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Notes From The SA

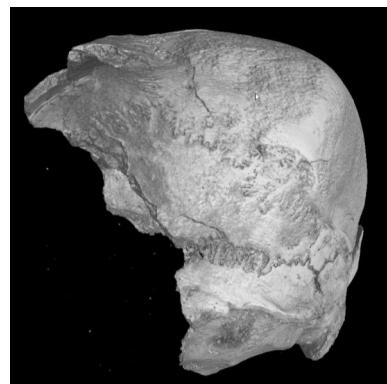
The Sustainable Archaeology Newsletter

A Non-Destructive Technology for Palaeopathology: Differential Diagnosis of Cranial Lesions in Archaeological Human Populations

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Palaeopathology is defined as the scientific study of disease processes from archaeological human remains. The pattern of disease that affects a population is the expression of the biological and cultural stressors to which they were exposed. It is influenced by the environment, sex, social status, diet, occupation, and even cultural belief systems. These factors help researchers to interpret and explain the patterns of disease observable on human skeletal remains. Recent microscopic analyses of bone have revealed that porotic lesions of the skull, referred to as cribra orbitalia and porotic hyperostosis, can be caused by more than one health related condition. Originally associated with anaemia, other conditions including vitamin deficiencies and localized infections have also been implicated as possible

causes of these lesions. Therefore, it is critical to establish methods that can accurately assess health conditions from skeletal remains. Inaccurate diagnoses can have significant implications for our current understandings of how disease and other health related conditions may have evolved over time, across geographic space, and how they may have affected human populations in the past.



3-D reconstruction of a Maya crania with an interesting non-metric trait on the occipital bone (posterior view)

The purpose of my current doctoral research is to examine an innovative non-destructive method for improving the accuracy of dis-

ease diagnosis in archaeological skeletal samples. The principal objective of this study is to determine whether micro-computed tomography (μ CT) and advanced methods of digital image analysis can be used in palaeopathology to visualize small scale bone changes which are typical of certain health conditions. The goals of this research are two-fold. First, I wish to assess the capability of μ CT and digital image analysis as sufficient alternatives to destructive thin section techniques which are traditionally used for microscopic skeletal analysis in bioarchaeological research. Second, I wish to evaluate the ability of μ CT for more reliable differentiation between the various pathological conditions that contribute to the presence skeletal lesions in archaeological human remains.

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A Non-Destructive Technology for Palaeopathology, continued

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Why is this significant?

In order to establish a reliable diagnosis it is often necessary to analyze the microscopic structures of diseased bone. Microscopy is essential in palaeopathology since although several disease processes can lead to similar bone surface changes, microscopic analyses demonstrate that there are patterns of microscopic changes which are unique to specific diseases. The classic way to examine bone microscopically is through the use of histological thin sections of bone, which require significant preparation and destruction of the sample. The method proposed for my doctoral research, using μ CT, requires little to no sample preparation and is a method which has the potential for high resolution bone analysis, while eliminating the need for destructive sampling of valuable archaeological remains.

For this research project, skeletal samples have been drawn from an Egyptian and several Maya collections housed at Western University in London, Ontario. A large number of individuals with observable porotic cranial lesions have been μ CT scanned in

Sustainable Archaeology's Ancient Images Laboratory .

The resulting images are currently being qualitatively and quantitatively analyzed using the digital image analysis software VGStudio Max 2.2.



Top: 2-D micro-CT image of a Maya crania with active cribra orbitalia (sagittal view)

Bottom: 2-D micro-CT image of a Maya crania with active, severe porotic hyperostosis (coronal view)



These analyses of bone structural changes will determine whether the characteristic microscopic patterns indicative of anaemia, vitamin deficiencies, and infectious processes described in the literature can be differentiated using μ CT.

It is anticipated that the results of this research project will make a significant contribution to palaeopathology by providing non-destructive, high resolution digital techniques for the diagnosis of disease from archaeological skeletal samples as well as vastly improving our epidemiological understandings of health and disease in archaeological populations.

For more information on Sustainable Archaeology's Ancient Images Laboratory and equipment, contact the SA Operations Manager:

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Research Grant Opportunities

Western Graduate Research Scholarships (WGRS)

Western Graduate Research Scholarships support full time graduate students at Western who are enrolled in Category I programs. The value of the WGRS varies by program and/or by student. Students must be registered full-time and meet the graduate program conditions for progression towards the degree

For more information about the grant, visit the Western Graduate and Post Doctoral Studies [Funding Opportunities](#) web page.

