

# 50<sup>th</sup> Annual Meetings of



Canadian Association for Biological Anthropology  
l'Association canadienne d'anthropologie biologique

25-28 October 2023

Fort Garry Hotel

Winnipeg, Manitoba



**University  
of Manitoba**

# Traditional Territories Acknowledgment

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Ojibwe-Cree, Dakota, and Dene peoples, and on the National Homeland of the Red River Métis.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.



**University  
of Manitoba**



The organizers would like to extend their appreciation and thanks to the following sponsors for supporting the hosting of the 2023 annual meetings here in Winnipeg.

## **Sponsors**

Faculty of Arts, University of Manitoba

Faculty of Arts Endowment Fund, University of Manitoba

Vice-President Research & International, University of Manitoba

Department of Anthropology, University of Manitoba



## **Donors**

*We are grateful for the generosity of past and current members  
for making the 50<sup>th</sup> Annual Meetings a great experience*

***Bone Clones ❖ France Casting ❖ Tourism Winnipeg***

***McGill-Queen's University Press***

# **Organizing Committee for CABA-ACAB 2023**

## **Organizing Committee:**

Julia Gamble, Stacie Burke, Linda Larcombe, Rob Hoppa

## **Volunteers**

Grace Holmes, Elizabeth Hydesmith, Alexis Brooks, Katya Godwin, Jay Macey, Tracy Jones, T.H. Boris Leung, Julie Chen, Jiamin Wang, Carmen Reimer, Olivia Hogan, Michal Blechman, Cameron Scott, Esther Heinrichs, Aaron Klassen, Aidan Walls, Maddie Lishka, Patricia Pittman, Gabriel Zabalegui Saitman

## **Student Luncheon Coordinator**

Katie Brent

## **Student Luncheon Guest Speaker**

Sarah Lockyer

## **Honorary Guests**

Chris Meiklejohn, Emőke Szathmáry

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## **Information for Presenters/Attendees:**

Podium presenters: Please be present to load your presentation onto the laptop (the machine is a PC) in the morning before sessions begin or during the coffee/lunch break prior to your talk. A student volunteer will be present to assist.

Poster presenters: Posters are scheduled to be up all day Thursday and Friday in the Concert Ballroom. Please put your poster up at the location corresponding to your poster number. A student volunteer will be present with supplies for hanging posters and to provide assistance as needed.

Online attendees: A zoom link will be emailed to you the Wed. This link is for registered attendees only. The same link will be used for all three days' meetings. All times are CST. Please raise your virtual hand if you wish to ask a question of a presenter, and a volunteer monitoring the zoom session will invite you to ask your question as time permits.

Wifi access: The network - Fort Garry Conference  
Password - Prairie2022

# Canadian Association for Biological Anthropology / l'Association canadienne d'anthropologie biologique

## **Mission Statement**

The Canadian Association for Biological Anthropology / l'Association canadienne d'anthropologie biologique is a learned society of international scholars and students whose aim is to promote and increase awareness and understanding of physical (biological) anthropology among its membership, as well as to supporting institutions and agencies and the public at large. Physical anthropologists study adaptation, variability and evolution in a biocultural context. Our members recognize and celebrate the geographic and temporal diversity and complexity of ancient and modern humankind, our hominin forebears and our nonhuman primate cousins and their ancestors. As such, our discipline is inherently multidisciplinary, crossing the boundaries between the natural and social sciences, in order to provide a richer understanding of human diversity and complexity.

## **Statement of Respect for Diversity and Inclusion**

Our organization embraces diversity among its membership and values the inclusion of people with diverse perspectives and backgrounds. We commit to providing a welcoming and safe space for scientists and scholars regardless of sex, ethnicity, age, physical appearance, sexual orientation, gender identity, disability, financial situation, religion, national origin, cultural background, pregnancy, parental or marital status, immigration status, academic affiliation, or any other aspect of identity. We seek at all times to mitigate the harms caused by inequities within our academy. We acknowledge the lands on which we gather and our continuing commitment to decolonizing our professional interactions through community-engaged approaches. Bullying, harassment or discriminatory forms of behaviour have no place within our society. All members are to be treated with dignity and respect and are expected to adhere to the CABA-ACAB Code of Ethics as well as any such codes by which they are bound through institutional or other affiliation.

