

Cotlow Award Application Form 2008
Department of Anthropology
The George Washington University
Washington, DC 20052

1. Personal Information

Applicant's name: Helen S. Alesbury

Degrees sought: Bachelor of Science and Bachelor of Arts

Field of study/major/minor/concentration: Biological Anthropology (BS), Archaeology (BA), minor in Art History

Expected date of graduation: May 2010

Faculty Advisor(s): Dr. Robin Bernstein

2. Language Skills

Does the proposed project involve the use of a "field language"?: No

3. Title of the Project and Abstract

Project Title: Age at Death Estimation using the Frontonasal Suture in Human Skeletal Remains

Abstract of the Project (provide a summary description of the project's goals, location, methods, and relevance to anthropology) [80 word maximum]:

The aim of this project is to investigate the utility of frontonasal suture fusion for determination of age at death in human skeletal remains. The main goal is to produce a usable scale, using known-age samples at varying degrees of fusion. To accomplish this, the research will make use of extensive collections housed at two institutions. The proposed research has important applications for practicing anthropologists as it will contribute valuable data and enhance the accuracy of age estimation.

4. Description of the Project (describe your overall research goals, what the project is generally about, and where you will conduct the research and why) [200 word maximum]:

No one single technique is used to determine age at death in human skeletal remains; instead multiple methods are utilized in order to obtain the greatest accuracy. The goal of this project is to investigate the validity of using the frontonasal suture in determining the age at death of unknown human skeletal remains, a novel

area of investigation. Initial data collection will use the Terry Collection (NMNH, SI), and will be supplemented by individuals housed in the Von Luschan Collection (AMNH). The NMNH houses approximately 1700 individuals; the AMNH holds over 10000 from varied geographical locations. The use of both these collections, which include known-age individuals, will ensure a large sample size, wide age range, and provide samples from varying geographical backgrounds. Data will be collected on the degree of closure of the suture between the frontal and nasal bones. Stages of closure will be defined, and age standards will be developed using pooled samples from both collections. These results will ultimately contribute to the methods used by anthropologists for the determination of age at death of unknown human remains.

5. Significance of the Project to Anthropology (in this literature review describe how the proposed research relates to other anthropological research on the topic, and/or region as relevant; use social science style citation--no footnotes) [300 word maximum]:

Studies of cranial sutures used to help determine age at death have been controversial and discussed heavily within physical anthropology. While some correlation between age at death and suture closure has been found, some results have been interpreted to be a combination of factors including genetic influences, pathological factors, and even independent from age. Despite these views, such macroscopic techniques are still widely used to help determine age at death (Dorandeu, et al. 2008), most likely because the cranium is most often better preserved than other areas of the skeleton which may estimate age more accurately. While there has been a great deal of stress placed on the utility of cranial vault sutures (lambdoidal, sagittal, coronal), and a breadth of studies have focused on specific cultural and regional variation (Sahni 2003, Perizonius 1983), little has been done to specifically look at craniofacial sutures. However, some research with nonhuman primate remains (Wang 2006) suggests that craniofacial and facial sutures may close at a later age than cranial sutures. This indicates that a cranio-craniofacial-facial suture closure sequence may exist that provides information beyond what can be gleaned from the postcranial skeleton alone.

It has been noted that facial sutures have different qualities and growth patterns than those on the cranial vault (Sardi 2005). Facial sutures are thinner and thus the fusion is easier to assess from a single surface. Aspects of cranial sutures can be difficult to examine without destroying the skull (Wang 2006). Overall, the majority of investigations of craniofacial sutures as age indicators have been limited to the cranial vault (Perizonius 1983). Further investigation into the sequence of closure of the facial sutures (such as the frontonasal) can offer additional methods to increase the validity and accuracy of estimating age at death.

6. Methods (clearly outline or list your research questions; describe the data you will collect and how you will collect it; discuss your analytical methods; and show how the data will address the research questions) [300 word maximum]:

This study will use established methods of data collection in order to allow for standardization and ease of comparison between studies. Both qualitative and quantitative methods are appropriate given the goals of the project.

This study will rely primarily on the use of individuals with known age at death. Collections at the NMNH (Terry Collection) and the AMNH (Von Luschan) allow for a wide age range and variety of ethnicities to be used.

I intend to use and modify an established qualitative scale (“four degrees of closure method”, Todd et al., 1924) that describes the basic, most simple stages of closure (Perizonius 1983). Based on preliminary findings I will take into account differences of the cranial vault sutures (what this scale is based on) versus the frontal bone sutures (what this study is proposing to investigate). I will begin with the following modifications:

0- Open suture. There is still a little space left between the edges of the adjoining bones.

1. Suture closed, but still visible as a continuous, often “zigzagging”, line.
2. Suture line is thinner, but may be interrupted by complete closure.
3. Only pits indicate the suture is present.
4. Completely obliterated, even suture location cannot be identified.

