

**THE CANADIAN  
ASSOCIATION FOR  
PHYSICAL  
ANTHROPOLOGY**



**L'ASSOCIATION  
CANADIENNE  
D'ANTHROPOLOGIE  
PHYSIQUE**

**44<sup>th</sup> Annual Meeting  
44<sup>e</sup> Congrès Annuel**

**October 26-29, 2016  
Du 26 au 29 Octobre, 2016  
Peterborough, Ontario**



**TRENT**   
UNIVERSITY

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## **WELCOME TO PETERBOROUGH!**

It is our pleasure to welcome you to the 44<sup>th</sup> Annual Meeting of CAPA-ACAP in beautiful Peterborough, Ontario. We acknowledge the land on which we gather is the traditional territory of the Anishinaabe Mississauga adjacent to the Haudenosaunee Territory and in the territory covered by the Williams Treaty. With a population of 80,000, Peterborough is known as the gateway to the Kawarthas and our rich natural setting provides many recreational opportunities. Peterborough is home to world renowned attractions such as the Lift Lock and the Canadian Canoe Museum. We are also part of the Trent Severn Waterway that connects Lake Ontario to Lake Huron. Peterborough has a vibrant culinary scene with many excellent restaurants within walking distance of the conference hotel.

Peterborough is home to Trent University; founded in 1965 and home to 8,205 students. Trent's Peterborough campus is north of the downtown core (approximately 10 minutes by car) in a breathtaking natural setting along the banks of the Otonabee River. If you have never visited the Peterborough campus we encourage you to venture north and take a walk around the campus and over the Faryon Bridge that spans the Otonabee River.

This year's meeting includes a total of 55 presentations and 19 posters; 29 students are competing for the student prizes. We are pleased to welcome members of the Paleoanthropology Society of Canada who are holding their business meeting at the end of the day on Thursday. As usual, many people played a role in pulling this meeting together. Thank you to the members who graciously agreed to judge the student poster/podium presentations and chair sessions. Thank you to Alexis Dolphin for agreeing to lead a workshop for the student luncheon. Individuals who hosted past CAPA/ACAP meetings provided helpful advice and information. Thanks to our generous sponsors for their financial support and also our donors for the fantastic prizes. Finally, thank you to our student volunteers who have been incredibly generous with their time and energy! We hope you enjoy your stay in Peterborough and please don't hesitate to find one of us if you have any questions or concerns.

Anne Keenleyside and Jocelyn Williams

**PROGRAMATA GLANCE/PROGRAMME EN BREF**

**WEDNESDAY, OCTOBER 26/MERCREDI 26 OCTOBRE**

- 5:00 – 9:00pm Registration: Garden Court
- 6:00 – 9:00pm Welcome reception (hors d’oeuvres and cash bar)  
Garden Court

**THURSDAY, OCTOBER 27/JEUDI 27 OCTOBRE**

- 8:00 – 9:00am Coffee, tea, juice/Caf , th , jus (Garden Court)
- 8:00am - 5:00pm Registration/Enregistrement (Outside Regency)
- 8:00 – 8:30am Poster set up (Garden court)/Presentation (Regency)
- 8:30am – 5:00pm **Poster Session A**  
Garden Court (authors present during coffee breaks)
- 8:45 – 9:30am **Session 1: Bone Biology and Morphology** (Regency)
- 9:30am – 12:15pm **Session 2: Bioarchaeology** (Regency)
- 10:00 – 10:30am Coffee Break/Pause Caf  (Garden Court)
- 12:15 – 1:45pm Lunch  
Student luncheon (Saffron Room)
- 1:45 – 2:15pm **Session 3: Primatology** (Regency)
- 2:15 – 5:00pm **Session 4: Contributions of New Scientific Methods to Paleoanthropology** (Regency)
- 3:00 – 3:30pm Coffee Break/Pause Caf  (Garden Court)
- 5:00 – 5:15pm Poster take down
- 5:00 – 6:30 Paleoanthropology Society of Canada (PASC) Business Meeting (Regency)
- 7:00 – whenever Social Night – Shots lounge (379 George St. N)  
Hors d’oeuvres and cash bar

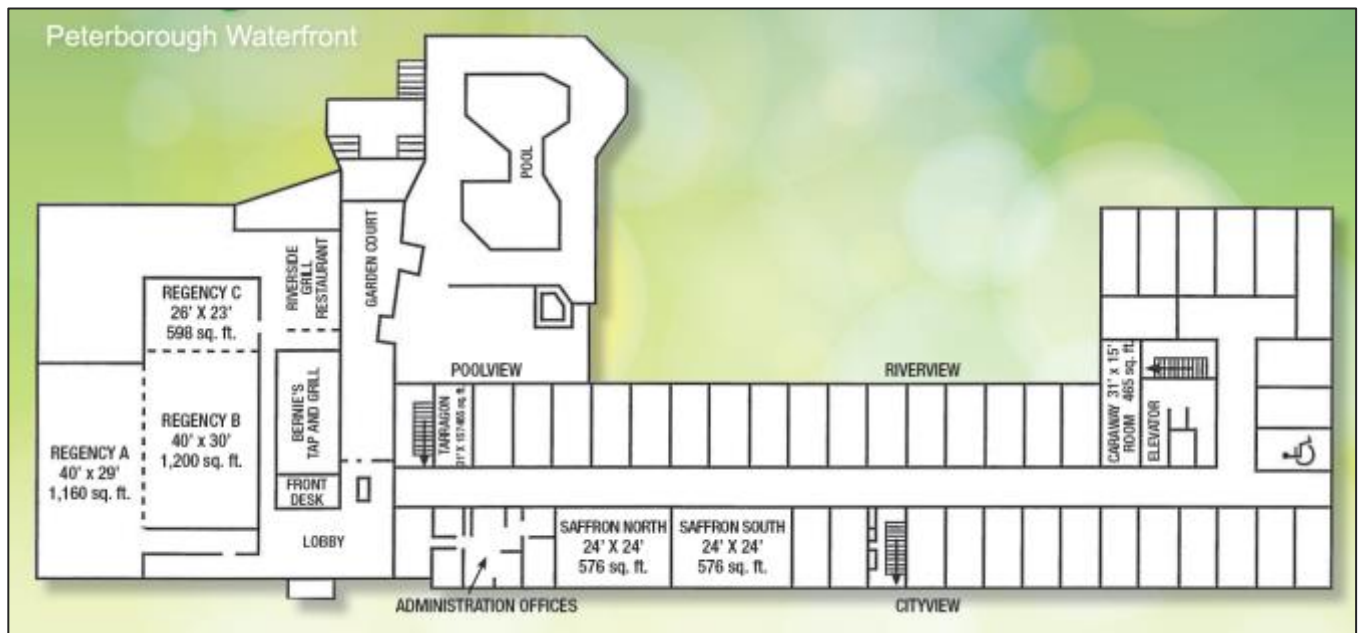
**FRIDAY, OCTOBER 28/VENDREDI 28 OCTOBRE**

8:00 – 9:00am	Coffee, tea, juice/Caf�, th�, jus (Garden Court)
8:00am - 5:00pm	Registration/Enregistrement (Outside Regency)
8:00 – 8:30am	Poster set up (Garden Court)/ Presentation (Regency)
8:30am – 5:00pm	<b>Poster Session B</b> Garden Court (authors present during coffee breaks)
8:30 – 10:15am	<b>Session 5: Biological Anthropology of Human Health</b> (Regency)
10:15 – 10:45am	Coffee Break/Pause Caf� (Garden Court)
10:45am – 12:00pm	<b>Session 6: Roman Bioarchaeology</b> (Regency)
12:00 – 1:30pm	Lunch
1:30 – 4:15pm	<b>Session 7: Surprises in the Soil: Outliers, the Unexpected, and the Unknown</b> (Regency)
3:00 – 3:30pm	Coffee Break/Pause Caf� (Garden Court)
4:15 – 5:00pm	<b>Session 8: Medical Anthropology</b> (Regency)
5:00 – 5:15pm	Poster take down
5:00 – 6:00	CAPA/ACAP Business Meeting/R�union de l'association (Saffron Room)
6:00 – 7:00	Reception/Cash Bar (Garden Court)
7:00 – 10:00pm	Banquet (Regency)

**SATURDAY, OCTOBER 29/SAMEDI 29 OCTOBRE**

- 8:30 – 9:30am Coffee, tea, juice/Caf , th , jus (Regency)
- 8:30 – 11:00am Registration/Enregistrement (Outside Regency)
- 9:00 – 11:30am **Session 9: “Follow that Dream”: Ann Herring’s Physical Anthropology Mentorship Diaspora** (Regency)
- 10:15 – 10:45am Coffee Break/Pause Caf  (Regency)
- 11:30 – 11:45am Closing comments and farewells/Conclusions et aurevoirs

**Holiday Inn Floor Plan**



## SCHEDULE OF PAPERS AND POSTERS/PROGRAMME DES PODIUMS ET POSTERS

### WEDNESDAY OCTOBER 26/MERCREDI 26 OCTOBRE

5:00-9:00pm Registration/Enregistrement (Garden Court)  
6:00-9:00pm Welcome Reception/R ception d'accueil (Garden Court)  
(hors d'oeuvres, cash bar)

### THURSDAY, OCTOBER 27/JEUDI 27 OCTOBRE

8:00-9:00am Coffee, tea, juice/Caf , th , jus (Garden Court)  
8:00am-5:00pm Registration/Enregistrement (Outside Regency)  
8:00-8:30am Poster set-up (Garden court)/presentation loading (Regency)

#### GARDEN COURT: POSTER SESSION A

8:30am-5:00pm Authors will be present during coffee breaks

1. Primate growth and development, an examination of macaque dental eruption and epiphyseal union. \***Mallory G. I. Atell**, and M.A. Schillaci
2. A preliminary investigation of activity budgets from a spatial perspective in golden-headed lion tamarins (*Leontopithecus chrysomelas*). \***Matthew de Vries**, and B.E. Raboy
3. Validating the use of canopy cover as a proxy predictor of human disturbance across forest habitats in northern Madagascar. \***Fernando Mercado Malabet**, and I.C. Colquhoun
4. Morphofunctional analysis of the metatarsals medio-lateral orientation in hominoids. \***Jesseca Paquette**, N. Brouillette, M. Levasseur, & M.S.M. Drapeau
5. Microscopic evaluation of mechanical loading on human second metacarpals of two populations. \***Sarah Borgel**, M.A. Streeter, R.A. Lazenby, & M.S.M. Drapeau

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\* Asterix beside name indicates the individual is competing for student prize

6. Three-dimensional geometric morphometric analysis of the trapezium in modern humans, African apes, orangutans, and fossil hominins. **\*Joanna L. Dowhos**, and M.W. Tocheri
7. Chronological and regional variation in the ontogeny of humeral asymmetry among Hunter-Gatherers. **Lesley Harrington**, and B. Osipov
8. Radiographically recognizable? An investigation into the appearance of osteomalacic pseudofractures. **Emma Jennings**, M.B. Brickley, & J. Buckberry
9. Expression of developmental stress through regional fluctuating asymmetry in the cranium. **\*Devin L. Ward**, E. Pomeroy, & J.T. Stock
10. Observations on experimentally mummified tumors. **\*Jennifer Willoughby**, C. Kirkpatrick, J. Koropatnick, & A. Nelson

REGENCY ROOM: ALL PRESENTATIONS

**Session 1: Bone biology and morphology**  
**Chair: Richard Lazenby**

- 8:45-9:00 Testing the hypothesis of Type II osteons as indicators of mechanical load. **E. Raguin**, M.A. Streeter, & M.S.M. Drapeau
- 9:00-9:15 Using CT scans in your research: What you need to know.  
**C.E. Merritt**
- 9:15-9:30 Bone fragility and fracture prevalence in the Kirsten Skeletal Collection: A study using mid-thoracic ribs. **\*A. Beresheim**, T. Vairamuthu, & S. Pfeiffer

**Session 2: Bioarchaeology**  
**Chair: Susan Pfeiffer**

- 9:30-9:45 Osteoarticular activity markers in two historical populations from Montr al and Beauce: Possible differences between urban and rural lifestyles. **\*M. Cr pin**, and I. Ribot



- 9:45-10:00 Shift in trauma patterns in the transition from rural to urban England. **Cindy G. Levesque**, C. Nichols, P. Nystrom, & D. Mahoney Swales
- 10:00-10:30 *Coffee Break and Posters/Pause caf  et posters Garden Court*
- 10:30-10:45 Dental affinities among mid-Holocene Eastern Africans: insights on the spread of herding. \***Elizabeth Sawchuk**
- 10:45-11:00 A case study using dental morphology and isotopes to explore population diversity in the 18th century Montreal. **Marie-H l ne B-Hardy**, I. Ribot, J. Vigeant, & A.M. Grimoud
- 11:00-11:15 Secret disease: Bioarchaeology of syphilis in America. **Shawn Philips**
- 11:15-11:30 The Strong Water Rapids “Sahgedahwegewohong” Middle Woodland burial mound, Hastings, Ontario. L. Jackson, **Kate Dougherty**, & J. Tighe
- 11:30-11:45 New discoveries about the lives of Huron-Wendat ancestors, 2016. **Susan Pfeiffer**
- 11:45-12:00 A forager child with compromised health and mobility from the Late Archaic, southwestern Ontario. **Thivviya Vairamuthu**, and S. Pfeiffer
- 12:00-12:15 Nuvumuitaq: The role of osteobiography in modern museum exhibits. **Janet Young**, and M. Betts
- 12:15-1:45 *Lunch (Student luncheon to be held in the Saffron Room)  
Sponsored by Trent University’s Dean of Social Sciences*
- Session 3: Primatology**  
**Chair: Ian Colquhoun**
- 1:45-2:00 A comparison of navigation strategies in three nocturnal lemur species. **Julie A. Teichroeb**, and A.Q. Vining

- 2:00-2:15 Anthropomorphism in anecdotes: How primatologists describe novel events. \***Malcolm S. Ramsay**
- Session 4: Contributions of New Scientific Methods to Paleoanthropology**  
**Chair: Mirjana Roksandic**
- 2:15-2:30 New scientific methods in the study of lithic residue from palaeoanthropological sites: Olduvai Gorge. **Julio Mercader**, R. Bird., M. Bundala, J. Favreau , M. Itambu, P. Lee, R. Patalano, & L. Tucker
- 2:30-2:45 *Homo heidelbergensis*: the view from the Eastern Mediterranean communications area (EMCA). **Mirjana Roksandic**
- 2:45-3:00 Scientific contributions of Dr. Davidson Black to the early science of Palaeoanthropology. **Julie Cormack**
- 3:00-3:30 *Coffee Break and Posters/Pause caf  et posters Garden Court*
- 3:30-3:45 Where they were not: What can the Mursi Formation tell us about early hominins habitat preferences? **Michelle S.M. Drapeau**, J.G. Wynn, D. Geraads, L. Dumouchel, C. J. Campisano, & R. Bobe
- 3:45-4:00 Investigating 3D shape change in the ilium during growth and the influence of habitual activity in Later Stone Age foragers of southern Africa. **Helen K. Kurki**, and L.A. Harrington
- 4:00-4:15 *Homo floresiensis* and *Homo sapiens* at Liang Bua (Flores, Indonesia): The current state of the evidence. **Matthew W. Tocheri**, T. Sutikna, S. Jatmiko, & E. Wahyu Saptomo
- 4:15-4:30 Bipedalism evolved from knuckle-walking: Evidence from 3D geometric morphometric analyses of vertebral shape in humans, chimpanzees, and orang-utans. **Mark Collard**, K.A. Plomp, K. Dobney, U.S. Vidarsdottir, & D.A. Weston