## **Déclaration de l'ACAP - CAPA sur la Diversité et l'Inclusion**

Notre organisation encourage la reconnaissance et le support de la diversité parmi ses membres et valorise l'inclusion de personnes ayant des perspectives et des expériences diverses. Nous nous engageons à fournir un espace accueillant et sûr aux scientifiques et aux membres de la communauté universitaire, quels que soient leur sexe, leur origine ethnique, leur âge, leur apparence physique, leur orientation sexuelle, leur identité de genre, leur handicap, leur situation financière, leur religion, leur origine nationale, leur identité culturelle, leur grossesse, leur statut parental ou matrimonial, leur statut d'immigrant, leur affiliation universitaire ou tout autre aspect ayant trait à leur identité. Nous cherchons à tout moment à atténuer les dommages causés par les iniquités au sein de notre organisation. Nous reconnaissons l'histoire des terres sur lesquelles nous rassemblons et perpétons notre engagement à décoloniser nos interactions professionnelles

par le biais d'approches communautaires inclusives. L'intimidation, le harcèlement ou les formes de comportement discriminatoires n'ont pas leur place dans notre société. Tous les membres doivent être traités avec dignité et respect et doivent adhérer au code d'éthique de l'ACAP-CAPA, ainsi qu'aux codes auxquels ils sont engagés par le biais d'affiliations institutionnelles ou autre.

## **Mental Health, Safety, and Sexual Assault Resources in Winnipeg**

### **Crisis Response Center**

817 Bannatyne Ave, Winnipeg

Phone: 204-940-1781

Website: <https://sharedhealthmb.ca/services/mental-health/crisis-response-centre/>

The Mental Health Crisis Response Centre in Winnipeg is creating a central point of access for adults experiencing a mental health crisis, accessible 24 hours a day, seven days a week within an atmosphere that promotes healing and recovery.

### **Mobile Crisis Service**

Phone: 204-940-1781

Website: <https://wrha.mb.ca/mental-health/mobile-crisis-service/>

The Mobile Crisis Service assists individuals experiencing a mental health or psychosocial crisis, including persons with a co-occurring mental health/substance use disorder.

### **Manitoba Suicide Prevention Support Line**

Phone: 1-877-435-7170

Website: <https://reasontolive.ca/>

### **Canada Suicide Prevention Service 24/7 National Suicide Prevention Hotline**

Phone: 833-456-4566

Text: 45645

Website: <https://talksuicide.ca/>

### **Klinic Crisis Line**

167 Sherbrooke Street, Winnipeg

Phone: 204-786-8686

Website: <https://klinik.mb.ca/about-klinik/>

Klinic Community Health provides a full range of health related services from medical care to counselling and education. Driven by our vision of creating healthy and engaged communities, we promote health and quality of life for people of every age, background, ethnicity, gender identity, and socio-economic circumstance. Rooted in social justice values, we believe that everyone deserves quality care, support and respect.

### **Trans Lifeline**

Phone: 1-877-330-6366

A non-profit helpline offering direct emotional and financial support to trans people in crisis run by and for trans people.

### **Winnipeg Police Services**

Emergency: 911

Winnipeg Police Non-Emergency – 204-986-6222

### **Downtown Community Safety Partnership with Downtown Biz**

Phone 211 or 204-947-DCSP (3277)

Website: <https://www.dbsp.ca/>

Safety App: <https://www.dbsp.ca/news/dbsp-launches-community-safety-app/>

The DCSP has three frontline teams that provide a welcoming and friendly downtown presence while also serving the complex needs of the downtown community 24/7. Calls to the DCSP will be forwarded for the appropriate response by the CONNECT, MAC247 (Mobile Assist and Connection), and COAR (Community Outreach Advocacy Resource) teams. DCSP services and responses include the provision of information, assistance and referrals, social needs assessments, advanced first aid, outreach, and safe/courtesy walks.

### **Manitoba Domestic Abuse Crisis Line**

1-877-977-0007

Text (204) 792-5302

### **Domestic abuse community resource map**

The domestic abuse community resource map provides locations, contact details, and descriptions of resources found through various locations and organisations in downtown Winnipeg. It also includes public transport route maps in relation to these.

