sit row upon row on wooden shelves in metal cabinets. Within the collection there are some numbering discrepancies—some specimens have the same number, while other have multiple numbers. Morton's habit of putting the numbers onto the skulls in India ink, a practice continued by his protégé J. A. Meigs, helped keep the collection well organized over the years and during its transfer to Penn.

For many years, the Morton Collection was on display at the Academy of Natural Sciences and open to visitors free of charge on Tuesdays and Saturdays. Its fame continued throughout the 19th century and, in 1892, the Academy sent 44 of the Native American crania to Spain for the 400th anniversary of Columbus's discovery of the New World.

In the mid-1960s, the Academy of Natural Sciences loaned the entire collection to the University of Pennsylvania Museum of Archaeology and Anthropology, later converting it to a gift to our Museum where it resides today. As Ann Fabian describes it: "There they sit, a relic and residue of past science, among a disorderly collection of grinning human skulls. Morton's skulls stand out. The craniologist varnished each to a high polish, tattooed each with a Roman numeral, and attached to each a small explanatory label."



Every cranium in the collection is meticulously labeled with the consecutive catalogue number assigned at the Academy of Natural Sciences, as well as details of the geographic location in which it was collected. In some cases, like the one illustrated here, the person who supplied Morton with the specimen is also listed.

Janet Monge

THE MORTON COLLECTION AND NAGPRA

by Janet Monge

Since 1990 the Native American Graves Protection and Repatriation Act (NAGPRA) has required all organizations that receive federal funds to notify and work in conjunction with Native American, Hawaiian, and Alaskan groups (within the United States) in order to eventually return (repatriate) skeletal materials (and some artifacts) that derive from these groups' ancestors (see *Expedition* 45(3):21-27). To this end, the Museum has a fulltime NAGPRA coordinator (Stacey Espenlaub) and a standing NAGPRA committee dedicated to handling requests for information about any objects or human remains of Native American origin. As a result, the Museum has received many inquiries dealing directly with crania from the Morton Collection.

Morton's profound interest in population differences and origins led him to spend much effort in amassing a large collection of crania from as many Native American groups as possible—these were then sampled and incorporated into his definitive volume, *Crania Americana* (1839). In the end, approximately one-quarter of the entire collection derived from such Native American peoples, while a roughly equal number came from the native peoples of Canada, Mesoamerica, and South America.

As of May 2008, over 200 skeletal remains have now been returned to Native American groups from among the vast collections of human skeletal remains housed in the Museum. Of these, approximately 100 derive from the Morton Collection, with the vast bulk of the returns being of Native Hawaiian ancestry—the Morton Collection had contained the second largest collection of Hawaiian skeletal remains curated within the continental United States.

At present it is difficult to say what NAGPRA and this process of repatriation will mean for the intellectual and research value of the Morton Collection. Fortunately, as part of the ongoing processes in place for recording the Museum's human skeletal remains, each and every one of these specimens have been CT scanned, and copious notes and records have been accumulated for documentary purposes. In the future, we hope these records will provide the information needed to address new research questions, but if not, there is always the possibility that the Museum will be able to work effectively with Native American peoples on research issues that are of central importance to all the groups involved.

Morton's Place in the History of Science

It is generally agreed by historians of anthropology that Samuel G. Morton was a pioneer in American anthropology and the founder in this country of the sub-discipline of physical anthropology. In his recent discussion of the development of physical anthropology, C. Loring Brace asserts that Morton's attention to ethnographic context and his use of over 12 cranial measurements to compare geographically circumscribed groups established Morton as a pioneering early scientist of anthropology. Regardless of the controversy associated with his findings on racial differences, Brace credits Morton with developing methods of cranial measurement that are still used today.

Scholarly debate, however, still surrounds the extent to which Morton's own personal racist beliefs impacted how he both consciously and unconsciously handled his craniometric data. Some insight into Morton's personal views on slavery can be gained from the journal he kept while traveling in the West Indies in the 1830s. On some days, his observations reflect deep racism, while on others he expresses disgust for the conditions of slavery in the Caribbean. Yet did his personal beliefs affect his science?