- 4:30-4:45 Neanderthals from Chagyrskaya Cave, Altai, Siberia **T.B. Viola**, S.V. Markin, N. Rudaya, S. Vasiliev, & K. Kolobova
- 4:45-5:00 Examining sources of variation in southern African Later Stone Age lower limb cross-sectional geometric properties.  
\***Michelle E. Cameron** and J.T. Stock
- 5:00-6:30 Business Meeting for PASC Members (Regency)
- 5:00-5:15 Poster take-down
- 7:00- ? Social event: Shots lounge (379 George St. N) Hors d'oeuvres and cash bar

FRIDAY, OCTOBER 28/VENDREDI 28 OCTOBRE

- 8:00-9:00am Coffee, tea, juice/Caf , th , jus (Garden Court)
- 8:00am-5:00pm Registration/Enregistrement (outside Regency)
- 8:00-8:30am Poster set-up (Garden court)/presentation loading (Regency)

GARDEN COURT: POSTER SESSION B

- 8:30am-5:00pm Authors will be at posters during coffee breaks
1. Mapping transhumance onto the landscape: A spatial understanding of stable isotopes and Greek animal management practices. \***Katherine G. Bishop**
  2. "The road to plasticity" with the Boas papers project: Documentary edition. **Alexis E. Dolphin**, R. Darnell, & G. Smithers
  3. Between a rock and a hard tooth: Investigating mobility in two Medieval Danish populations using strontium isotopic analysis. \***Sarah E. Duignan**, J.A. Gamble, J. Boldsen, M. Fayek, R.D. Hoppa, & N.M. Halden
  4. Investigating the geographic origins of workers at the Imperial cemetery of Vagnari (1st - 3rd century C.E.), using strontium and oxygen isotopes.  
\***Matthew V. Emery**, H.P. Schwarcz, R.J. Stark, S. Elford, & T.L. Prowse

5. Satiating sailors and settlers: Multi isotopic (C, N, S) dietary analyses of seventeenth-century human remains from the Fort Saint Louis and La Belle shipwreck sites (c. AD 1680s) in Texas. \***Eric Guiry**, and M.P. Richards
6. Taking a bite out of early life: Studying dental wear on deciduous teeth. **Julilla Paul**, and L. Harrington
7. An assessment of the utility of estimating stature using data collected in situ using two types of laser scanners. \***Ryan Mullins**, and J. Albanese
8. Changing patterns of stature and body mass in Medieval Denmark. \***Kaela Parker**
9. Critically assessing age data to maximize the research potential of identified reference collections. **Jennifer Sharman**, and J. Albanese

REGENCY ROOM: ALL PRESENTATIONS

**Session 5: Biological Anthropology of Human Health**  
**Chair: Tracey Galloway**

- 8:30-8:45 Stressing about stress: Using multiple methods of analysis to interpret stress severity and duration in the Danish Black Friars Cemetery population (13th-17th centuries). **Amy Scott**
- 8:45-9:00 The impact of food subsidy on food security and health in Canada's Arctic communities 2007-2015. **Tracey Galloway**
- 9:00-9:15 Diabetes prevalence and program access in Yukon First Nations. \***Kirsten Bruce**
- 9:15-9:30 The knowledge translation (KT) of nutritional health information during pregnancy: A case study from the Mothers to Babies (M2B) project. \***Lindsay Grenier**, T.Moffat, M. McConnell, M. Pottruff, & D. M. Sloboda
- 9:30-9:45 Timing of stress episodes at Houtaomuga: Neolithic and Bronze Age comparisons. **Deborah C. Merrett**, H. Zhang, X.M. Xiao, Q.C. Zhang, D. Wei, L.X. Wang, H. Zhu, & D.Y.Y. Yang

- 9:45-10:00 Insights into health at the Napoleonic era Royal Naval Dockyard, Antigua, W.I. **Tamara Varney**, M. Brown, T. Swanston, & R. Murphy
- 10:00-10:15 Assessing the longterm biological and health effects of malnutrition and hunger in Canada's residential schools. Ian Mosby, **T. Galloway**
- 10:15-10:45 *Coffee Break and Posters/Pause caf  et posters Garden Court*
- Session 6: Roman Bioarchaeology**  
**Chair: Tracy Prowse**
- 10:45-11:00 A large-scale investigation of vitamin D deficiency in the western Roman Empire. **Tracy Prowse**, M. George, S. Mays, & M. Brickley
- 11:00-11:15 Subadult body mass estimations and child health status during the Late Roman and Merovingian Period in Lisieux, France. **\*S. Timmins**, T. Moffat, & M. Brickley
- 11:15-11:30 Age-based variation in diet at the Roman Imperial site of Vagnari, south Italy. **L. Semchuk**, and T. Prowse
- 11:30-11:45 Inequalities at Roman Winchester: Challenging ancient literature with dental health. **\*L.C. Avery**, Prowse, T.L., & M.B. Brickley
- 11:45-12:00 Greater levels of habitual activity produce lower risk for dysfunction following fracture: Evidence from two Roman communities. **\*R.J. Gilmour**, M.B. Brickley, E. Jurriaans, & T. Prowse
- 12:00-1:30 *Lunch*

- Session 7: Surprises in the Soil: Outliers, the Unexpected, and the Unknown**  
**Chairs: Madeleine Mant and Alyson Holland**
- 1:30-1:45 Forgotten coffins: the excavation of three 19th century interments in downtown Toronto. **Alyson Holland**, and T. Irvin
- 1:45-2:00 The curious case of the cat mummy in the nighttime. **Drew Wade**, G.J. Garvin, J.R. Butler, N. Gelman, G. Moran, & A.J. Nelson
- 2:00-2:15 Seren[di]pity: Taking advantage of the unexpected in historical health research. **Paul Hackett**
- 2:15-2:30 Gateways to death? Reconsidering 18th century London hospital reputations with skeletal and archival evidence. **Madeleine Mant**
- 2:30-2:45 Imprints of ancient pathogens: bridging the historical and molecular narratives. **Stephanie Marciniak**
- 2:45-3:00 Buried within the bones: Histological examination as a method for uncovering unexpected cases of vitamin D deficiency in paleopathology. \***Laura Lockau**, S. Timmins, S. Mays, L. Bondioli, & M. Brickley
- 3:00-3:30 *Coffee Break and Posters/Pause caf  et posters Garden Court*
- 3:30-3:45 Weaning and comfort nursing in wild chimpanzees shown using fecal stable isotopes and behavioural data. \***Iulia Bădescu**, A. Katzenberg, D. Watts, & D. Sellen
- 3:45-4:00 Tales from the teeth: Challenges of using dental calculus as a proxy to bone for stable isotope analysis. \***Samantha Price**, H.P. Schwarcz, & A. Keenleyside
- 4:00-4:15 The effect of individual differences on calling rates across the vocal repertoire of the ring-tailed lemur (*Lemur catta*). **L.M. Bolt**

**Session 8: Medical Anthropology**  
**Chair: Larry Sawchuk**

- 4:15-4:30 The epidemiological transition theory in 19th century Antigua. \***Jessica Kamckey**
- 4:30-4:45 Insights into secular trends of respiratory tuberculosis: The early 20th century Maltese experience. L. Tripp, and **L.A. Sawchuk**
- 4:45-5:00 Undulant fever: Colonialism, culture, and compliancy. L. Tripp, and **L.A. Sawchuk**
- 5:00-5:15 Poster take-down
- 5:00-6:00 CAPA Business Meeting/R union de l'association (Saffron Room)
- 6:00-7:00 Reception/Cash bar (Garden Court)
- 7:00-10:00 Banquet (Regency)

SATURDAY, OCTOBER 29/SAMEDI 29 OCTOBRE

- 8:30-9:30am Coffee, tea, juice/Caf , th , jus (Regency)
- 8:30am-11:00pm Registration/Enregistrement (outside Regency)

REGENCY ROOM: ALL PRESENTATIONS

**Session 9: "Follow that dream": Ann Herring's Physical Anthropology Mentorship Diaspora**  
**Chairs: Tina Moffat and Sylvia Abonyi**

- 9:00-9:15 Opening Remarks. **Tina Moffat and Sylvia Abonyi**
- 9:15-9:30 What's in a document? The benefits of actually looking at the original documents and historical context of documented collections when developing forensic methods. **John Albanese**

- 9:30-9:45 The post-war experiences of First World War veterans treated at the Ontario military hospital, 1917-1920. **Kandace Bogaert**
- 9:45-10:00 Maternal mortality in a northern Ontario mining town: A case study of Cobalt, 1908-1912. **Stacie Burke**
- 10:00-10:15 Growth status of survivors and non-survivors of skeletal tuberculosis: The relevance of records of child admissions to the Sant'Ana Sanitarium, Portugal (1904-1953) for health studies of archaeological populations. L. Spake, E. Gooderham, S. Fisk, L. Marinho, & **H.F.V. Cardoso**
- 10:15-10:45 *Coffee Break /Pause caf  (Regency)*
- 10:45-11:00 Proportional changes in body size measures among US military personnel between 1988 and 2012. H-J Choi and **Todd Garlie**
- 11:00-11:15 Biocultural approach to the interpretation of human osteoarchaeological data from ancient China. **Dongya Yang**, D. Merrett, & G.H. Zhang
- 11:15-11:30 Closing Remarks. **Tina Moffat and Sylvia Abonyi**
- 11:30-11:45 *Closing comments and farewells/Conclusions et aurevoir*



## ALPHABETICAL LIST OF ABSTRACTS/R SUM S

### **What's in a document? The benefits of actually looking at the original documents and historical context of documented collections when developing forensic methods [Session 9]**

Albanese J.

Department of Sociology, Anthropology and Criminology, University of Windsor. Centre for Forensic Research, Simon Fraser University

In *Grave Reflections*, Saunders and Herring: 1) assembled a series of case studies illustrating how both documentary and skeletal data used together can lead to better understanding of past populations; and 2) synthesized some fundamental concepts that could be applied to other contexts where documentary and skeletal data can be used most effectively together. One of these contexts is the use of identified reference collections for developing methods used in forensic anthropology. It is ironic that only the minimum of documentary data are used for research involving collections that are, or with a bit of effort could be, the most document skeletal collections. Considering samples from these collections without the context provided by the documentary data may result in methods that are at best useless and at worst harmful because they perpetuate scientific and popular stereotypes of human variation. In this paper several examples are presented from various widely used reference collections to illustrate that forensic anthropology can do better by actually looking at "what's in a document" and how it got there.

### **Primate growth and development, an examination of Macaque dental eruption and epiphyseal union [Poster, Session A]**

\*Atell M.G.I.<sup>1</sup>, and M.A. Schillaci<sup>2</sup>

<sup>1</sup>Department of Anthropology, University of Toronto St. George; <sup>2</sup>Department of Anthropology, University of Toronto Scarborough

The maturation of an animal can be estimated based on many development systems, such as stature and long bone growth, dental formation and eruption as well as epiphyseal union. In non-human primates, dental eruption and epiphyseal union have been predominantly used in studies of age estimation, but there is no consensus on which is more precise in estimating age, and the association between dental and epiphyseal development remains poorly understood. Our aim was to assess the relationship between dental eruption and epiphyseal union in a skeletal sample of 68 *Macaca mulatta* from the University of Toronto. The two main objectives were to estimate dental and epiphyseal age based on published development schedules and to identify associations between particular dental and epiphyseal variables. Dental eruption was scored on a scale from 0 to 4, and epiphyseal union on a scale from 0 to 2. Because the chronological age of the sample is unknown, we analyzed the data using seriation and comparisons to previous studies.

The dental eruption schedule of the sample was M1-I1-I2-M2-P3-P4-C-M3, following the general primate pattern. Cheverud (1981) produced a dental eruption schedule for the rhesus macaque based on his evaluation of the Cayo Santiago population: di1-di2-dc-dp3-dp4-M1-I1-

I2-M2-P3-C-P4-M3, the difference might be due to captivity affecting dental eruption schedules. The late union of the medial clavicle compared to Kimura's (1993) *Macaca fuscata* sample of known age could be related to intraspecies differences. Overall, the relationship between dental eruption and epiphyseal union is complex and warrants further study.

**Inequalities at Roman Winchester: Challenging ancient literature with dental health**  
**[Session 6]**

\*Avery L.C., T.L. Prowse, and M.B. Brickley

Department of Anthropology, McMaster University

This study investigates ways that potential dietary inequalities were influenced by sex and social status at Roman Winchester (4th-5th c. AD). Antemortem tooth loss (AMTL), dental caries, and dental wear were recorded on 342 individuals, and analyzed with respect to sex and status (as inferred from mortuary data). Rates of anterior AMTL ( $p=0.030$ ) and dental wear ( $p=0.000$ ) differed between males and females, but the differences were not in line with the levels expected according to historical evidence, which often represents women as collectively inferior to men. When considering sex and social status concurrently, higher status males and females did not exhibit any statistically significant differences in dental health. Lower status males and females exhibited differences in anterior AMTL ( $p=0.043$ ), as well as anterior ( $p=0.000$ ) and posterior dental wear ( $p=0.000$ ).

Contrary to historical accounts, these results suggest the diet consumed by women at Roman Winchester was not drastically different from the diet consumed by men. Further, dietary differences were not solely due to gender differences, but social status likely played a role. In families where resources were strained (i.e., lower status families), men and women consumed slightly different diets, while in families where resources were plentiful, men and women consumed similar foods. This study reveals that the factors influencing an individual's diet in Roman Britain were more nuanced and complex than previously considered. The current research also shows how the evaluation of archaeological human remains can reveal important information about the interplay of status and gender in past human communities.

**A case study using dental morphology and isotopes to explore population diversity in the 18th century Montreal [Session 2]**

B-Hardy M.H.<sup>1</sup>, I. Ribot<sup>1</sup>, J. Vigeant<sup>1</sup>, and A.M. Grimoud<sup>2</sup>

<sup>1</sup>Universit  de Montr al; <sup>2</sup>Universit  de Toulouse

The cemetery of the Premi re  glise Notre-Dame (1691-1796) is an exceptional site in Montreal (New France) covering the city's early colonial history. Indeed, its skeletal collection could provide a snapshot of the first urban population that resulted from both the arrival of immigrants and relationships with local communities. In order to examine the possible interactions between these groups, we tested whether both European immigrants and Aborigines were buried together in Notre-Dame, and whether admixture between the two groups had occurred. As there is no

obvious distinction in terms of mortuary evidence, two different approaches were used. Dental morphology helped to assess genetic relationships and admixture, and oxygen and carbon isotopes complemented the individual profiles by looking at their dietary profiles and mobility patterns. Biodistance analyses based on dental non-metric traits confirmed that the majority of the sample (30 out of 37 in total) appeared to be of European ancestry. However, the remaining individuals presented a mixed phenotype suggesting possible admixture. According to the isotopic evidence, they were born in Montr al or its surroundings, and their diet at childhood differed from the rest of the sample. The result of this study used two approaches which allowed us first to identify individuals of mixed phenotypes, reflecting interactions between colonists and locals, and thereafter to explore their life history through isotopes. Notre-Dame's cemetery has provided evidence of early Aboriginal genetic contribution to Montreal's founder population, before being progressively diluted through time.