[https://www.gov.mb.ca/justice/vs/dvs/domestic/pubs/resource\\_map.pdf](https://www.gov.mb.ca/justice/vs/dvs/domestic/pubs/resource_map.pdf)

### **Manitoba Justice Domestic Violence Support Service (DVSS)**

1410-405 Broadway, Winnipeg

Phone: 204-945-6851 or Toll free: 1-866-484-2846

Toll free domestic abuse crisis line: 1-877-977-0007

Website: <https://www.gov.mb.ca/justice/vs/dvs/dvss/>

DVSS helps victims of domestic violence when criminal charges have been laid. They also help individuals who have received police services for domestic violence incidents that do not result in charges or arrests.

### **Hope for Wellness**

Phone: 1-855-242-3310

Chat at <http://www.hopeforwellness.ca>

The Hope for Wellness Helpline is available to all Indigenous people across Canada. Experienced and culturally competent counsellors are reachable by telephone and online 'chat' 24 hours a day, 7 days a week

### **Rainbow Resource Centre**

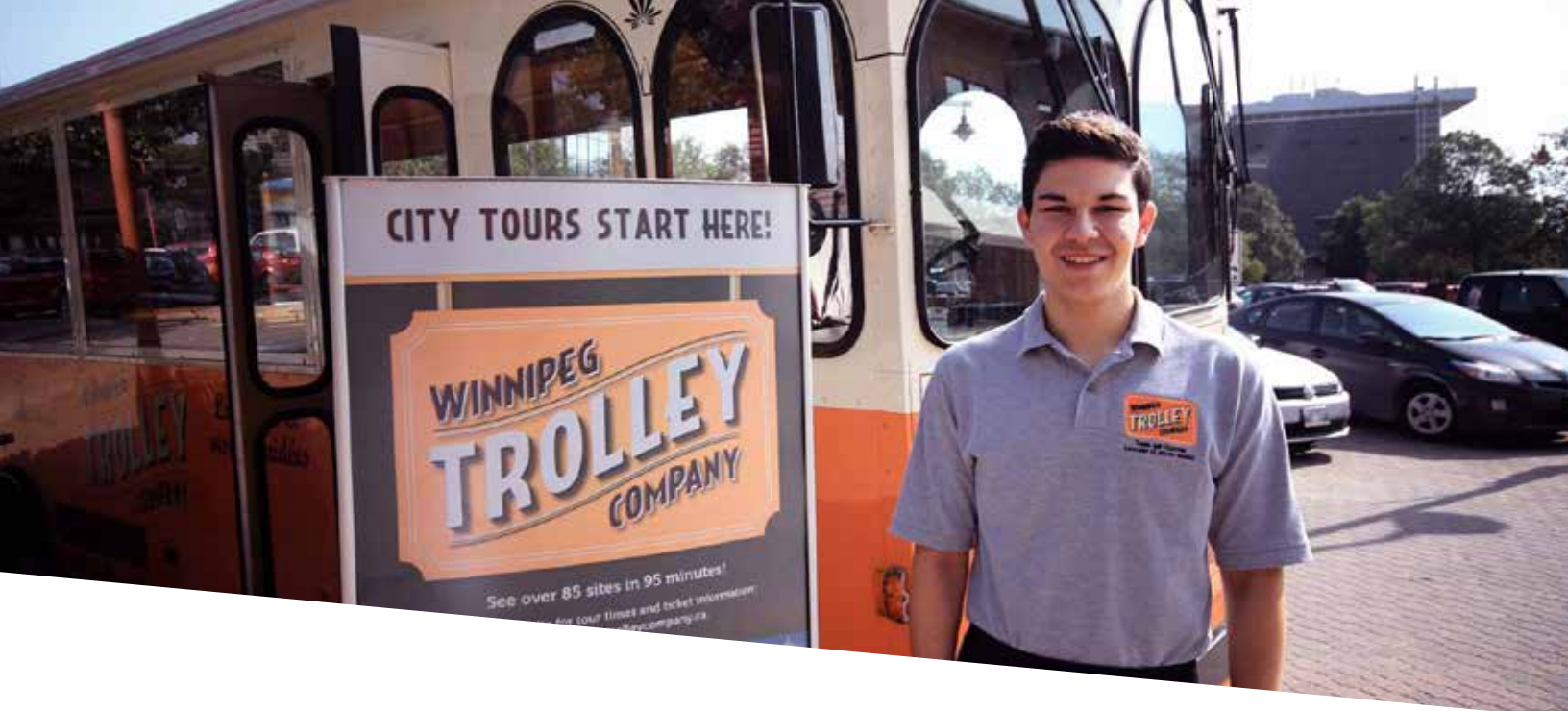
545 Broadway, Winnipeg

Phone: (204) 474-0212 or Toll-Free: 1 (855) 437-8523

Website: <https://rainbowresourcecentre.org/about>

Rainbow Resource Centre offers support to the 2SLGBTQ+ community in the form of counselling, education, and programming for individuals ranging from children through to 55+. It also supports families, friends, and employers of 2SLGBTQ+ individuals.





## Flash Your Badge

The Flash Your Badge program offers discounts on attractions, tours, and many other goods and services with tourism partners. Simply present your delegate badge and enjoy the savings.