Richard F. Salisbury Student Award

Yearly \$1500 award to a PhD candidate in an Anthropology programme at a Canadian university, for dissertation fieldwork. Applicants must be current members of Canadian Anthropology Society (CASCA).

Application Deadline: March 15

For more information, visit www.cas-sca.ca/prizes-awards/salisbury-award/salisbury-call-for-nominations

Ruggles-Gates Fund for Biological Anthropology

The Royal Anthropological Institute administers a fund, which provides grants for graduate research in biological anthropology. No nationality restriction.

Application Deadline: March 31

For more information, visit www.therai.org.uk/awards/research-grants/ruggles-gates-fund-for-biological-anthropology/

The Leakey Foundation Research Grants

The Foundation funds research related specifically to human origins, including paleoanthropology, primate behavior, & studies of modern hunter-gatherer groups.

Research Grants to doctoral student are in the \$3,000-\$13,500 range; larger grants, especially to senior scientists and post-doctoral students, may be funded up to \$22,000. No citizenship restrictions. Research grants are awarded twice annually

Application Deadline: July 15

For more information on the grant, deadlines, and the application process, visit www.leakeyfoundation.org/grants/

ACLS Digital Innovation Fellowship

The program supports an academic year dedicated to work on a major scholarly project that takes a digital form. Each fellowship carries a stipend of up to \$60,000 towards an academic year's leave and provides for project costs of up to \$25,000. ACLS Digital Innovation Fellowships are intended as salary replacement and may be held concurrently with other fellowships and grants and any sabbatical pay up to an amount equal to the candidate's current academic year salary.

This program is open to scholars (PhD conferred) holding U.S. citizenship or permanent resident status in all fields of the humanities and the humanistic social sciences.

For more information on the fellowship, eligibility, and application deadlines, visit www.acls.org/programs/digital/



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Sustainable Archaeology is dedicated to advancing a transformative practice of archaeology that integrates the many forms of the discipline – commercial, academic, avocational – by consolidating the extensively recovered archaeological record from a region of the world and converting that material and contextual data into broadly accessible and integrated digital information. This compiled and converted record will allow for ongoing and innovative research advancing the knowledge, conception, appreciation, and engagement of this compiled and rich archaeological heritage left by the countless previous generations of those who loved, lived, and died in this place, by all those today who draw awareness, meaning, value, and identity from this human heritage.

Upcoming Events, Lectures, Conferences, and Workshops

Events

Ontario Archaeological Society: London Chapter Meeting. Meetings are held on the second Thursday of the month at the Museum of Ontario Archaeology, 1600 Attawandaron Rd., 8pm. www.ssc.uwo.ca/assoc/oas/

Western University Department of Anthropology: Graduate Research Seminar Series

Feb. 8th, 2:30 pm, Western Social Science Centre (SSC) Rm. 2257.

March 1st, 2:30 pm, SSC, Rm. 2257.

March 22nd, 2:30pm, SSC, Rm. 2257. Speakers: Nicole Jones, (topic: "Collections Management Issues in Current Archaeological Practice") and Arthur Klages (topic: "A Micro-CT Analysis of Hominoid Craniofacial Morphology").

Conferences

Digital Past 2013: New technologies in heritage, interpretation & outreach, February 20-21, The Shire Hall, Monmouth, Wales.

www.digitalpast2013.blogspot.co.uk

Follow the conference on Twitter:

[#digitalpast](https://twitter.com/digitalpast)

Computer Applications & Quantitative Methods in Archaeology Annual Conference: Across Space and Time March 25-28, University Club of Western Australia, Perth.

www.caa2013.org

Follow the conference on Twitter:

[@CAA2013Perth](https://twitter.com/CAA2013Perth) and #CAAPerth

Society for American Archaeology Annual Meeting, April 3-7, Honolulu, Hawaii. www.saa.org

Follow the conference on Twitter:

[@SAAorg](https://twitter.com/SAAorg) and #SAA2013

American Association of Physical Anthropologists Annual Meeting, April 9-13, Knoxville, Tennessee.

meeting.physanth.org/local-arrangements/2013

Canadian Anthropology Society (CASCA) Conference: Unsettling Records: Re-working Anthropology's Role in Turbulent Times, May 8-11, University of Victoria, Victoria, B.C. www.cas-sca.ca/conference/upcoming-conference/2013-conference

Canadian Archaeological Association Annual Meeting, May 15-19, Whistler, British Columbia.

www.canadianarchaeology.com/caa/annual-meeting

Canadian Society for Digital Humanities Annual Meeting: "@ the Edge", June 3-5, Victoria, British Columbia. csdh-schn.org/2012/11/16/cfp2013