### **Weaning and comfort nursing in wild chimpanzees shown using fecal stable isotopes and behavioural data [Session 7]**

\*B descu I<sup>1</sup>, M.A. Katzenberg<sup>2</sup>, D.P. Watts<sup>3</sup>, and D.W. Sellen<sup>1</sup>

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Obtaining accurate weaning ages is important in modelling life history variation. A challenge in field primatology is knowing whether nursing observations provide a valid measure of continued nutritive suckling or weaning. Comparison with physiological dietary measures can distinguish whether observed nursing: (1) overestimates weaning age when individuals make nipple contact for comfort only; (2) accurately measures duration of lactation; or (3) underestimates weaning age, as infants may appear weaned during the day but continue to nurse at night. We conducted a validation study of nursing rates by comparison with a physiological measure of the contribution of milk to infant diet through fecal stable isotopes ( $\delta^{15}\text{N}$ , ‰) in chimpanzees (*Pan troglodytes schweinfurthii*). We used 235 focal hours and 123 fecal samples from 20 mothers and infants transitioning from partial dependence on milk to complete nutritional independence. At ages >3-4, >4-5, and >5-6, offspring showed mean nursing rates of 1.0, 1.0, and 0.8 bouts per hour, respectively. At the same ages, offspring showed mean  $\delta^{15}\text{N}$  and ‰ values of 0.3‰ and 0.1‰, -0.2‰ and 0.1‰, and -0.2‰ and -0.2‰ greater than their mothers, respectively. A lack of mother-offspring differences in  $\delta^{15}\text{N}$  and ‰ indicated that offspring were weaned at around 4 years old – up to 2 years earlier than nursing ceased. Findings suggest that a proportion of observed nipple contacts are best interpreted as non-nutritive, comfort nursing. Physiological measures of infant diets should be employed in combination with nursing observations to more precisely measure the timing of weaning in wild primates.

**Bone fragility and fracture prevalence in the Kirsten Skeletal Collection: A study using mid-thoracic ribs [Session 1]**

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The current study aims to explore the relationship between rib fracture prevalence and a clinical measure of osteoporosis in a recent population of South Africans from the Western Cape. 221 mid-sternal rib ends (usually R6), each representing a single individual (n female=81, n male=140, mean age 48.6±17 years), were macroscopically inspected for healed fractures. Associated rib thin-sections were histologically examined using the Parabolic Index (PI) in order to determine osteoporosis diagnosis (Epker and Frost, 1964). Age, sex, government designated “race” classification, and cause-of-death information are known for each individual in the sample. Less than 10% (19/221) of the Kirsten sample exhibit healed anterolateral rib fractures. Most of the healed fractures were sustained by men, with the oldest cohort having the greatest crude prevalence rate (CPR). However, after controlling for unequal sample sizes, there are no significant differences between the sexes or among racial subgroups. Using the PI, 14.9% (33/221) of the Kirsten sample is classified as osteoporotic. This proportion is greater than expected given the sample’s demographic features. There is a positive relationship between age and osteoporosis diagnosis (rbp=0.203, p=0.002), but no significant sex-based differences. A weak positive relationship between CPR and PI ( $\phi$ =0.154, df=1, p=0.04) suggests that low bone mass increases fracture risk. This research contributes to the paucity of bone quality and fragility data available for South Africans who lived under the apartheid regime. Biological stress, malnutrition, and substance abuse problems may have contributed to the higher than expected rates of bone loss in this population.

**Mapping transhumance onto the landscape: A spatial understanding of stable isotopes and Greek animal management practices [Poster Session B]**

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University of Alberta

Mediterranean mobile pastoral communities are tied to the terrain that they roam across, the seasonal environmental conditions experienced, and how they interact with their animals and surroundings. Relationships between landscapes and pastoralists in antiquity are relatively understudied and provide distinctive challenges to archaeologists who study them. Methodologies that require tangible evidence of habitation or landscape use are limited because of continuous pastoral mobility and poor site preservation. I argue that stable isotope analysis using specific isotopes (carbon, oxygen, and strontium) provides a new way of analyzing landscape archaeology. Isotope variation in bones and teeth results from different biogeochemical processes that are capable of being mapped across a landscape in the form of an

isoscape. Throughout my investigation I explain (1) how strontium isoscapes identify pastoral movement across different terrains, (2) oxygen isoscapes demonstrate how environments impacted living conditions in different landscapes, and, (3) carbon isotopes indicate how individuals interact with different aspects of their landscapes in antiquity. I will integrate the use of stable isotope analysis in examining transhumant landscapes with an illustrative case study from Hellenistic Greece (323-31 BCE). Research of this nature has not yet been conducted in Greece. Ultimately I aim to show how isotope values recorded in animal teeth can be used as a tool for studying spatiotemporal distribution of transhumance, and inevitably put humans back into the archaeological study of landscapes.

### **The post-war experiences of First World War veterans treated at the Ontario military hospital, 1917-1920 [Session 9]**

Bogaert K.

Laurier Centre for Military Strategic and Disarmament Studies

During the First World War, some 9600 soldiers in the Canadian Expeditionary Force (CEF) were diagnosed with combat related psychiatric illnesses. While military medical officers published research on the prevalence and treatment of “mental defectives” and “shell shock” sufferers during and immediately following the war, little is known about their post-war experiences. The central question behind this research is: what happened to these veterans after the war? To answer this question, the hospital records of soldiers admitted as “mental cases” to the Ontario Military Hospital at Cobourg, Ontario, were linked to 152 individual veterans’ pension applications. Even though many of these soldiers were deemed “incurable”, the majority were discharged to civilian life. Veterans’ pension files are an invaluable source of medical and social data, which often span from discharge to death. Analysis of these pension records, which often include personal letters, medical and home visit reports, reveals that these veterans’ experiences with psychiatric illness, the Canadian Pension Commission, re-integration into society, and life at home varied greatly.

### **The effect of individual differences on calling rates across the vocal repertoire of the ring-tailed lemur (*Lemur catta*) [Session 7]**

Bolt L.M.<sup>1,2</sup>

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Vocalization rates have rarely been studied in primates, but understanding how vocal repertoires are used by individuals can lead to a better understanding of the cognitive capacities of social species. In strepsirrhine primates, it is largely unknown how inter-individual differences relate to vocalization usage. To investigate, I studied the ring-tailed lemur (*Lemur catta*), a gregarious strepsirrhine with a large repertoire of 22 vocalizations, including two which are male-specific. My study explored the relationship between individual age, dominance rank, and vocalization

rate for all call types across the vocal repertoire of the male ring-tailed lemur. In 2010, 565 hours of focal data were collected from 31 males aged 1 and older from Beza Mahafaly Special Reserve, Madagascar. High-ranking and older males had higher vocalization rates for calls used in aggressive agonistic contexts (Spearman rank tests,  $p < 0.01$ ). Lower-ranking males had higher vocalization rates for some affiliative and some submissive agonistic calls (Spearman rank tests,  $p < 0.05$ ). Younger males had higher vocalization rates for some anti-predator and some affiliative calls (Spearman rank tests,  $p < 0.05$ ). My results indicated that when call usage across behavioural contexts was considered, there were patterns in ring-tailed lemur vocalization rates that varied with age and dominance rank. Gaining a better knowledge of how the ring-tailed lemur vocal repertoire is used on an individual level informs our understanding of the evolution of primate cognition in basal strepsirhines.

### **Microscopic evaluation of mechanical loading on human second metacarpals of two populations [Poster Session A]**

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Bone remodeling is regulated by systemic and mechanical factors. However, the specific effects of the latter have not been studied extensively. Humans, because their upper limbs are usually lateralized with larger bones on one side, are perfectly suited for studying the effect of loads on remodelling while controlling for systemic factors.

This study compares right and left metacarpals of two genetically distinct archaeological populations, Eurocanadians (n=55) and Inuit (n=48). A value of directional asymmetry was calculated from midshaft thin sections for macroscopic variables (polar moment of inertia, J; and second moment of area, I) and microscopic variables (osteon population density, OPD; mean osteon area, On.Ar.; and mean haversian canal area, H.Ar.). Correlations between macroscopic and microscopic asymmetry variables were calculated with the prediction that the two types of variables would correlate (the more loaded side would present larger OPD, but smaller On.Ar. and H.Ar.).

In contrast to what we expected, our results show that few correlations are significant, and when they were, they often went in the opposite direction of what was predicted. For example, OPD is smaller in the anterior cortex in the more loaded side in Eurocanadian men ( $r = -0.412$ ) and Inuit women ( $r = -0.547$ ). In Eurocanadian men, H.Ar. ( $r = 0.288$ ) and On.Ar. ( $r = 0.297$ ) are larger on the more loaded side. These results support the idea that mechanical loading has an impact on bone microstructure, but not necessarily in the expected direction, and the effect of other confounding factors, such as diet or genetics, might overwhelm the mechanical signal.

**Diabetes prevalence and program access in Yukon First Nations [Session 5]**

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Type 2 Diabetes (T2D) has been described as both epidemic and endemic in First Nation (FN) populations in Canada. Culturally appropriate prevention and management programs funded through the Aboriginal Diabetes Initiative (ADI) can support those living with the disease. This study used community-based participatory research methods to interview Health Directors and administration staff (n=6) from three Yukon FNs. The purpose was to understand how Health Directors access and implement ADI funding and how current Federal health policies sustain health disparities between FN and non-FN persons. Using a biocultural and critical-medical anthropological approach, this study found that barriers existed when Health Directors access and implement ADI funding. Variation in local capacity also existed when comparing FNs with and without Final and Self-Government Agreements. Unreliable estimates of diabetes prevalence exist for Yukon First Nations, furthering challenges when formulating diabetes management strategies. Perceptions of health and well-being were shaped by residents' access to health services and ADI funding within communities. To contribute to decolonizing Indigenous health, study results were used to develop a set of recommendations for the Federal Government to create more equity and capacity for Yukon FNs. Participants recognized that current funding policy was rooted in colonial ideologies of power and control, and what is needed is to create local capacity and greater autonomy for FNs to increase health service delivery related to T2D.

**Maternal mortality in a northern Ontario mining town: A case study of Cobalt, 1908-1912 [Session 9]**

Burke S.

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In 1907, the town of Cobalt, Ontario, was incorporated. Cobalt was one of a number of Northern Ontario mining towns that flourished in the early 20th century, growing steadily in population size while struggling to provide adequate housing and infrastructure. The health challenges associated with an emerging population are reflected in maternal and infant mortality rates, sensitive demographic indicators of overall population wellbeing. Birth and death registry data was collected and, in Cobalt, the maternal mortality ratio was estimated at 1295/100,000 live births, while the infant mortality rate stood at 274/1000 live births. This case study examines these high rates, positioning the findings within a life course perspective and using biographical archival research to assess how environment, biology, and medicine impacted on maternal mortality in Cobalt.

**Examining sources of variation in southern African Later Stone Age lower limb cross-sectional geometric properties [Session 4]**

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Southern African Later Stone Age (LSA) individuals have lower limb cross-sectional geometric properties (CSGPs) indicative of high terrestrial mobility. However these properties vary among LSA Cape coast foragers (n=72), central interior herder-foragers (n=50), and Namib Desert herder-foragers (n=17). Ecology, terrain, and subsistence strategy may contribute to this variability. This paper examines lower limb CSGP variation among LSA groups by contextualizing their CSGPs with those of foraging groups (Australian Aborigines, n=29; Andaman Islanders, n=27; Santa Cruz Islanders, n=30; Sadlermiut, n=30; Yaghan foragers, n=21) and non-foraging groups (Badari herders, n=9; Kerma agriculturalists, n=28) from regions with diverse ecologies and terrains. Midshaft (50%) femoral and tibial torsional strength (J), total subperiosteal area (TA), and diaphyseal shape indicators (Imax/Imin and Ix/Iy) were compared. CSGPs were calculated from periosteal contours obtained using periosteal molds and 3D laser surface scans.

LSA Cape coast and central interior individuals have higher TA and J than other foraging and non-foraging groups, but have similar values to some terrestrial foragers, including Australian Aborigines. However, Namib Desert individuals have similar CSGPs to Badari herders. These results may reflect more intensive foraging among Cape coast individuals; sparse resource availability in the semiarid central interior; and more intensive herding in the Namib Desert. LSA Cape coast men and women have high Imax/Imin and Ix/Iy. This trait is shared with other groups who lived in mountainous regions, including Santa Cruz Islanders. Overall, LSA lower limb strength and robusticity properties may vary with resource availability and subsistence strategy, while shape indicators may vary with terrain.

**Proportional changes in body size measures among US military personnel between 1988 and 2012 [Session 9]**

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Understanding body size changes in the military, and other, civilian first responders, is critical for providing information about the design and development of all military systems including lifesaving clothing and individual equipment (CIE), personal protective equipment (PPE), and workstations. Variability in age, sex, racial/ethnic composition, secular trends and changing fitness and/or body fat standards can influence overall body size distributions (Gordon and Friedl, 1994). In 2015, Choi and Garlie outlined a comparative analysis of body size changes among White and Black military personnel between 1988 and 2012 confirming both non-



significant changes in many length and height measurements and dramatic changes in several circumferential measurements (Gordon et al 2012; Paquette et al., 2009). Results also revealed that White military personnel had larger circumferential dimensions relative to Black military personnel, however, the percent increment (i.e. ANSUR II 2012 relative to ANSUR 1988) shows greater increments for Black military personnel for both male and female, specifically at the 95th percentile. This trend suggests potential dissimilarities in body shape changes between these groups. The goal of this paper is to conduct a more detailed investigation of increments within population groups when focusing on body shape indicators such as: Chest/Waist ratio, Waist/Hip ratio, BMI and percent body fat values. These indicators were compared between population groups at critical percentile values (i.e. 90th, 95th, and 98th) as well as between 1988 and 2012 such that the secular changes in body shape in each population group can be compared, visualized and projected.

**Bipedalism evolved from knuckle-walking: Evidence from 3D geometric morphometric analyses of vertebral shape in humans, chimpanzees, and orang-utans [Session 4]**

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The locomotor behaviour of the last common ancestor (LCA) of hominins and panins is a controversial topic. The most popular hypothesis contends that the LCA used knuckle-walking while on the ground, and vertical climbing and forelimb suspension while in the trees, like the African apes. The main alternative to this ‘‘African ape hypothesis’’ avers that the LCA used arboreal quadrumanous climbing and hand-assisted bipedalism, similar to orang-utans. Here, we outline two studies designed to test between these hypotheses. In the first, we compared the lower two cervical and upper two thoracic vertebrae of humans, chimpanzees, and orang-utans using 3D geometric morphometrics. The second study employed the same taxa and methods as the first but focused on the lower two thoracic and upper two lumbar vertebrae. We found a difference between the two sets of vertebrae. Both the anterior and posterior elements of the upper vertebrae of humans were closer to those of chimpanzees than to those of orang-utans. The anterior elements of the lower vertebrae of humans were also closer to those of chimpanzees than to those of orang-utans. But the posterior elements of the lower vertebrae of humans were closer to those of orang-utans than to those of chimpanzees. When the species’ phylogenetic relationships and locomotor behaviours are taken into account, these results are most consistent with the African ape hypothesis. Consequently, the studies add to the growing body of evidence indicating that bipedalism was preceded by a combination of knuckle-walking, vertical climbing and forelimb suspension.

**Scientific contributions of Dr. Davidson Black to the early science of Palaeoanthropology**  
**[Session 4]**

Cormack J.L.