**Tourisme Riel / Ô Tours** Saint-Boniface Walking Tours- Buy one ticket for a 1.5 hour walking tour of Saint-Boniface, Winnipeg's French Quarter, and get a second ticket free. Not valid in conjunction with any other offer or discount. Walk-ups accepted.

**Royal Canadian Mint Guided Tours** Buy One Admission, Get One Free on guided tours. Please call to make a reservation.

**Canadian Museum for Human Rights** The Canadian Museum of Human Rights is pleased to offer 15% delegate discount. Not valid for special exhibition, not to be combined with any other offer.

**Manitoba Museum** Come explore this unique attraction, including a Museum, Science Gallery and Planetarium, with a 15% delegate discount. Not valid for special exhibition, not to be combined with any other offer.

**Winnipeg Art Gallery** Enjoy two-for-one admission, or 50% off one adult admission to the galleries and Gallery Shop.

**Assiniboine Park Zoo** Assiniboine Park Zoo invites you to enjoy a 15% discount off general admission rates. Not to be combined with any other offer.

**Rainbow Stage** Rainbow Stage is pleased to offer \$5 off any Prime seat. Valid for regular performances only (no rush seating or preview showings) Can not be combined with any other offer.

### **Winnipeg Richardson International Airport Plaza**

Premium Lounge - Receive 20% off Plaza Premium Lounge at Winnipeg Richardson International Airport.

Root98 Restaurant - Enjoy 20% off at Root98 at Winnipeg Richardson International Airport.