In 1981 this debate came into popular focus when Stephen J. Gould published *The Mismeasure of Man*. This book explored the motives underlying Morton's influential findings (which provided fodder for others such as Josiah Nott to argue for the superiority of whites). Gould used Morton as an illustration of the impact that a scientist's personal beliefs can have on his selection of samples, measurements, and analysis of data. Claiming that Morton was a racist who believed whites to

Jennifer Chiappardi (top), Museum Conservation (bottom)

be superior to blacks, Gould accused Morton of knowingly manipulating his samples and calculations to show that whites had the largest cranial capacities of all racial groups.

But was this true? In 1988, John S. Michaels, a Penn undergraduate, re-measured a sample of Morton's crania and found—contrary to Gould's assertions—that Morton's measurements of cranial capacities were actually accurate within the practices of his day. There was no evidence to suggest that Morton's personal beliefs had led him to racially bias his data. He studied the crania he had at hand objectively and scientifically and reported his findings as such. In contrast, as C. Loring Brace has pointed out, it appears that Stephen J. Gould's portrayal of Morton as a subjectively influenced scientist is, in fact, a clearer example of a scientist selectively choosing his data to support an assertion. Having never bothered to check Morton's measurements, Gould allowed his own perception—that Morton was a racist and therefore a suspect scientist—to influence his own analysis of Morton's science!

The Morton Collection Now and into the Future

Although no one can doubt Morton's contribution to the study of crania in physical anthropology or his influential role in the controversial debates surrounding the differences between races (which even today are surrounded in layers and layers of interpretation), his work became less and less timely and more and more obscure (except to historians interested in the development of scientific racism in the United States) as the 19th century faded into the 20th century.

But with the transfer of his collection to the Penn Museum in the mid-1960s, whole new vistas of research have come into focus based upon the unique composition of the collection—a huge comparative set of crania that illustrate human biological variation in the skull from the early to middle 19th century. Dozens of researchers have requested permission to visit the collection and to use the CT scan data we have derived from the skulls. To illustrate the range of new research being undertaken and to provide a glimpse of how the Morton collection will help define the new biological anthropology of the future, we have provided a sample of this exciting new work in the three sidebars to this article.

EMILY S. RENSCHLER *received her Ph.D. in Anthropology from the University of Pennsylvania in 2007.*

JANET MONGE *is Acting Curator-in-Charge of the Museum's Physical Anthropology Section and the Keeper of the Museum's Physical Anthropology collections.*

For Further Reading

Brace, C. Loring. *"Race" is a Four-Letter Word*. New York: Oxford University Press, 2005.

Douglass, Frederick. *The Life and Writings of Fredrick Douglass*. New York: International Publishers, 1850.

Erickson, Paul A. "Morton, Samuel George (1799–1851)," in *History of Physical Anthropology: An Encyclopedia*, edited by Frank Spencer, pp. 689-90. New York: Garland, 1997.

Fabian, Ann. "The Curious Cabinet of Dr. Morton," in *Acts of Possession: Collecting in America*, edited by L. Dilworth, pp. 112-37. New Brunswick, NJ: Rutgers University Press, 2003.

Gould, Stephen J. *The Mismeasure of Man*. New York: Norton, 1981.

Meigs, James Atkin. *A Memoir of Samuel G. Morton*. Philadelphia, PA: Collins, 1851.

Morton, Samuel G. *Catalogue of Skulls of Man and the Inferior Animals in the Collection of Samuel George Morton*. 3rd edition. Philadelphia, PA: Merrihew & Thompson, 1849.

Michael, John S. "A New Look at Morton's Craniological Research." *Current Anthropology* 29-2(1998):349-54.

Smedley, Audrey. *Race in North America: Origin and Evolution of a Worldview*. Boulder, CO: Westview, 1993.

Stanton, William R. *The Leopard's Spots: Scientific Attitudes toward Race in America, 1815–1859*. Chicago, IL: University of Chicago Press, 1960.

Stocking, George. *Race, Culture, and Evolution*. New York: Free Press, 1968.

Emily S. Renschler (left)
Janet Monge (below)

Janet Monge