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Dr. Davidson Black was a key member of the first-ever multidisciplinary team project in human origins. The Peking Man excavations at the Chinese site of Zhoukoudian started in 1927 and initially included scientists from China, Sweden, France, and Canada. Davidson Black worked during a time in which foundations of biological anthropology and specifically, palaeoanthropology were being created and defined. His best friend during his university education was Edmund Cowdry, later an embryological expert and the person who recommended Black for employment at the Peking Union Medical College. Black's friends during his tenure in Cleveland were Jocky Macleod, of insulin discovery fame, and Wingate Todd for which the Todd-Hamann osteological collections are renowned. While planning to study brain anatomy, Black's visit to Grafton Elliot Smith's lab and his trip to Piltdown changed his career direction permanently. In China, he held many endearing friendships including most significantly with: Swedish geologist, Johan Gunnar Andersson with whom he travelled, explored sites, and published osteological reports; and French geologist/philosopher, Jesuit priest, P re Teilhard de Chardin who Black's daughter recalls often visiting their house in Beijing. Shared dialogues with Elliot Smith, Abb  Henri Breuil, Aleř Hrdlička, Amadeus Grabau and especially with his Chinese colleagues (Pei Wenzhong, Weng Wenhao, and C.C. Young) not only expanded anthropological and geological knowledge worldwide but also gave a voice to those whose words were often not heard. This paper reviews some of Dr. Black's scientific contributions to the (palaeo)anthropological community and also reflects on his cooperative spirit with his Chinese colleagues.

**Osteoarticular activity markers in two historical populations from Montr al and Beauce:**  
**possible differences between urban and rural lifestyles [Session 2]**

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Osteoarticular Activity Markers (OAM) and their use in bioarchaeology have been hotly debated recently. Their aetiology is complex and related to many factors, not only activity that is a form of adaptation to both physical and social environments, but also to age and sex. As these facts need still to be explored, the present study will focus on two historical skeletal populations originating from different environmental settings (rural versus urban) in Quebec. The questions are addressed on two different levels (intra- versus inter-group): i) Do the OAM traits increase with age? ii) And, do they differ between sexes and archaeological sites?

For this purpose, two cemeteries previously analysed were used: Notre Dame, Montr al (1691-1796) and Sainte Marie, Beauce (1748-1878). The first site consists of an urban population sample (55 adults) and the second a rural one (31 adults). After sex and age estimations,

enthesal changes were observed following Villotte's method. Chi-square tests and GEE were performed in order to explore various group differences.

Preliminary results show that the frequency of some OAM traits seem to increase with age such as those related to the radial tuberosity and the humeral sub-scapular regions. Significant differences between the two population samples (especially the 18-40 years old males) were found on the lower limbs for the insertion site of the gluteus minimus. As the latter is less frequent in the urban group, it could suggest a relatively more sedentary life style than in the rural one.

**A preliminary investigation of activity budgets from a spatial perspective in golden-headed lion tamarins (*Leontopithecus chrysomelas*) [Poster Session A]**

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The use of activity budgets in primatology is often limited to studying temporal distribution of behaviour. We investigated a primate's daily activity patterns in a spatial context. We studied golden-headed lion tamarins (*Leontopithecus chrysomelas*), a territorial callitrichid, using long-term instantaneous scan and point locality data collected at Una Reserve in Southern Bahia, Brazil between 1999 and 2007. Home ranges were determined using kernel density estimation (KDE), a nonparametric analytical tool. We generated activity cores (within the 50% KDE contour) and activity edges (remaining area up to the 95% KDE contour) for each group. Each behaviour record (n=62,130) was paired with its closest spatial coordinate in time, and overlaid on contour maps to determine its location in the core (n=28,959) or the edge (n=33,171). For most behaviours there were no differences between frequency of occurrence in the core and edge. However, for 3 groups scent marking occurred 16 - 28% more frequently in the activity edge, suggesting a role of scent marking in inter-group communication. Additionally, for one group, prey feeding increased 18% in the edge and plant feeding was 29% more frequent in the core. The predominance of mature forest in this group's core and secondary in its edge may explain the pattern, given secondary forest use is sometimes associated with increased prey feeding in callitrichids. Our findings suggest that spatial analysis of activity budgets can reveal ecological pressures such as intergroup dynamics and resource availability that influence the location of activities within a group's home range.

**“The Road to Plasticity” with the Boas Papers Project: Documentary edition [Poster Session B]**

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Referred to as “The Father of American Anthropology”, Franz Boas (1858-1942) is often viewed as the quintessential Anthropologist. His commitment to holism, his meticulous and voluminous collections of anthropometric data, and his arguments against the concept of ‘stable human types’, or races, have made him a particularly salient figure for biological anthropologists working toward a biocultural understanding of human experience. While Boas’ “The Mind of Primitive Man” (1911), was published over 100 years ago, his work continues to hold a powerful place at the centre of recurring debates regarding the nature of human biological variation and the relationship of biological anthropology to the rest of the discipline.

“The Boas Papers Project: Documentary Edition” is an international and inter-disciplinary research initiative which aims to reassess and re-contextualize the work of Franz Boas, primarily through his original writings and correspondence. The research presented here derives from the analysis of Boas’ correspondence with friends, colleagues and other prominent early-20th century physical anthropologists. Analysis of these documents provides new insights into how Boas worked to dismantle scientific racism and provide a systematic critique of the eugenics movement. Boas’ correspondence demonstrates how he strove to connect his scientific findings to pressing public concerns, all while navigating his socio-political location as a ‘Jewish foreigner’. One hundred years later, new insights into Boas’ anthropology can provide models for how we, as 21st century biological anthropologists, may consider our work through a more holistic and politically-attuned lens.

**Three-dimensional geometric morphometric analysis of the trapezium in modern humans, African apes, orangutans, and fossil hominins [Poster Session A]**

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Hominids include living and fossil humans and great apes and these taxa are known to vary in terms of trapezium morphology. As the wrist bone with the only articulation with the pollical metacarpal, the trapezium and its morphological characteristics play an important role in interpreting the evolution of manual dexterity and tool use in hominins, but its usefulness for evaluating hominid phylogenetic relationships is less clear. Using three-dimensional (3D) geometric morphometrics, we explored variation in trapezium shape in a 3D-laser-scanned sample of extant hominids including modern humans, chimpanzees, bonobos, eastern gorillas, western gorillas, orangutans, as well as fossil hominin samples. A series of 640 landmarks and semi-landmarks were applied to the articular surfaces of each 3D model to capture key features of

trapezium shape and these were subsequently superimposed by generalized Procrustes analysis. Multivariate statistical analyses of the resulting shape data, including principal components analysis (PCA), between-group PCA, and canonical variates analysis, result in clear separation between all extant taxa. Interestingly, modern human trapezia are most similar to those of chimpanzees and bonobos, suggesting that these taxa share subtle but derived shape features relative to other hominids. Moreover, all fossil hominin trapezia examined here fall within or between the clusters of Homo and Pan, again suggesting that trapezium morphology retains important phylogenetic information.

**Where they were not: What can the Mursi Formation tell us about early hominins habitat preferences? [Session 4]**

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At more than 4 Ma, the Mursi Formation is among the oldest sediments of the Omo Group of the Omo-Turkana Basin. Despite an age that corresponds to the *Ardipithecus-Australopithecus* transition, it has been only occasionally explored since its discovery in 1967. The existing faunal collection included fewer than 250 specimens and notably lacked hominins.

Renewed fieldwork in the formation allowed us to triple the faunal collection to more than 900 specimens and to better understand the depositional context of the fossils. The increased sample confirms the previously observed abundance of suids relative to bovids (3:1), and the relative abundance of hippos, elephants, deinotheres, crocodiles, and *Euthecodon*. The larger sample now includes a primate and perhaps a tragulid, but still no hominins. Stable carbon isotopic composition of calcitic rhizoliths and organic matter from paleosols are extremely <sup>13</sup>C-depleted. These values indicate very closed, wooded vegetation dominated by C<sub>3</sub> plants and little or no C<sub>4</sub> understory, with a proxy-based estimate of woody cover greater than 80%. The paleosol carbon isotopic values from the Mursi Formation are extremely different from those at the 4.4 Ma *Ardipithecus ramidus* locality of Aramis, the latter of which indicates average woody cover of less than 25%. The paleosol carbon isotope values from Mursi are also very different from the penecontemporaneous *Australopithecus anamensis* locality of Kanapoi, with an estimated woody cover of ~ 50%. The closed, likely mesic habitat inferred from the fauna and paleosols of the Mursi Formation might represent an environment that was unfavorable for hominins.

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**Between a rock and a hard tooth: Investigating mobility in two Medieval Danish populations using strontium isotopic analysis [Poster Session B]**

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During the medieval period of Denmark (AD 1050 - 1536), economic and trade relations grew inter-regionally, with culture, ideas and products being transferred on a more regular basis throughout the period. By the 14th century, the population underwent a dramatic decline. In spite of many cemeteries being abandoned, it appears that burial patterns remained constant, with all members of the community being buried in the same cemetery. During the medieval period the country faced drastic changes in climate, shifting economic and agricultural practices, and disease outbreaks (most notably The Black Death). Human enamel samples from two medieval sites around Horsens, Denmark were explored: the rural site of Sejet and the urban site of Ole Wormsgade, both used throughout the 12th to 16th centuries. This study analyzed variations in 87Sr/86Sr ratios from 35 enamel samples, compared against known local and regional 87Sr/86Sr ratios. The 87Sr/86Sr ratios are slightly different between eastern and western Denmark. One individual, a female aged 42-52 at time of death, was found to have a significantly higher 87Sr/86Sr ratio than expected for Denmark, which could be due to individual movement between Scandinavian regions. Additionally, 16 individuals had 87Sr/86Sr ratios that could indicate movement from other regions within Denmark. The extent to which these populations used mobility as a response to famine and disease during this turbulent period will be explored in relation to isotopic and paleopathological evidence. The results are discussed with respect to broader differences within and between the two populations.

**Investigating the geographic origins of workers at the Imperial cemetery of Vagnari (1st - 3rd century C.E.), using strontium and oxygen isotopes [Poster Session B]**

\*Emery M.V., H.P. Schwarcz, R.J. Stark, S. Elford, and T.L. Prowse

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Isotopic applications to determine human mobility are now ubiquitous in bioarchaeological research, though their use as a tool in Roman migration research has only recently become common. We present the oxygen ( $\delta^{18}O$ ) and strontium (87Sr/86Sr) values obtained from 42 individuals buried at the Imperial Roman period cemetery at Vagnari, a burial ground composed of workers on an Imperial estate, in southern Italy (1st – 3rd century C.E.). We also report the 87Sr/86Sr composition of associated fauna and soil from the site (n=15) in order to determine the local 87Sr/86Sr bioavailable range to help identify outliers. In addition, our research presents the first preliminary 87Sr/86Sr baseline map of the Italian peninsula, compiled from disparate geological, archaeological, floral, and faunal data collections. The dental enamel 87Sr/86Sr

results suggest that the Vagnari occupants originated either locally or from the Italian coast. The oxygen data indicate movement to Vagnari as children from inland region, near the coastline of Italy, or across the Mediterranean Sea from coastal North Africa. A conservative estimate for migrants at Vagnari was generated using a bivariate boxplot (i.e. bagplot). Results from plotting the 2 dimensional medians of both isotope datasets suggest that only (~7%) of individuals buried at Vagnari were born elsewhere and migrated to Vagnari as children. Finally, our isotope dataset was analyzed using Multi-Criteria Evaluation and GIS-based computational Analysis (GIS-MCE), as a novel means to visually represent, overlay, and provenance the isotope data points.

### **The impact of food subsidy on food security and health in Canada's Arctic communities 2007-2015 [Session 5]**

Galloway T.

Department of Anthropology, University of Toronto Mississauga

Since the 1960s, food subsidy has been a core component of Canada's northern development policy. The most recent iteration of that approach, Nutrition North Canada (NNC), is a retail subsidy program implemented in 2011 and designed to reduce the cost of nutritious food for residents living in Canada's remote, northern communities. The present study evaluates the impact of NNC on food security and health patterns of people living in remote northern communities. Publicly-available program documents are examined for evidence that the subsidy is meeting its objective in a manner both comprehensive and equitable across regions and communities. These outcomes are compared with measures of food security and general health and nutrition status available from the CCHS for the period prior to and since implementation of NNC. NNC has not met its goal of reducing the cost of nutritious food for northerners. Prices for subsidized foods are consistently higher in Canada's Territories than in other jurisdictions, and NNC lacks price caps or other means of ensuring food is affordable and equitably priced in communities. Both the volume and cost of nutritious food delivered to communities is highly variable and dependent on factors such as retailers' pricing practices, over which the program has no control. Gaps in fiscal and food cost reporting constrain the program's accountability and recent measures to increase program accountability. Prevalence of high blood pressure and adult obesity are significantly higher in the territories since the implementation of NNC, while the proportion of people who report eating fruit and vegetables 5 times per day is significantly lower in the territories since implementation. The proportion of moderate-to-severely food-insecure households has increased significantly in Yukon and Northwest Territories communities while in Nunavut it has remained the same. It may be necessary to consider alternative forms of policy in order to produce sustainable improvements to food security, nutrition and health in remote, northern communities.

**Greater levels of habitual activity produce lower risk for dysfunction following fracture:  
Evidence from two Roman communities [Session 6]**

\*Gilmour R.J.<sup>1</sup>, M.B. Brickley<sup>1</sup>, E. Jurriaans<sup>2</sup>, and T. Prowse<sup>1</sup>

<sup>1</sup>Department of Anthropology, McMaster University; <sup>2</sup>Department of Radiology, Juravinski Hospital

Fracture analyses were integrated with biomechanical data on long bone cross-sectional areas to investigate post-traumatic extremity disuse at the Roman period sites of Ancaster, UK (n=181) and Vagnari, Italy (n=66). Poor functional outcomes can be affected by a fracture's location, type, and associated complications (e.g., osteoarthritis, malunion), but clinically, are also frequently affected by individual and social attitudes toward injury and recovery. While some of these attributes are measurable in palaeopathology, long-term dysfunction associated with fractures has not previously been addressed on a large scale.

Long bone fractures were observed at both Ancaster (n=39/181, 21.5%) and Vagnari (n=12/66, 18.2%). Evidence for limb disuse associated with injury was not observed at Vagnari, but was present in two individuals from Ancaster. Fractures tended to heal with minimal amounts of malunion at both sites. Among the individuals without fractures, evidence for increased mechanical loading was present at Vagnari, particularly in the lower limb, suggestive of greater overall physical activity.

Results from this study suggest that the level of habitual activity present in these Roman communities may have played a role in injury recovery. That is, more active individuals (e.g., Vagnari) may have been more likely to regain physical function after injury than people who were not as intensely active (e.g., Ancaster). The tendency for fractures to heal with minimal malunion suggests that individuals were afforded sufficient time for their bones to heal, and the absence of impairment suggests they returned to function quickly.

**The knowledge translation (KT) of nutritional health information during pregnancy: A case study from the Mothers to Babies (M2B) Project [Session 5]**

\*Grenier L.<sup>1</sup>, T. Moffat<sup>1</sup>, M. McConnell<sup>2</sup>, M. Pottruff<sup>2</sup>, and D.M. Sloboda<sup>3</sup>

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Purpose: An exploratory pilot study to investigate the state of knowledge translation (KT) of nutritional information during pregnancy as well as the sources pregnant women use to find nutrition information.

Method: Participants recruited from the City of Hamilton (n=78) completed the Mothers to Babies (M2B) survey. A multiple linear regression analysis examined the predictive power of a pregnancy health knowledge scale created from the survey. Chi-square significance tests determined sociodemographic patterns in pregnancy nutrition information sources used by



women. Open-ended questions about pregnancy nutrition information with qualitative responses were analysed.