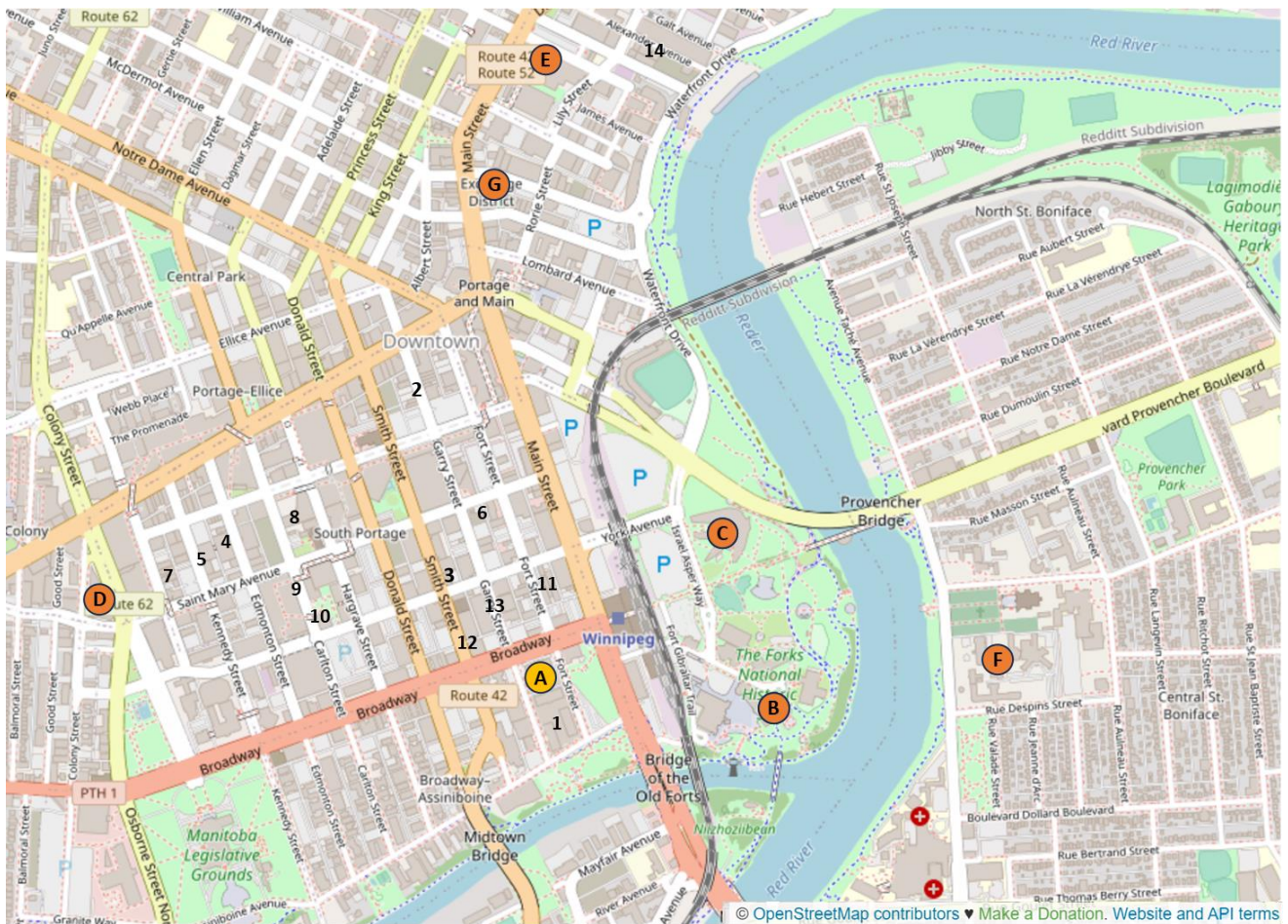
### **Outlet Collection**

Visitors shopping at Outlet Collection Winnipeg that live 60km or more outside city limits can take advantage of special discounts and offers up to 50% OFF from participating retailers! Out-of-town shoppers can visit the Guest Services Centre and present proof of residency to claim their FREE VIP Shopping Experience card.

### **Tourism Winnipeg Attractions Pass**

Save on some of the city's top attractions with the digital Attractions Pass. Climb aboard the Nonsuch at the Manitoba Museum; journey through the awe-inspiring architecture and powerful exhibits at the Canadian Museum for Human Rights; let your imagination take off and soar at the Royal Aviation Museum of Western Canada; experience a tour worth every penny at the Royal Canadian Mint; and get back to nature at FortWhyte Alive. 1-day and 3-day passes are available.

To purchase: <https://www.tourismwinnipeg.com/deals-and-passes/winnipeg-attractions-pass>



**A Fort Garry Hotel**  
 222 Broadway  
 - The Oval Room Brasserie (Restaurant)  
 - Ten Spa

**B The Forks Market**  
 1 Forks Market Road  
 Local focus food market with a range of cuisines  
 - Market food hall <https://www.theforks.com/eat-and-drink>  
 - Johnston Terminal with Old Spaghetti Factory

**C Canadian Museum for Human Rights**  
 85 Israel Asper Way  
 1-877-877-6037  
<https://humanrights.ca/>

*The Canadian Museum for Human Rights is just down the road from the Forks Market on Israel Asper Way. It is the first museum solely dedicated to the evolution, celebration and future of human rights. Its "mandate is to explore the subject of human rights, with special but not exclusive reference to Canada, in order to enhance the public's understanding of human rights, to promote respect for others, and to encourage reflection and dialogue."*

**D Winnipeg Art Gallery - Quamajuq**  
 300 Memorial Blvd.  
 (204) 786-6641  
<https://www.wag.ca/>

*WAG-Quamajuq features an impressive collection of over 27,000 artworks spanning centuries, cultures, and media, including the largest public collection of contemporary Inuit art in the world. Each piece has its own story to tell. Sharing these stories with the world is at the core of WAG-Quamajuq. This is an engaging, accessible space where visitors can experience art and learning in new ways.*