I will also use a method developed by Hershkovitz to quantitatively compare condition of suture closure as “the ratio between the sum of the length of the open portion of the suture and the total sutural length (Hershkovitz et al., 1997)”, which will help account for human error in the first, qualitative method.

Based on the time line indicated below I estimate that the overall sample size will range from 700 to 900 individuals.

The results of these two assessments will then be compared to the actual age of the individuals examined, as pooled samples and separately by sex and geographic location. In order to determine the most accurate method of evaluation, I plan to employ statistical tests including significance tests, student t-tests, and linear regression to evaluate correlation (Wang et al. 2006, Perizonius 1983, Dorandeu et al. 2006).

7. Research Ethics [150 word maximum]:

I have thoroughly reviewed the American Anthropological Association (AAA) code of ethics online and found it does not specifically address the use of human remains in research. Additionally, the American Association of Physical Anthropologists (AAPA) does not go into detail, however both advise the following: “Anthropological researchers must do everything in their power to ensure that their research does not harm the safety, dignity, or privacy of the people with whom they work, conduct research, or perform other professional activities”. The utmost care and respect will be taken with the remains when handling them—and aside from individual information on age at a death, sex, and other pertinent measurements, no personal

information on the individual remains will be published. Should any specific cases be referred to will I will use the research catalogue number. Additionally, permission to use the remains will be obtained from each institution prior to any research.

8. Research Product (discuss how you will use and present your findings including, for example, a presentation at a professional meeting, a film, a museum exhibit, a publishable paper, a thesis) [150 words maximum]:

Primarily, the research and final product of this project is towards a thesis to graduate with special honors in Biological Anthropology. Additionally, Dr. Ubelaker and I will conduct further research and data collection and plan to publish the project and the results in an academic journal. I will also present my findings and conclusions to date at the Cotlow conference in October.

9. Timetable (provide a listing of the schedule of your research activities including data collection and analysis):

July 2009: Apply for permission to research at AMMH collection from Dr. Ian Tattersall, curator of Physical Anthropology

Mid-August 2009: Arrive back to GWU campus and commence data collection from Terry Collection

First week in September 2009: Go to American Museum of Natural History to collect additional data

Mid/late-September 2009: Finish Terry Collection research, begin analysis of collected data.

Mid-October 2009: Present preliminary findings so far at Anthropology Student Research Conference.

October-December 2009: Continue analysis, begin write-up.

January-March 2010: Complete analysis and write-up of thesis.

March 2010: Submit thesis for review to GW.

10. Budget Amount and Projected Expenditures

Total Amount Requested: \$1150

Projected Expenditures:

Transportation→ \$250

Train—approximately \$200 (Amtrak.com)

Local transportation in NYC—approximately \$50

Room and Board→ \$900

Hotel for three nights in New York City—approximately \$250 per night (expedia.com)

Food for four days—approximately \$150

11. Staff/help (if others are to participate in the project as researchers or research assistants, please give their name and qualifications): Dr. Douglas Ubelaker, Curator of Physical Anthropology at the Smithsonian Institution.

12. Outside Financial Support: None

13. References Cited/Select Bibliography:

Bass, William M. *Human Osteology: A Laboratory and Field Manual*. Columbia, MO: Missouri Archaeological Society, 2005.

Dorandeu, Anne. "Age-at-death estimation based on the study of frontosphenoidal sutures." *Forensic Science International* 177, (2006): 47-51.

Hershkovitz, Israel, et al. "Why Do We Fail in Aging the Skull From the Sagittal Suture?." *American Journal of Physical Anthropology* 103, no. (1997): 393-399.

Lynnerup, Niels and Jens Jacobson. "Brief Communication: Age and Fractal Dimensions of Human Sagittal and Coronal Sutures." *American Journal of Physical Anthropology* 121, (2003): 332-336

Perizonius, W.R.K.. "Closing and Non-closing Sutures in 256 Crania of Known Age and Sex from Amsterdam." *Journal of Human Evolution* 13, (1983): 199-205.

Sahni, Daisy. "Time of closure of cranial sutures in northwest Indian adults." *Forensic Science International* 148, (2005): 199-205.

Sardi, Marina and Fernando Rozzi. "A cross-sectional study of human craniofacial growth." *Annals of Human Biology*, 32, no. 3 (2005): 390-396.

Todd, T. Wingate and D.W. Lyon, Jr. "Endocranial suture closure. Its progress and age relationship." *American Journal of Physical Anthropology* 7, no. 3 (1924): 325-384.

Ubelaker, Douglas H. *Human Skeletal Remains: Excavation, Analysis, Interpretation*. Washington, DC: Smithsonian Institution, 1999.

Wang, Qian, David S. Strait, and Paul C. Dechow. "Fusion Patterns of Craniofacial Sutures in Rhesus Monkey Skulls of Known Age and Sex from Cayo Santiago." *American Journal of Physical Anthropology* 131, (2006): 469-485.

14. Permits : See attached file on email.

15. Transcript: See attached file on email.