Results: Women who are immigrants and whose main source of income is from government assistance are predicted to have lower pregnancy health knowledge. The most frequently reported source of dietary information during pregnancy was social networks (87.5%), which consisted of family, friends and partners. Women from low SES households were more likely to use doctors, prenatal classes and nurses as sources of dietary information, whereas women from high SES households were more likely to use midwives. Women reported confusion about nutritional guidelines during pregnancy; most recent evidence for pregnancy information are not yet included in government and healthcare practitioner recommendations.

Conclusions: This pilot study of pregnant women indicated that the KT of pregnancy nutrition information is somewhat inconsistent, leading to confusion among expectant mothers. Women who are immigrants and from low SES households are more vulnerable than other populations to having low pregnancy health knowledge. Pregnancy nutrition KT must be improved in general and particularly for these more vulnerable populations.

**Satiating sailors and settlers: Multi isotopic (C, N, S) dietary analyses of seventeenth-century human remains from the Fort Saint Louis and La Belle shipwreck sites (c. AD 1680s) in Texas [Poster Session B]**

\*Guiry E.<sup>1</sup>, and M.P. Richards<sup>2</sup>

<sup>1</sup>Department of Anthropology, University of British Columbia; <sup>2</sup>Department of Archaeology, Simon Fraser University

We investigate human diet among sailors and settlers from terrestrial (Fort Saint Louis) and underwater (La Belle) sites associated with a seventeenth-century French expedition to establish a New World colony at the mouth of the Mississippi River. Stable carbon, nitrogen, and sulfur isotope analyses were performed on collagen from bones and teeth from two small groups of humans that, although part of the same colonization event, perished at different times. A well-contextualized faunal isotope baseline, including a large sample of rat remains which may provide a proxy for shipboard diet, offer a detailed context in which to interpret divergent human dietary life histories for each group. Results highlight the potential for dietary heterogeneity among early New World colonists. This research also demonstrates the value of historical records for interpreting archaeological human isotopic data.

**Seren[dip]ity: Taking advantage of the unexpected in Historical health research [Session 7]**  
**Hackett F.J.P.**

Department of Geography and Planning, University of Saskatchewan

Conducting research into the health of past populations can present significant challenges, such as those resulting from the failure of relevant records to survive into the present, and issues with data collection methods of the past. These limitations are not always disastrous to our research,

however. Sometimes a creative approach coupled with a thorough understanding of the documents can yield new insights into the past. In this presentation I draw upon case studies to discuss my experiences with dealing with historical data challenges, by harnessing the unexpected in the historical record.

**Chronological and regional variation in the ontogeny of humeral asymmetry among hunter-gatherers [Poster session A]**

Harrington L., and B. Osipov

Department of Anthropology, University of Alberta

The study of humeral asymmetry as measured through cross-sectional geometry has played an important role in reconstructing the behaviour of past human populations. Studying the ontogeny of humeral asymmetry broadens understanding of behaviour as it can elucidate when behavioural differences between populations develop during growth. Humeral midshaft asymmetry in Total Area (TA) and torsional rigidity (J) was evaluated for juveniles and young adults from three populations: the Early Neolithic Cis-Baikal, Siberia (8,000-6,800 cal BP); Late Neolithic/Early Bronze Age Cis-Baikal, Siberia (6,000-4,000 cal BP); and Later Stone Age South Africa (8,000-800 BP). Arm asymmetry was compared separately for individuals younger or older than 13 years. Comparisons were also made between male and female adolescents and young adults for the Cis-Baikal and Later Stone Age populations. Results demonstrate no significant differences in humeral asymmetry among groups prior to adolescence. Adolescents of the Late Neolithic/Early Bronze Age Cis-Baikal individuals have significantly lower TA but not J compared to the Later Stone Age group. Adolescent Later Stone Age males have significantly higher values of TA and J than Later Stone Age females and Cis-Baikal males or females. The homogeneity of Cis-Baikal asymmetry trajectories may indicate behavioural adaptation to a broadly similar ecology. High levels of asymmetry among Later Stone Age adolescent and young adult males are suggestive of the habitual use of specific hunting tools. Overall, the study shows that population differences in humeral asymmetry become visible in adolescence and likely stem from the commencement of adult foraging behaviours.

**Forgotten coffins: The excavation of three 19th century interments in downtown Toronto [Session 7]**

Holland A.<sup>1</sup>, and T. Irvin<sup>2</sup>

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Routine construction work at a building in downtown Toronto resulted in the discovery of unexpected human remains. Further exploration of the area revealed the presence of four individuals and three coffins, representing three adults and a sub-adult. Historical research into the neighbourhood indicated that the area had previously been zoned as the Duchess Street Burial ground, though documentation of the cemetery was lost in the late 1800s. The cemetery was relocated at the turn of the last century to the Toronto necropolis, and the area was rezoned for

commercial buildings. This paper describes the bioarchaeological findings associated with these remains, while also using this case study as a mechanism to explore the past and present problems associated with historic cemetery relocations. As a previously recognized cemetery, the discovery raised wider issues that are inherent in assessing, removing, and curating intentional interments discovered through subsurface excavation. As a result the discussion of these remains will also engage with the political and social ramifications of discovering forgotten coffins.

**The Strong Water Rapids “Sahgedahwegewohong” Middle Woodland burial mound, Hastings, Ontario [Session 2]**

Jackson, L.<sup>1</sup>, K. Dougherty<sup>2</sup>, and J. Tighe<sup>1</sup>

<sup>1</sup>Northeastern Archaeological Associates Ltd.; <sup>2</sup>Department of Anthropology, Trent University

In 2011, human remains were accidentally discovered by a construction crew excavating a cottage foundation on the north bank of the Trent River just below the village of Hastings, Ontario. Forensic concerns were quickly ruled out and the office of the Registrar of Cemeteries funded a multi-year recovery operation in conjunction with the Williams Treaty First Nations and Northeastern Archaeological Associates Ltd. In the late 1800s, ROM archaeologist David Boyle investigated what he called the Preston Mounds in Hastings. This mound group produced distinctive Middle Woodland materials but was never protected and in subsequent decades was largely destroyed and the location lost. Strong Water Rapids is the remnant of a single burial mound (perhaps part of the Preston Mound group) which at the time of the archaeological work had only a single partial burial in-situ and a small section of the east end of the mound still preserved. Severe disturbance of the site over many decades is indicated. After gaining permission of the First Nation, the material was radiocarbon dated to the 2nd century A.D., early in the Middle Woodland. Remains of perhaps 25 First Nation individuals were identified, although the material is highly fragmented (typically less than <10% per element). The assemblage was examined for demographic, metric, nonmetric and pathological conditions and is comparable to other Middle Woodland populations in the region. The Registrar has declared the site a First Nation cemetery and reburial of the remains and their associated Middle Woodland personal artifacts is planned for 2017.

**Radiographically recognizable? An investigation into the appearance of osteomalacic pseudofractures [Poster Session A]**

Jennings E.<sup>1</sup>, M.B. Brickley<sup>1</sup>, and J. Buckberry<sup>2</sup>

<sup>1</sup>Department of Anthropology, McMaster University; <sup>2</sup>Archaeological Sciences, University of Bradford

Osteomalacia is a type of metabolic bone disease caused by vitamin D deficiency. Vitamin D is a pro-hormone that, in humans, is most commonly sourced from sunlight and dietary sources, such as fish oils, milk, and eggs. A deficiency in vitamin D causes defects in the mineralization of osteoid, which over time leads to softened, weakened bone. As in the juvenile form of vitamin D

deficiency, rickets, this weakened bone is prone to collapse and bending. However, exclusive to osteomalacia are pseudofractures; small, linear cracks in the cortex of the bone, surrounded by irregular, spiculated new bone.

Radiography is frequently used to definitively diagnose pseudofractures, both clinically and in paleopathology, but little research has been done to define whether these fractures appear similar to fractures caused by trauma, and in what ways they differ. A radiographic study of the characteristics of pseudofractures was performed on a number of individuals from 19th-century sites in Canada and the United Kingdom. The radiographic features of these pseudofractures were then compared with previously recognized radiographic features of healing trauma-related fractures.

Preliminary results reveal key differences between pseudofractures and trauma-related fractures. Most surprising is the finding that pseudofractures may not always be visible radiographically, as the new bone formation is too poor a quality to appear radiographically dense like a true fracture callus.

This research has interesting implications for the diagnosis of pseudofractures, both paleopathologically and clinically, and is especially timely considering the rising instances of vitamin D deficiency in many Western countries.

### **The Epidemiological Transition Theory in 19th Century Antigua [Session 8]**

\*Kamckey J.

Lakehead University

Researchers have implemented a number of models and techniques in the analyses of elucidating patterns of health from death records. Discovering and understanding patterns in historical death record research can be a complex, multifaceted process particularly since research in the field of health and medicine has been largely driven by empirical cause and effect; however, health and medicine is actually socially driven. One of the most widely employed techniques has been based upon theories developed from the epidemiologic transition theory, established by Abel Omran in 1971.

More individualistic knowledge concerning disease experience can be ascertained by exploring death records with a more socialist, anthropological point of view. This approach can aid in the understanding of the inter-workings of a particular population and specific disease pathways. This research explores anthropological avenues of death record analyses with a specific case study from 19th century Antigua, West Indies. The sample population, dated from 1863 to 1873 represents two of five parishes on the island, one rural and one with a large urban center. There is a relatively equal ratio of male to female with a racial distribution representative of the island's population at the time.

This study highlights challenges to the ideologies inscribed in medicine by the language used in describing disease experience. Language that uses terms like acute and chronic, communicable and non-communicable, and infectious and degenerative that represent conflicting or overlapping

ideas. It leaves questions regarding the structure of our understanding of disease experience in historical health research today.

**Investigating 3D shape change in the ilium during growth and the influence of habitual activity in Later Stone Age foragers of southern Africa [Session 4]**

Kurki H.K.<sup>1</sup> and L.A. Harrington<sup>2</sup>

<sup>1</sup>Department of Anthropology, University of Victoria; <sup>2</sup>Department of Anthropology, University of Alberta

High levels of within-population size and shape variation in the human adult pelvis suggest that this structure is more biologically plastic than previously thought. The adult pelvis is the product of the skeletal growth process, and as such, use of the lower limb in locomotion during the growth period may influence the shape of the developing pelvis. Variation among individuals in the levels of mobility may contribute to pelvic variation. This study examines the pattern of shape change in the ilium in a sample of juveniles (N=54) from the Later Stone Age foragers of southern Africa (mid-Holocene) using three-dimensional geometric morphometrics, and assesses the relationship of ilium shape change through ontogeny with femoral midshaft robusticity (J) as an indicator of mobility. Principal components analysis of twelve 3D landmarks of the ilium summarized shape variation in the sample. Four of the first five PCs (PCs 1, 2, 4 and 5) show significant relationships with estimated age at death, capturing shape change through ontogeny. Age-adjusted values of PCs 1-5 were regressed on size-standardized femoral midshaft J values. None of these relationships were significant, suggesting that activity levels do not significantly influence overall shape variation in the ilium through ontogeny. It is possible that robusticity variation is too low in this highly active forager population to produce detectable variation in ilium shape, or that biomechanical influences on ilium shape during growth are too subtle to be detected in an analysis of whole-ilium shape.

**Shift in trauma patterns in the transition from rural to urban England [Session 2]**

Levesque C.G.<sup>1</sup>, C. Nichols<sup>2</sup>, P. Nystrom<sup>1</sup>, D. Mahoney Swales<sup>1</sup>

<sup>1</sup>Department of Archaeology, University of Sheffield; <sup>2</sup>Department of Humanities, Uppsala University

Over the course of the nineteenth century, England underwent a period of intense industrialization, and the proportion of the population living in urban environments increased dramatically at this time. This shift in lifestyle brought with it novel, potentially hazardous activities, exposure to which has the potential to result in a shift in trauma patterns. This study aims to determine what types of trauma—if any—appear characteristic of the post-medieval industrial period (PMIP) England in comparison to medieval England, and assess the relative risk of injury during either period. To this end we compare the trauma patterns of an industrial period cemetery from South Shields with a medieval cemetery from Newcastle upon Tyne. The geographical proximity of these samples ensures that any variation observed is more likely due to

a change in lifestyle over time rather than due to regional variation. In either period we observed a distinct set of characteristic injuries: clavicles were the most affected in the medieval assemblage, and hand bones in the PMIP assemblage. We suggest these changes are best explained by the shift from rural to urban life and the adoption of new technology that accompanied that shift, such as the ensuing use of large, potentially dangerous machinery.

**Buried within the bones: Histological examination as a method for uncovering unexpected cases of vitamin D deficiency in paleopathology [Session 7]**

\*Lockau L.<sup>1</sup>, S. Timmins<sup>1</sup>, S. Mays<sup>2</sup>, L. Bondioli<sup>3</sup>, and M. Brickley<sup>1</sup>

<sup>1</sup>Department of Anthropology, McMaster University; <sup>2</sup>English Heritage Centre for Archaeology;

<sup>3</sup>Sezione di Antropologia, Museo Nazionale Preistorico Etnografico

In paleopathology, histological examination of bone using light or scanning electron microscopy (SEM) is used to interpret pathological structural changes in the skeleton. It can provide important evidence for establishing and confirming diagnoses of several metabolic bone diseases, including vitamin D deficiency, in which disrupted mineralization processes result in weakened bone prone to deformity and fracture. In SEM examinations of rib samples from Roman period skeletal material from Ancaster (3rd to 4th centuries AD) in the UK and Isola Sacra (1st to 3rd centuries AD) in Italy, microscopic features could be used not only to support macroscopic diagnoses of vitamin D deficiency, but also to suggest additional cases of deficiency not detected based on macroscopic features alone. For five adults from Ancaster, microscopic evidence allowed for a slight shift in diagnostic category. More importantly, for one juvenile individual from Ancaster and another from Isola Sacra, microscopic evidence was sufficiently clear to justify their inclusion as possible cases of vitamin D deficiency. In the absence of microscopic analysis, these individuals would have been classified as exhibiting no evidence of deficiency, either due to the lack of features in a relatively complete skeleton or the presence of insufficient material to properly evaluate the presence of deficiency. These cases highlight histological analysis as a valuable tool for uncovering unexpected cases of vitamin D deficiency, both within bones that appear normal on the surface and within skeletons that appear too partial and fragmentary to evaluate paleopathologically.

**Gateways to death? Reconsidering 18th century London hospital reputations with skeletal and archival evidence [Session 7]**

Mant, M.

Department of Anthropology, McMaster University

The reputation of the eighteenth-century hospital has traditionally been poor, with historians citing rampant infectious disease, drunken nursing staff, and bedbug infestations among the challenges facing patients. Recent historical scholarship is challenging this characterization and this project, incorporating skeletal and historical datasets, reveals that individuals admitted to four London hospitals for fractures during the long eighteenth century remained in hospital long

enough for substantial fracture healing to have taken place and that the majority were discharged or made outpatients. 5233 individual hospital admittances for fracture to the Middlesex, Royal London, St. Thomas', and Guy's Hospitals were analyzed. Closed fractures of the lower limbs generally resulted in longer average hospital stays than fractures of the upper limbs for both males and females. Some evidence of successful medical intervention is available: of the 56 males admitted to the Royal London and Middlesex hospitals for compound leg fractures, only 16 (28.6%) were fatal cases. The skeletal sample (n = 721), from both hospital (Royal London, St. Thomas') and parish (St. Bride's lower churchyard, Cross Bones, Payne Road and Bow Baptist) cemeteries included only four examples of perimortem fracture trauma. Contemporary surgeons' and physicians' notes describe a variety of successfully treated fractures, indicating that the eighteenth-century hospital deserves a reconsideration of its previously treacherous characterization.