**E Manitoba Museum**  
 190 Rupert Ave.  
 (204) 956-2830  
<https://www.manitobamuseum.ca/>  
*Provincial museum of Manitoba, containing HBC collection, a replica of the Nonsuch with diorama, and coverage of the Winnipeg General Strike.*

**F St. Boniface Cathedral**  
 180 Av. de la Cathédrale  
 (204) 233-7304  
*Roman Catholic cathedral built in 1906 and damaged by fire in 1968. Picturesque façade remains with historic cemetery.*  
<https://www.cathedralestboniface.ca/>

**G Winnipeg Exchange District**  
*Downtown neighbourhood stretching along Main Street beginning on the North side of Portage Ave. Designated a National Historic Site, its 20 block expanse hosts approximately 150 heritage buildings. Interesting shopping and worth a wander around if you have time. Daytime visiting (for example, Saturday) recommended as it gets quiet at night.*  
<https://www.tourismwinnipeg.com/plan-your-trip/neighbourhoods/display.neighbourhood/6/exchange-district>

# Places to Eat and Drink

## 1a Two Kelly's Café

3-81 Garry St. (Located in Fort Garry Place II)  
(204) 942-4020  
Fresh and homey café. Good for breakfast!  
<https://2kellyscafe.ca/>

## 1b Two Broke Girls the Friendly Diner

16-81 Garry St.  
(204) 944-1634  
Classic diner behind the Fort Garry  
<https://www.facebook.com/2brokegirlsthefriendlydiner/>

## 2 LOCAL Public Eatery

274 Garry St.  
(204) 557-1729  
<https://localpubliceatery.com/neighbourhoods/garry-st/>

## 3 La Roca

115 Smith St.  
(204) 615-9695  
Mexican cuisine  
<https://www.laroca.ca/>

## 4 Affinity Vegetarian Garden

208 Edmonton St.  
(204) 943-0251  
Vegetarian Taiwanese  
<https://www.affinitygarden.com/>

## 5 Kokeb Restaurant

266 Edmonton St.  
(204) 784-9267  
Ethiopian cuisine

## 6 Mitzi's Chicken Finger Restaurant

250 St Mary Ave  
(204) 943-9770  
Old-school fixture offering chicken finger plates, plus Chinese dishes & teriyaki in a simple space. Winnipeg classic!

## 7 White Star Diner

258 Kennedy St.  
(204) 947-6930  
Old fashioned mom & pop diner  
<https://www.whitestardiner.ca/>

## 8 Hargrave St. Market

242 Hargrave St  
(204) 942-6446  
Upscale food hall, bar & brewery  
<https://www.hargravestmarket.com/>

## 9 Shannon's Irish Pub & Eatery

175 Carlton St.  
(204) 943-2302  
Irish pub with craft beers and live entertainment  
<https://shannonsirishpub.ca/>

## 10 East India Company Pub & Eatery

349 York Ave.  
(204) 947-3097  
East Indian restaurant with large buffet  
<https://www.eastindiaco.com/>

## 11 Johnny G's Restaurant & Bar

172 Main St.  
Pub food & drink  
(204) 943-1072  
<https://johnnygs.ca/>

## 12 Capital Grill and Bar

100-275 Broadway  
(204) 416-1144  
<https://www.capitalwinnipeg.com/capital-broadway>