**Imprints of ancient pathogens: bridging the historical and molecular narratives [Session 7]**  
Marciniak, S.

Department of Anthropology, McMaster University

The biological reality of a pathogen can be accessed with ancient DNA, but it is necessary to situate this presence using additional evidence, whether it is historical, skeletal, or archaeological. I discuss the investigation of malaria in Imperial period Italy (1st-4th c. A.D.) as one such scenario where the molecular evidence for *P. falciparum* from adults in two disparate locations (a rural estate and a minor port city) was unexpected since malaria was thought to be prevalent in urban coastal areas. Accordingly, the biosocial context of disease was explored using literary, epidemiological, and archaeological evidence in order to frame relationships between the pathogen, human hosts, mosquito vector, and environment. By applying such an approach, it was possible to propose pathways that potentially enabled a varied distribution of malaria at the studied localities, ranging from elements of disease ecology (e.g., climate, landscape, and geomorphology) to human-environment interactions (e.g., land use patterns such as agriculture or infrastructure activities). As pathogens are embedded in specific historical and geographical contexts, it is necessary to highlight the synergistic interactions underlying ancient landscapes of disease. Although much remains unknown regarding epidemiological patterns in antiquity, combining ancient DNA with complementary evidentiary sources represents a dynamic strategy to frame the multifaceted experience of disease.

**New scientific methods in the study of lithic residue from palaeoanthropological sites:  
Olduvai Gorge [Session 4]**

Mercader J.<sup>1</sup>, R. Bird<sup>1</sup>, M. Bundala<sup>2</sup>, J. Favreau<sup>1</sup>, M. Itambu<sup>1,2</sup>, P. Lee<sup>1</sup>, R. Patalano<sup>1</sup>, L. Tucker<sup>1</sup>  
<sup>1</sup>Department of Anthropology and Archaeology, University of Calgary; <sup>2</sup>Archaeology and Heritage Department, Dar es Salaam University

Several compendia have illustrated the reach of conventional approaches to exploring the evolutionary origin of omnivorous diets. Included are the cost of developing unusually large

brains and bodies, tooth size, shape, enamel thickness, mechanics and wear, and the chemical signal (e.g. isotopes) from diet left on bones and teeth. Over the last decade, a new interpretation of human origins has proposed a long history of dependence on fire, suggesting that humans are biologically adapted to cooked foods. However, both the conventional and more recent approaches have not provided direct indication of plant utilization as a key dietary component, nor have they revealed which tools were used to process different types of food.

Lithic residue is a triple proxy at the interface of tool use, paleoenvironment, and diet. The number of stone tool assemblages yielding Plio-Pleistocene microremains such as starch granules is very limited, and authenticity has not been rigorously established in many cases. What taphonomic lines of evidence must we unlock to address current preservation/authenticity controversy in molecular paleontology? Contamination is one of the key issues. Strict controls are rarely followed in practice. Many researchers still ignore stringent criteria possibly because they believe they are not really necessary but give no indication as to why the criteria ignored are not relevant. In this presentation we describe anticontamination measures deployed at Olduvai Gorge and the University of Calgary to increase the reliability of the recovered signals from lithic residue both in the field and laboratory.

### **Validating the use of canopy cover as a proxy predictor of human disturbance across forest habitats in northern Madagascar [Poster Session A]**

\*Mercado Malabet F.<sup>1</sup> and I.C. Colquhoun<sup>1,2</sup>

<sup>1</sup>Department of Anthropology, University of Western Ontario; <sup>2</sup>The Centre for Environment & Sustainability, University of Western Ontario

Much of the ongoing loss and fragmentation of forest habitats throughout Madagascar is the direct result of human activity on the island. Due to the extensive impact that this activity has on lemur populations, it is necessary to develop models that accurately monitor the effects of different human activities on Madagascar's remaining forest habitats. Obtaining direct measurements of anthropogenic disturbance can be a difficult and costly task, especially in large-scale studies covering large areas. In these cases, anthropogenic variables are often modelled indirectly, using proxy variables, like the percentage of forest cover. The limitations with this approach lies on the fact that percentage of forest cover can be a by-product of social and environmental factors. Additionally, this variable fails to account for disturbance that does not affect the upper canopy level. We seek to validate how well percentage of canopy cover correlates to observed anthropogenic disturbance, in order to create a baseline framework that understands the amount of error that results from using this proxy predictor. Using field data gathered at Oranjia Conservation Park in Northern Madagascar and High resolution canopy cover data for the region, we model how well correlated canopy cover is to observed disturbance at Oranjia. Our results show that canopy cover explains a considerable amount of the observed variation in anthropogenic disturbance. However, we caution that efforts need to be taken to ensure that human activity is accurately represented by the percentage of canopy cover and that



environmentally-caused disturbance (e.g., storm damage) does not constitute too much confounding variation.

**Timing of stress episodes at Houtaomuga: Neolithic and Bronze Age comparisons [Session 5]**

Merrett D.C.<sup>1,3</sup>, H. Zhang<sup>1,3</sup>, X.M. Xiao<sup>2,3</sup>, Q.C. Zhang<sup>2,3</sup>, D. Wei<sup>2,3</sup>, L.X. Wang<sup>2</sup>, H. Zhu<sup>2,3</sup>, and D.Y.Y. Yang<sup>1,3</sup>

<sup>1</sup>Department of Archaeology, Simon Fraser University; <sup>2</sup>Research Centre for Chinese Frontier Archaeology, Jilin University; <sup>3</sup>SFU-JLU Joint Centre for Bioarchaeological Research, Simon Fraser University

The unworn and minimally worn anterior teeth of 48 individuals from Neolithic and Bronze Age levels of Houtaomuga site in Jinlin Province, China were examined macro- and microscopically for location on the labial surface of lines of Enamel Hypoplasia relative to the cemento-enamel junction. From estimated ages of enamel formation across the tooth crown surface, ages of occurrence of stress exposure were calculated. Variation in timing of growth cessation and recovery from birth to 6 years, as recorded in the enamel of the anterior dentition, is explored within the cultural and environmental contexts of two distinct subsistence economies: the Neolithic based solely on hunting-gathering-fishing, the Bronze Age with millet cultivation added to the basic h/g/f economy. This study examines the bioarchaeology and life histories of young children across dimensions of time, environment and subsistence in Northeast China.

**Using CT scans in your research: What you need to know [Session 1]**

Merritt, C.E.

Centre for Anatomy and Human Identification, University of Dundee

In many countries, CT scans of cadavers are used at forensic institutes to eliminate unnecessary autopsies, help ascertain cause of death, and create biological profiles of unidentified individuals. These scans are linked to a vast amount of personal information, including medical records, police reports, occupation data, and pathology reports.

These databases represent tremendous potential for research in biological anthropology. However, these new tools require new methodological approaches. This talk provides key questions and issues biological anthropologists should know before designing a study that uses CT scans. What kinds of adjustments do we need to make to our current methods for analyzing bones and soft tissues? What are the limits of existing software? What kinds of permissions are needed to access these materials and to use the results in publications? What information do you need to know before you select your field sites?

My postdoctoral research assesses how fat and muscle influence bone turnover rates on markers used in skeletal aging. I use CT scans to estimate skeletal age and measure soft tissue, and correlate these data with occupation records and medical records on weight and lifestyle. I have

worked with CT scans at the Centre for Anatomy and Human Identification (CAHID) at the University of Dundee in Scotland, at the Department of Forensic Medicine at the University of Copenhagen in Denmark, and at the Victorian Institute of Forensic Medicine (VIFM) in Australia.

**Assessing the longterm biological and health effects of malnutrition and hunger in Canada’s residential schools [Session 5]**

Mosby I.<sup>1</sup>, and T. Galloway<sup>2</sup>

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In recent years, there has been an increasing medical consensus that Canada’s Indian Residential School system - a system of federally-funded and church-run boarding schools which operated between 1883 and 1996 - had an at times devastating and usually lifelong impact on the health of residential school survivors. What was once referred to vaguely as the “residential school syndrome” in both popular and medical literature has now been widely recognized as a complex of health outcomes related to a range of mental, physical, emotional, social and cultural traumas experienced by former students as a result of their common experiences. Until recently, much of the research on these long-term health effects have focused on the impacts of the residential school experience on survivors’ mental health. What has been less recognized by both medical researchers and practitioners, however, has been the long-term and even intergenerational physical consequences of the residential school experience. This paper offers some tentative insights into the possible long-term and even intergenerational impacts of the diet of residential school survivors.

**An assessment of the utility of estimating stature using data collected in situ using two types of laser scanners [Poster Session B]**

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Laser scanners (LS) are increasingly being used in forensic and archaeological contexts. This research assessed the utility of two LS, Faro Focus3D 330X and the Faro Freestyle3D, to obtain osteological measurements that could be suitable for stature estimation. The LS data were collected using Scene 6.0 and compared to a control (measurements collected using an osteometric board). The LS data and the control were used to estimate stature. The results indicate that the virtual measurements could be used to estimate stature with comparable accuracy to the control. Skeletal data collected post hoc from a scan of a crime scene or burial can be a usable source of information if the specimens are no longer available for analysis.

**Morphofunctional analysis of the metatarsals medio-lateral orientation in hominoids**

**[Poster Session A]**

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Anthropology Department, University of Montreal

Hypotheses concerning the evolution of the hominin foot usually focus on the timing of the appearance of the longitudinal arch, on the opposability of the hallux, and on the development of the heel region. Little attention has been given to the alignment of the lateral digit relative to the posterior part of the foot. This study explores the medio-lateral alignment of the lateral metatarsals among hominoids. The sample consists of tridimensional surface scans of second to fifth metatarsals of five different taxa: *Pongo pygmaeus*, *Gorilla gorilla*, *Pan troglodytes*, *Homo sapiens* and *Homo naledi*. The medio-lateral angle (MLA) was measured as the angle between the longitudinal axis of the metatarsal and the orientation of the articular base in dorsal view. We predicted that humans, because their metatarsals are shifted medially towards the hallux, would have a MLA that is less than 90°. Apes, on the other hand, would present angles that are closer to 90°, particularly in the most arboreal Pongo. Our preliminary results are significant only for the third metatarsal, but they follow partially our prediction, since Pongo has the angle closest to 90°. The other taxa follow the expected pattern, but are not significantly different. The lack of difference between the bipedal Homo and the other taxa (except Pongo) is intriguing and could indicate that this trait is not useful to infer bipedality in fossil foot bones. However, our very small sample size warrants caution in making definitive conclusions.

**Changing patterns of stature and body mass in Medieval Denmark [Poster Session B]**

\*Parker K.

Department of Anthropology, University of Manitoba

Urbanization began in Denmark during the Middle Ages (AD 1000–1536). Very few towns have been documented prior to the 12th century. Rural and urban communities would have been subjected to increasingly distinct pressures as urban towns became more densely populated. To evaluate changing patterns of health throughout the Middle Ages, stature and body mass were analyzed in archaeological samples from the rural cemetery of Tirup (ca. AD 1150–1350) (n=139) and the urban cemetery of Black Friars (ca. AD 1300–1660) (n=393). Where preservation allowed, the anatomical method for stature estimation was used; in cases of poorer preservation the next best available standard was used (skeletal length in grave or regression equations based on the femur and tibia or on the femur alone). Body mass was estimated using the femoral head diameter. No difference was found in either stature or body mass between the rural or urban cemeteries. A statistically significant decrease in stature was noted in males buried before ca. AD 1400 and those buried later. Interestingly, no decrease in stature was noted for females. A statistically significant increase in body mass was documented for both sexes living before the late 13th century compared with those living later. Estimates of stature and body mass allow for more in-depth research into changing patterns of health and disease in the Middle Ages.

Analyses of these changes in stature over time will provide the basis for understanding age- and size-related skeletal degeneration (osteoporosis, osteoarthritis, DISH, and gout) among medieval Danes.

**Taking a bite out of early life: Studying dental wear on deciduous teeth [Poster Session B]**

Paul J., and L. Harrington

Department of Anthropology, University of Alberta

Diet in early life lends insight into the biological, ecological, and cultural realities of past peoples. This study examines early childhood diet among foragers in southern Africa through the lens of dental wear on deciduous teeth. Variation in dental wear has two primary determinants: the length of time teeth have been in occlusion (dental age) and the abrasiveness of the diet. Studies of deciduous teeth allow for the process of wear to be evaluated in detail because dental age in juveniles can be estimated with relative precision. By constraining age, the effects of diet are, potentially, more easily isolated. Furthermore, new methods of quantitatively measuring deciduous dental wear warrant an exploration of their potential. Dentine exposure was quantified for deciduous teeth in a sample of 47 juvenile Holocene (10 000 BP- present) foragers drawn from collections across South Africa. Dental wear in the sample was expected to vary based on ecological and temporal differences between subsamples, and the length of time teeth had been in occlusion (dental age). Of the three variables, only dental age was significantly correlated with dental wear. The uniformity in early childhood diet, implied by the dental wear data presented in this study, emphasizes the need for further research. This study contributes new information about dental wear patterns in child foragers, and provides insight into how current methods for measuring dental wear could be modified to better document the process of dental wear in early life.

**New discoveries about the lives of Huron-Wendat Ancestors, 2016 [Session 2]**

Pfeiffer S.

Department of Anthropology, University of Toronto

In contexts of new archaeological excavations and of repatriation of curated collections, the Huron-Wendat Nation has allowed the retention of one tooth from each ancestor, so that small amounts of dental tissue and adhering bone can be studied. The U of Toronto Department of Anthropology curates the materials on behalf of the Nation, to which researchers apply for research permission. New radiocarbon dates have been generated, so that changes over time can be considered, from the 14th to 17th centuries. This presentation will provide a summary of new discoveries that have been made possible through isotopic studies. New, clear isotopic evidence documents patterns in ancestral Wendat reliance on maize, and the very diverse sources of protein that were exploited. New evidence also provides information on when mothers weaned their babies and the nature of childhood diets. The work is part of an exploration into how we can ask questions that descendants care about, and how we can frame our work in accessible ways.

## **Secret Disease: Bioarchaeology of syphilis in America [Session 2]**

Phillips S.M.

Human Osteology Laboratory, Indiana State University

This study examines the evidence for the presence of syphilis in America from its Colonial Period through the early 20<sup>th</sup> century. Questions include what is the earliest evidence for the disease, if the rate of the disease varies, and if/when does syphilis become endemic? To address these questions skeletal data from across North America are pooled (>5,900) and compared according to time frame. In addition, the historical record is examined for both public health and medical responses to syphilis. The historical analysis reveals a purposeful effort by the medical community to aide patients in “hiding” the disease. Colonial period physicians often complained of the common “Secret Disease.” This effort continued with the American Medical Association pushing to end the “Conspiracy of Secrecy” still surrounding syphilis in the early 20<sup>th</sup> century. Historical epidemiological data indicate syphilis likely reached endemic levels by the early 1800s, ranging from 8-20% of the population. By the early 20<sup>th</sup> century, congenital syphilis was reported to account for 3.5% of fetal and infant mortality. The skeletal data from bioarchaeological studies demonstrates distinct patterns in the distribution of syphilis. Frequencies of reported syphilis vary greatly between military, family, and institutional contexts. This study explores the cultural dynamics that resulted in the bioarchaeological reported patterns in the unfolding development of modern public health and medicine.

## **Tales from the teeth: Challenges of using dental calculus as a proxy to bone for stable isotope analysis [Session 7]**

\*Price S.D.R.<sup>1</sup>, H.P. Schwarcz<sup>2</sup>, and A. Keenleyside<sup>3</sup>

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Dental calculus has been examined in archaeological material for years, but has largely been relegated to considerations about dental pathology. Research within the last decade has focused on paleodietary studies of dental calculus using methods such as microfossil analysis, stable isotope analysis, and ancient DNA. This study investigates paleodiet using stable isotope analyses ( $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ) of a skeletal sample from the Greek colonial site of Apollonia Pontica, Bulgaria (5th to 3rd century BC). Paired dental calculus and bone samples were analyzed and, unlike previous studies, the organic and the inorganic components ( $\text{CO}_3$  from calcium phosphate phases) were analyzed separately. No significant correlation was found between the  $\delta^{13}\text{C}$  values of either the organic or inorganic components. However, a significant correlation was found between the  $\delta^{15}\text{N}$  values of bone collagen and the organic component of dental calculus. The  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  values of the organic component of calculus varied more widely than values for bone collagen samples of the same individuals. These results indicate that dental calculus is not an appropriate proxy to bone for paleodietary studies using stable isotope analysis and that any dietary signal that may have been present is clouded by other effects. One possible explanation is the great diversity of the oral microbiome, and the inclusion of microbial material into the

calculus. A significant, positive correlation found between the C/N ratios and the  $\delta^{15}\text{N}$  values of the organic dental calculus samples suggests that these values may indicate evidence of bacterial activity in the dental plaque before mineralization.

### **A large-scale investigation of vitamin D deficiency in the western Roman Empire [Session 6]**

Prowse T.<sup>1</sup>, M. George<sup>2</sup>, S. Mays<sup>3</sup>, and M.B. Brickley<sup>1</sup>

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This paper presents the preliminary results of a large-scale study of rickets and osteomalacia in the ancient Roman world (1st – 4th centuries AD). Data were collected on 2855 individuals of all ages from three large settlements located in Italy, Spain and the UK, two mid-sized settlements in the UK and France, and two small towns/rural sites located in the UK and Italy. Only one skeletal sample from rural southern Italy showed no skeletal evidence of vitamin D deficiency in juveniles (a more sensitive indicator of deficiency at a site than active or healed cases in adults), but evidence for vitamin D deficiency was found in the other small-scale settlements and at sites in southern latitudes. Prevalence of rickets in juveniles ranged between 1.4% and 15%.

Our preliminary results indicate that although latitude is clearly an important variable, biocultural factors are also critical for the development of vitamin D deficiency. Prior to the widespread atmospheric pollution of the Industrial Revolution, the amount of time spent indoors, child-care practices, clothing, along with gender-, status -, and age-based inequalities were likely significant determinants of vitamin D status. Through the integration of multiple lines of evidence, this project will offer new insights into the factors contributing to the presence of vitamin D deficiency in the ancient Roman world and regional variation in vitamin D status.

### **Testing the hypothesis of Type II osteons as indicators of mechanical load [Session 1]**

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Different types of osteons result from bone remodeling. Type I and drifting osteons are relatively well known, but two other forms, zonal and Type II (TII), are still poorly understood. The TII osteon are defined as a smaller version of Type I with a scalloped reversal line and concentric lamellae within another osteon with its own reversal line. This suggests that an area of bone along the haversian canal has been resorbed and filled in again. Some authors have suggested that these osteons could possibly be a sign of active mineral regulation such as maintaining calcium homeostasis. We hypothesized that TII osteons are less common in the upper limb (humerus) relative to the lower limb (tibia) and if they correlated with bending rigidity (I) and polar moment of area (J). Our sample consists of 10 humeri and 27 tibiae. In 11 individuals, we

have both bones. The sample originates from Euro-Canadian settlers from St. Matthews cemetery in Quebec City, Quebec. The cemetery was active from 1771 to 1860.

No significant difference (Mann-Whitney U test for paired sample;  $p=0,075$ ) was found between humerus and tibia of the same individuals. However, when the whole sample was used, significant differences were found between the bones ( $p=0,009$ ). Moreover, no correlation was significant between Type II osteons and cross-sectional properties. These preliminary results suggest that Type II osteons are not necessarily a direct indicator of mechanical load but could be a sign of active mineral exchange in more loaded bones.

### **Anthropomorphism in anecdotes: How primatologists describe novel events [Session 3]**

\*Ramsay M. S.<sup>1,2</sup>

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Anecdotal evidence has long been used as a vital source of information in the discipline of primatology; including some of the most important discoveries of the last century. However, anecdotal evidence can also be misleading or unrepresentative of actual animal behaviour and thus anecdotal accounts are often placed below more rigorous quantitative data in hierarchies of knowledge production. This presentation will explore and critically analyse the use of anecdotes within the discipline of primatology with specific reference to potential anthropomorphic biases and the variable evidence available for anecdotes. I systematically sampled the four major primatological journals (American Journal of Primatology, Folia Primatologica, International Journal of Primatology, and Primates) for peer-reviewed reports using anecdotal evidence from 2000 to present. I found 161 examples of anecdotal accounts in the primatological literature. Anecdotal evidence was most often used to describe novel social behaviours, infanticide, and predation events. Anecdotal accounts were significantly biased towards haplorhine primates, with great apes being the single largest taxonomic category. As human observers, this skew towards great apes suggests that it may be easier for primatologists to relate to animals in an anecdotal account that are closer to us phylogenetically. This creates biases in models of primate behavioural evolution as certain behaviours (such as tool use) are categorized as being present in certain taxa but not others based on mainly anecdotal accounts. Overall, this analysis suggests that while anecdotal evidence remains important for primatologists, as scientists we must be careful of anthropomorphic biases in these types of data.

### ***Homo heidelbergensis*: the view from the Eastern Mediterranean Communications Area (EMCA) [Session 4]**

Roksandic M.

Dept. of Anthropology, University of Winnipeg

The hominin mandible BH-1 from the Middle Pleistocene cave of Mala Balanica suggested a possibility that human populations in this part of the continent were not subject to the process of

Neanderthalization observed in the west. Current hominin fossil record of the early Middle Pleistocene of the Central Balkans suggests that Europe was inhabited by two different populations, a population in the west of the continent with developed derived Neanderthal morphology, and a more variable population in the east characterized by a combination of plesiomorphous and synapomorphous traits. Together with the Southwest Asia the Balkans form the “Eastern Mediterranean” geographic entity, a region at the crossroads of the continents that should be conceptualized as the fertilization zone between different populations and their technological traditions. Building on the scant – but growing – fossil human record contextualized by more abundant archaeological data, we examine the evidence for this larger Eastern Mediterranean Communications Area in the Middle and Upper Pleistocene record. In the context of the Eastern Mediterranean, the presence of two populations suggests that, in order to continue using the nomenclature of *Homo heidelbergensis*, the current hypodigm needs to be revised to include only the specimens from the latter group.

**Dental affinities among mid-Holocene Eastern Africans: insights on the spread of herding [Session 2]**

\*Sawchuk E.

Department of Anthropology, University of Toronto

Mechanisms underlying the spread of herding into Eastern Africa ~5000BP are still debated. Domesticated animals first appear in the Turkana Basin, coinciding with the construction of megalithic “pillar sites” around the lake. Excavations at three sites revealed dense burials (MNI=49) as well as goat remains and zoomorphic artifacts suggesting these people were herders. Because the ceramic and lithic technology deviates substantially from that of prior fisher-hunter-gatherers in the region, archaeologists propose that these herders migrated from desiccating areas of the Sahara, Sahel, or Ethiopian Rift. The human remains present an opportunity to assess biological affinity through well-preserved dental morphology. To test the migration hypothesis, 37 crown, root, and intraoral osseous non-metric traits were compared between the pillar site sample (n=25 permanent dentitions) and archaeological skeletons from Later Stone Age (n=40), early herder (n=53), and Pastoral Neolithic (n=91) sites from Kenya and Tanzania. Additional comparisons were made with Historic Turkana peoples, plus pooled dental trait frequencies from North, sub-Saharan, and Southern Africa. Biological distances were generated using mean measure of divergence and visualized with multi-dimensional scaling. There are no significant phenetic differences between the pillar sites and earlier foragers or later pastoralists, indicating biological continuity across the transition to food production. This suggests the spread of herding to the Turkana Basin involved gene flow between indigenous foragers and incoming herders, and that this mosaic influenced subsequent development of the Pastoral Neolithic. Conversely, significant differences between Eastern Africa and other regions contribute to our broader understanding of African dental diversity through time.



**Stressing about stress: Using multiple methods of analysis to interpret stress severity and duration in the Danish Black Friars Cemetery population (13th-17th centuries) [Session 5]**  
Scott A.

University of New Brunswick

The study of stress in an osteological context is a challenge from both a methodological and theoretical perspective as we use skeletal remains to decipher the lived experience. Recognizing the limitations of this, particularly in how stress and overall health are gauged, this study unites multiple methods of analysis in an attempt to close the gap between what remains archaeologically and the biological processes that influence these changes. Spanning a period of socioeconomic change and an expanding urban environment, the Danish Black Friars cemetery population (13th-17th centuries) was used for this analysis comparing medieval (n=61) and post-medieval (n=142) patterns of health. Osteological indicators of stress (i.e. cribra orbitalia, porotic hyperostosis, enamel hypoplastic lesions and Harris lines), body size measurements and biochemical methods were all used to assess overall health with a specific focus on the interpretation of stress severity and duration. The results of this analysis confirmed that every individual experienced some form of stress whether through the manifestation of lesions, growth disruptions or biochemical fluctuations, highlighting an overall decline in health after AD 1536, particularly for females. Upon closer examination of this trend, it appeared that the co-prevalence of multiple indicators of stress was more detrimental to overall health, whereas differences identified within each type of indicator likely represented individual heterogeneity. By effectively identifying how stress spreads across the skeleton and the relationship between these different skeletal changes, we are better equipped to identify health trends throughout the life course and the impact of stress over time.

**Age-based variation in diet at the Roman Imperial site of Vagnari, south Italy [Session 6]**  
Semchuk, L., and T. Prowse

Department of Anthropology, McMaster University

Roman dietary research often draws from historical sources, which may be biased towards urban elite perspectives and neglect the dietary practices of rural inhabitants. The cemetery at Vagnari, an Imperial Estate in southern Italy (1st – 4th centuries AD), provides an opportunity to learn about the diets of rural inhabitants and the variation in food choices among ordinary Romans. This paper presents an analysis of diet at Vagnari using stable carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) isotopes from human bone. Stable isotope ratios of bone collagen and carbonate indicate the diet was composed mainly of  $\text{C}_3$  plants (e.g., wheat), with the incorporation of some animal-based proteins and  $\text{C}_4$  foods (e.g., millet). Results of stable isotope analyses at Vagnari align with historical representations of the ordinary Roman diet as a ‘Mediterranean triad’ of cereals, olives and wine.

Dietary variation within the Vagnari sample is inferred from changes in  $\delta^{15}\text{N}$  and  $\delta^{13}\text{C}_{\text{ap}}$  values with increased age-at death. Individuals in the transitional stages of weaning and adolescence

have distinct  $\delta^{15}\text{N}$  values from those in older age categories. Additional changes in total diet are observed in  $\delta^{13}\text{C}_{\text{ap}}$  values among individuals in later adulthood. This age-based dietary variation at Vagnari may be related to changing social roles and responsibilities, recommendations from Roman dietetics, or differential experiences of stress with age, all of which may affect access to food or food choices. Stable isotope data from Vagnari provide further details on the diets of rural Romans, including the finding that age was an influential factor in food choices.

**Critically assessing age data to maximize the research potential of identified reference collections [Poster Session B]**

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Department of Sociology, Anthropology, and Criminology, University of Windsor

Accurate age at death data are essential for developing and testing age estimation methods, but these age data are also correlated with patterns of sexual dimorphism, and “race”. Furthermore, because of the narrow time frame in which most collections were amassed, the age data are often highly correlated with year of birth, and thus secular changes: the youngest adults whose growth was most compromised also have the most recent years of birth and should be affected most by positive secular changes. The impacts of aging need to be considered in research that is not directly related to age estimation. However, “documented” does not necessarily mean accurate, and age at death data need to be critically assessed for accuracy in individual cases and for the collection as a whole. Although transcription and documentation errors are possible, the issues with age data for many collections are likely to be systemic within the specific historical contexts when collecting occurred. We offer a framework for working with documented skeletal collections, consisting of the classic ‘5 W’ questions, and several examples from the Terry, Dart and Pretoria collections to illustrate how the accuracy of age data can be evaluated to maximize their research potential. Furthermore, we present an example that illustrates how failure to consider age data can lead to a very misleading understanding of human skeletal variation.

**Growth status of survivors and non-survivors of skeletal tuberculosis: The relevance of records of child admissions to the Sant’Ana Sanitarium, Portugal (1904-1953) for health studies of archaeological populations [Session 9]**

Spake L., E. Gooderham, S. Fisk, L. Marinho, and H.F.V. Cardoso

Department of Archaeology & Centre for Forensic Research, Simon Fraser University

Low height and weight for age are hypothesized to be linked to increased frailty in children. This impacts the interpretation of past child growth and health, as skeletal samples are composed of the deceased in a population, and therefore frailer, individuals. To date, few investigations of the difference in growth status between surviving and non-surviving individuals have been conducted, mainly due to the lack of appropriate samples. Intake records from the Sant’Ana Sanitarium were used to address this question, as there are a number of deaths that occurred among the patients admitted to the institution. Height and weight data were recorded from the

intake records of 771 girls, aged 0-22 years old, admitted to the sanitarium between 1904 and 1953. Height and weight for age at admission were compared between the survivors and non-survivors using Z-scores. The likelihood of survival based on body size for age upon admission was calculated. Results showed that non-survivors were consistently shorter and lighter than the survivors throughout the age range, supporting a difference in growth status between the groups. This substantiates the commonly held idea that the non-survivors who make up archaeological samples do not accurately represent the health of the overall population, even when the comparative population is itself diseased.

### **A comparison of navigation strategies in three nocturnal lemur species [Session 3]**

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Humans solve multi-destination route problems with the application of simple heuristics (i.e., rules-of-thumb). Animals may do the same but the evidence is only strong for vervet monkeys. We examined whether strepsirrhines, who diverged from haplorhines more than 58 mya, would also show evidence of heuristic use when solving a multi-destination route. We hypothesized that whether a species had evolved these strategies, or not, may depend on their dietary specialization. Three nocturnal lemur species were tested at the Duke Lemur Center on an array of targets where certain paths were consistent with several heuristics (the nearest-neighbour rule, the convex hull, and a cluster strategy). Frugivorous fat-tailed dwarf lemurs (*Cheirogaleus medius*) were expected to use distance-saving heuristics most because fruit trees are stationary targets; whereas species like gray mouse lemurs (*Microcebus murinus*) and aye-ayes (*Daubentonia madagascariensis*), that rely on more mobile (insects) and ephemeral (fungus) foods, were expected to show less evidence of heuristic use and to be more exploratory. We found support for all of these hypotheses. Dwarf lemurs showed evidence for use of all three heuristics, took the shortest paths, and were the least exploratory. Mouse lemurs were the most exploratory but did use a few paths consistent with the convex hull and the nearest-neighbour rule. Aye-ayes showed no evidence of heuristic use and were quite exploratory. This research provides support for heuristic use in strepsirrhines but further work is needed to confirm this.