## 13 The Keg Steakhouse & Bar

115 Garry St.  
(204) 942-7619  
<https://www.thekeg.com/en/locations/garry-street>

## 14 Patent 5 Distillery and Tasting Room

108 Alexander Ave  
(204) 808-8614  
<https://patent5.ca/>

**\*\*Note also the restaurants at the Forks (B on map)**

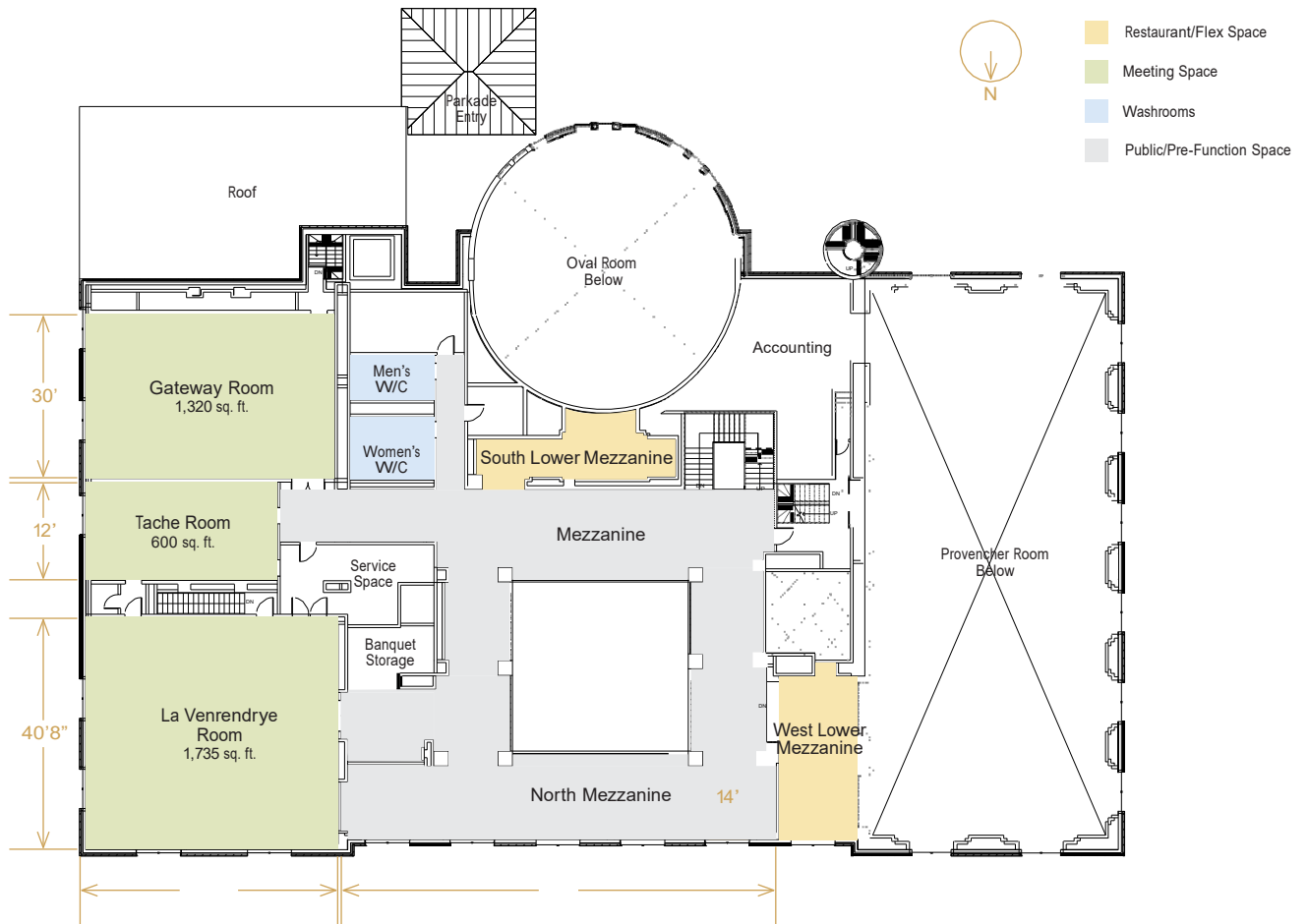
# MAIN FLOOR

## FLOOR PLAN



# MEZZANINE FLOOR

## FLOOR PLAN



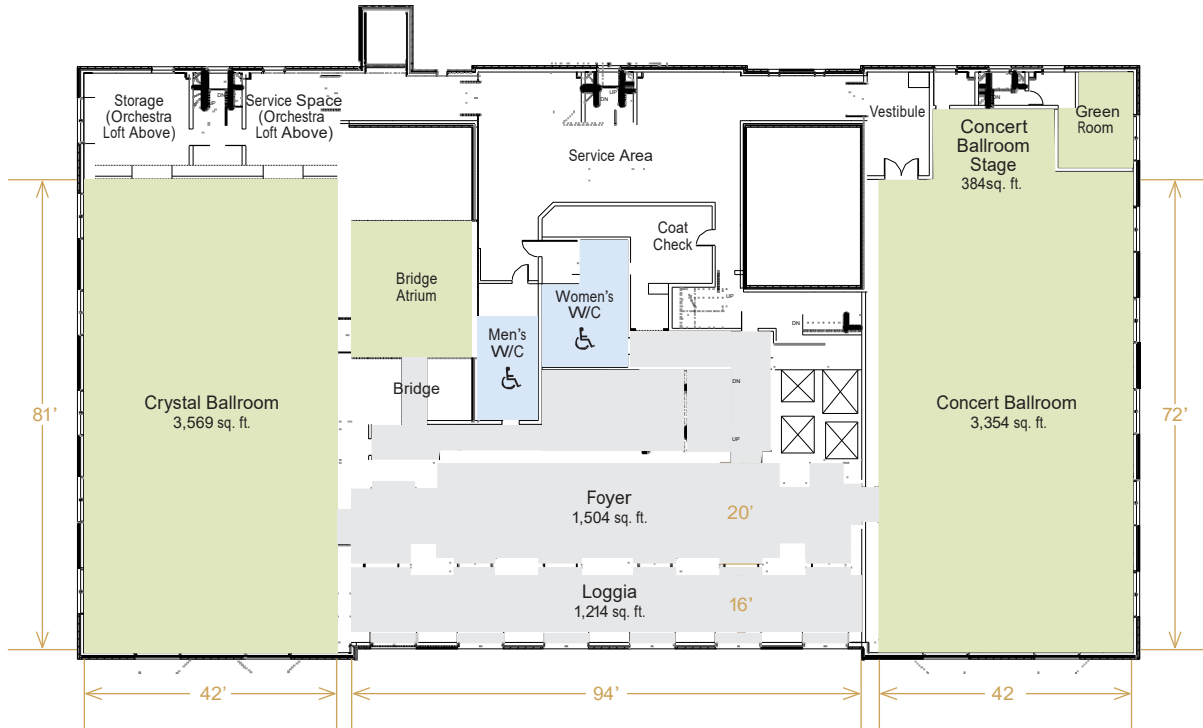
Reception in North Mezzanine, Wed 25 Oct 7pm-11pm

# 7<sup>TH</sup> FLOOR

## FLOOR PLAN



- Restaurant/Flex Space
- Meeting Space
- Washrooms
- Public/Pre-Function Space



Podium Presentations  
in Crystal Ballroom

Poster Presentations  
in Concert Ballroom

# Schedule

Podium Talks Crystal Ballroom – Posters Concert Ballroom 7<sup>th</sup> Floor

Authors in **BOLD** are eligible for the student prizes  
Virtual Presenters highlighted in **blue**

## Wed 25 Oct 2023

7pm-10pm Badge Pickup

7pm-11pm Reception – North Mezzanine (2<sup>nd</sup> Floor)

Please join us for some light finger foods and a cash bar to catch up with folks as they arrive for the start of the meeting. Badge pickup will be available.