### **Subadult body mass estimations and child health status during the Late Roman and Merovingian Period in Lisieux, France [Session 6]**

\*Timmins, S., T. Moffat, and M.B. Brickley

Anthropology Department, McMaster University

Assessments of body mass are commonly used to evaluate the health and nutrition status of living children. Child health status is also used as a sensitive indicator of socio-political stresses within a community. The current study estimated living body masses of subadults from a skeletal collection recovered from the Michelet necropolis dating to the late Roman (4th-5th century AD)

and Merovingian period (7th-8th century AD) in Lisieux, France through x-ray technique. This transitional period was associated with varying degrees of social, political and economic stress. This study aimed to identify health and nutrition disparities using body mass estimates in subadults (1-12 years) between the two time periods, between individuals buried with and without grave goods, and between subadults recovered from different burial types (used as a broad proxy for socioeconomic status). Results obtained from the archaeological individuals were compared to a healthy reference standard of children's weight-for-age, available for ages 0-5 years, from the World Health Organization. Statistical analysis demonstrated no significant change in body mass estimates over time, between individuals with/without grave goods, or those in different burial types. There was no significant difference between the healthy reference standard of weight-for-age and body mass estimates of the subadults recovered from the Michelet necropolis, though the archaeological individuals consistently had lower body mass estimates than the reference sample indicating nutritional stress. These results demonstrate that childhood health of those who would not have formed the political elite remained generally low in a community during a period of substantial socio-political stress.

***Homo floresiensis* and *Homo sapiens* at Liang Bua (Flores, Indonesia): The current state of the evidence [Session 4]**

Tocheri M.W.<sup>1,2</sup>, T. Sutikna<sup>3,4</sup>, S. Jatmiko<sup>4,3</sup>, and E. Wahyu Saptomo<sup>4,3</sup>

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Liang Bua is a large limestone cave on the Indonesian island of Flores that preserves skeletal and cultural evidence of two hominin species, *Homo floresiensis* and *Homo sapiens*. However, whether these two different hominins ever overlapped temporally at the site or on the island is a critically important research question. The discovery and initial dating of *H. floresiensis* at Liang Bua to between ~95–12 thousand years (ka) ago highlighted the uncertainties about when *H. sapiens* first arrived on Flores but the earliest evidence of modern humans on the island was also from Liang Bua and was restricted to the last 11 ka. This unexpectedly late arrival of *H. sapiens* on Flores was difficult to explain because modern humans are on the nearby island of Timor by ~42 ka ago and in Australia possibly as early as ~50–60 ka ago. Current evidence from the cave suggests that *H. floresiensis* disappears ~50 ka ago and here we report new skeletal and cultural remains of modern humans that have been recovered from ~46–12 ka-old deposits at Liang Bua. This earlier arrival of *H. sapiens* on Flores is much more consistent with the available evidence of this hominin species in the greater region of Island Southeast Asia and Australasia but major questions still remain as to how, when and why *H. floresiensis* became extinct, and whether modern humans played any direct or indirect role in this process.

**Insights into secular trends of respiratory tuberculosis: The early 20th century Maltese experience [Session 8]**

L. Tripp, and L.A. Sawchuk

Department of Anthropology, University of Toronto, Scarborough

This paper delves into the relationship of economics, in particular the cost of living (Fisher index), and its relationship to the secular trends of tuberculosis mortality in the islands of Malta and Gozo. Notwithstanding the criticism of the economic hypothesis that has been directed at McKeown, the progenitor of this theory, we present evidence that economics offers the most parsimonious explanation for the decline of tuberculosis mortality in Malta during the 20th century.

We reaffirmed that the reproductively age individuals were most at risk of dying of tuberculosis, as 70 to 90% of all deaths due to tuberculosis occurred between the ages of 15 and 45 years of age. There was a clear sex differential in deaths, in that prior to 1930, rates in females were higher than males. During times of extreme hardship the sex differential was exacerbated. Over the course World War I, the sex disparity in tuberculosis rates increased until 1918, when there was also the influenza pandemic. The heightened differential was most likely a result of gendered roles as opposed to biological differences since female tuberculosis rates again surpassed male rates in 1945 during World War II.

Respiratory tuberculosis in both urban and rural settlements in Malta proper were significantly associated with the Fisher index, which explained approximately 61% of the variation in tuberculosis death rates ( $R=0.78$ ;  $R^2=0.61$ ;  $p<0.0001$ ). In Gozo, there was no significant impact on respiratory tuberculosis ( $R=0.23$ ;  $p=0.25$ ), most likely a consequence of the island's biological and social isolation as well as a self-sufficient economy.

**Undulant fever: Colonialism, culture, and compliancy [Session 8]**

Tripp L., and L.A. Sawchuk

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Undulant fever (also known as Maltese fever, or brucellosis), originated in Egypt around 1600 BC and is currently a re-emerging disease that threatens both the health of the working poor in Central Asia and the Middle East.

This paper provides a comparative intra-colonial study in the epidemiology of undulant fever, and reopens the debate over the impact left by colonialism on the health of civilian populations of Malta and Gibraltar during the late 19th to 20th century. Consideration of both positive and negative consequences of colonialism on indigenous populations is explored, where colonialism is viewed as a 'distal social determinant of health.'

We ask the question, why did the undulant fever experiences of Malta and Gibraltar differ drastically despite a known etiology? Through an exploration of how the disease was modified during a complex process that involved colonial action taken on cultural milk practices and the scale effect's impact on the creation, implementation, and enforcement of health policy, we argue

that Gibraltar's experience with the disease was distinct from that of Malta. We propose the new concept of the scale effect, as a multifaceted construct that embodies the demographic properties of size, density and dispersion together with its impact on the social determinants of health. The difference is attributable to Gibraltar's having: (1) a culturally entrenched tradition of goat-herding, but not an exclusive tradition of consuming raw goats' milk; (2) effective health-directed policies regarding herding and milk consumption; and (3) greater enforcement of policies and higher levels of group compliancy.

**A forager child with compromised health and mobility from the Late Archaic, southwestern Ontario [Session 2]**

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The skeletal remains of a forager child (about 14.5 to 16.5 years old and probable female) from the Late Archaic Hind Site (AdHk-1; ca. 3000 BP) of Southwestern Ontario indicate prolonged survival with a debilitating pathological condition. Pervasive gracility characterized by a diffuse reduction in osseous density involving both the axial and appendicular skeletons suggests a chronic, systemic condition. Assessment of the motor function of the child's limbs indicates a low likelihood of normal ambulation and limited upper body activity, presenting a unique case of chronic physical impairment in a mobile, foraging society. Abnormal morphology of the oral cavity suggests reliance on a soft food diet, very different from that of other group members. Differential diagnosis focused on lifelong conditions that could produce the observed conditions, with osteogenesis imperfecta (Types I, IV or VI) seeming most probable. The care of a non-ambulatory child in a mobile hunter-gatherer society is considered in the greater context of the Hind population as a community. The implications of surviving with compromised mobility and masticatory function in a seasonally mobile hunter-gatherer context include lifelong dependency on aid for transportation, both between and within occupation sites, as well as the necessity for special preparation of foods. The long-term survival of this child to adolescence suggests that she/he lived in a community that valued every member, reflecting a likely adaptive strategy for such small populations.

**Insights into health at the Napoleonic era Royal Naval Dockyard, Antigua, W.I. [Session 5]**

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Despite the numerous accounts of the ill effects of various fevers on the health of military personnel stationed at or near English Harbour, there is little morphological evidence of the experience with infectious disease on the skeletal remains of Naval personnel. Given the acute

nature of most tropical fevers, the lack of evidence for infectious conditions is not entirely surprising. Although a partial picture of health and lifestyle can be pieced together for a few individuals that show osseous evidence for non-infectious health conditions (i.e. nutritional, developmental, and traumatic), gross skeletal analysis has not allowed for a more general view of what the average person serving in the Navy at English Harbour may have experienced. Bone samples from two cemeteries associated with the historic Dockyard, the Royal Naval Hospital Cemetery (n=24) and Galleon Beach (n=10), were analyzed via inductively coupled plasma mass spectrometry (ICP-MS) to reveal variable and often high levels of lead and one notable case of high mercury. These findings demonstrate not only hazardous exposure to toxins and their accumulation, but also probable use of toxic trace elements in medicinal compounds, some of which would have been administered to treat fevers. The application of trace element analysis of human skeletal remains has allowed us greater insight into health at this tropical outpost for the clarification of issues that had been largely speculative based on historical texts.

#### **Neanderthals from Chagyrskaya Cave, Altai, Siberia [Session 4]**

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The presence of Neanderthals in the Altai mountains of Siberia has been suggested since the 1980s, following the discovery of human remains associated with Middle Palaeolithic industries at Okladnikov and Denisova caves. These remains had few morphologically diagnostic traits, but analyses of mitochondrial and nuclear DNA supported the assignment of some of these fossils to Neanderthals, whereas others belong to another group, the Denisovans.

Since 2008, our team has been excavating Chagyrskaya cave, about 100 km west of Denisova.

The Pleistocene deposits of the site date to the transition between OIS 4 and 3 based on 14C dates and environmental data. The excavations have yielded more than 100,000 lithics and about 150,000 animal bones, as well as 75 hominin fragments coming from at least five individuals.

The majority of the material comprise isolated teeth and phalanges, but we have also recovered large parts of a right arm and shoulder girdle and a left foot.

The Chagyrskaya assemblage preserves a large number of Neanderthal traits in the dentition such as midtrigonid crests on the lower molars and strongly shoveled upper incisors with a convex labial surface. The postcranial material also shows several features seen in Neanderthals, like the presence of a dorsal sulcus on the axillary border of the scapula, large and rounded apical tufts on the phalanges and robust first metacarpals with large M. opponens pollicis crest.

We will discuss the morphology of these specimens in a comparative context and their implications for our understanding of Neanderthal geographic variability.

**The curious case of the cat mummy in the nighttime [Session 7]**

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Following in the vein of the session's unusual, unexpected, surprising, and potentially negative results, this paper will discuss the somewhat expected negative and completely unexpected positive results encountered in the study of an experimental cat mummy, named Yes, at the University of Western Ontario.

The Yes Project represents one of only a handful of experimental Egyptian-style mummies produced in the last 20 years. Yes has been CT imaged repeatedly since its mummification in 2004, with the intent of tracking the change in radiological appearance of the remains over time. The project examined the possibility that postmortem changes resulting from embalming might mimic antemortem pathological conditions. Recently, it has also become possible to employ MR imaging on desiccated mummies and was applied to the study of Yes.

The findings in the intended study (forthcoming) were negative; that is, the postmortem changes to the soft tissues were not mimicking pathological conditions. The most recent set of CT and MR images, however, demonstrated an unexpected anomaly in the appearance of Yes' heart. The implication is the presence of dried blood, appearing highly dense in the CT but absent in the MRI, which suggests a multimodal comparative approach to the identification of mummified thrombi and hematoma (forthcoming).

This unexpected finding demonstrates that applying a multimodal approach to anthropological imaging provides novel information available in neither single modality on its own. Findings of this type could then have implications for perimortem trauma identification and for palaeopathological and forensic analyses of desiccated human and animal remains.

**Expression of developmental stress through regional fluctuating asymmetry in the cranium [Poster Session A]**

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The *Homo sapiens* bony labyrinth (inner ear), cranial base, vault, and face develop progressively and retain relative morphological and developmental independence despite integration. Bones are more plastic during growth and, therefore, possibly more apt to preserve evidence of physiological stress during development. Comparing levels of fluctuating asymmetry (FA), a commonly-used indicator of physiological stress, between cranial regions may facilitate mapping stress levels through development. We hypothesize that levels of FA in these regions will correlate positively with the time it takes a region to reach adult morphology.



To evaluate this hypothesis we use two populations from the Ancient Nile Valley, the el-Badari (n=32) and Kerma (n=27). Previous research suggests that these samples have very disparate health, and therefore should have different FA levels. 36 bilateral, linear dimensions were recorded on the bony labyrinth, base, vault, and face. Each measurement was scaled and tested for skew and normality before FA evaluation.

As expected, FA scores were lowest in the bony labyrinth, suggesting the structure is functionally constrained and genetically canalized. However, other regions did not follow the expected pattern: FA peaked in the cranial base and then decreased through the face and vault, with variable significance. This result may demonstrate that cranial base morphology is relatively more susceptible to physiological stress or that stress is higher during cranial base development. FA did not differ significantly between samples, but el-Badari coefficients of variance for FA were higher in every region, suggesting the samples may have had different health profiles than previously thought.

### **Observations on experimentally mummified tumors [Poster Session A]**

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Archaeological evidence of cancer consists primarily of cases of primary or secondary bone neoplasms, since bones survive better than soft tissues in the archaeological record. Mummified human remains are a valuable resource for future paleo-oncological studies as they have the potential to preserve cancers affecting soft tissues as well as bone. Recently, an experimental mummification project was undertaken by the authors to assess the effects of mummification on tumor tissue. Mice containing human melanoma tumors were desiccated through natural and anthropogenic mummification styles. The mice were scanned using microCT pre and post mummification, and the size, shape, and characteristics of the tumors and other tissues were analyzed and compared. Early observations indicate that tumors in mummified material remain very well preserved in both natural and anthropogenic mummification. Tumors were able to be differentiated from other tissues in pre and post mummification scans, and in post mummification images the tumors were more easily distinguished from other soft tissues. These results are supported by other experimental studies that found that tumor tissue survives better than other soft tissues in mummification. This poster will discuss observations about change in shape and density of tumors and other tissues, and the analytical challenges associated with materials and processes associated with mummification in different styles.

**Biocultural approach to the interpretation of human osteoarchaeological data from ancient China [Session 9]**

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As a biological entity, human skeleton is subjected to biological principles that guide growth, development and remodelling processes of bones but it can also be affected dramatically by social and cultural factors of human populations. Through three case studies of human skeletal remains from ancient China, this paper aims to prove that biocultural approach should always be used to facilitate the interpretation of human osteological data in order to better reconstruct human activities of the past. To do so, the biological dimension of skeletal changes should be critically examined through Wolff's law, biological principles and biomechanical responses to detect any "abnormal" changes of bones; the cultural dimension of human societies should also be vigorously examined from archaeological contexts to retrieve insights about social and cultural changes in subsistence practices, labour division by gender and by occupation, and among others. When these two dimensions, with more accurate and precise data are brought together, any significant connections and correlations, if existed, should naturally emerge. This biocultural approach has helped us make our osteoarchaeological research of ancient Chinese skeletal remains more meaningful to the study of Chinese archaeology.

**Nuvumitq: The role of osteobiography in modern museum exhibits [Session 2]**

Young J. and M. Betts

Canadian Museum of History, Gatineau, QC

In preparation for a repatriation request, human remains collected near the small community of Arctic Bay, Nunavut in 1958 and curated at the Canadian Museum of History were re-examined. The pattern of traumatic and adaptive changes, consistent with etchings on a bowdrill that accompanied the man in death, revealed a story of strength and survival. As the museum prepared for the complete renovation of its Canadian History Hall, it was recognized that the story of this individual provided an avenue to introduce the museum audience of over a million people annually to the Inuit. This paper will discuss the role of the First Peoples' community in creating a successful and authentic museum learning experience, the process from osteobiography to expert reconstruction of the man from the peninsula, Nuvumitq, and the adaptation of skeletal evidence for public engagement.