Please remember, *registration is [online only](#).*

## Thurs 26 Oct 2023

8am Poster Setup – Concert Ballroom

8am-4pm Badge Pickup Foyer

8am COFFEE

845am Welcome Remarks

9am-10:15am Bioarchaeology

10:15am-10:45am COFFEE / POSTERS (odd numbers)

10:45am -12pm Bioarchaeology cont.

12pm-1:30pm Student Luncheon and Talk

1:30pm-2:45pm SYMPOSIUM: Restitution and repatriation/repatriation in biological anthropology: Defining and realising ethical practice, restoration of justice, return and redress.

2:45pm-3:15 pm COFFEE / POSTERS (even numbers)

3:15pm-5:30pm Primatology

## Fri 27 Oct 2023

8am-4pm Badge Pickup Foyer

8am COFFEE

8:30am-10:30am Health and Disease in the Past

10:30am-11am COFFEE / POSTERS (even numbers)

11am-12pm SYMPOSIUM: Innovation and technology forensic anthropology/archaeology

12pm-1:30pm LUNCH

1:30pm-3pm Biomedical Anthropology

3:15pm-3:45pm COFFEE / POSTERS (odd numbers)

3:45pm-5pm Skeletal Biology

**5pm POSTER TAKE DOWN**

5pm-6pm BUSINESS MEETING

7pm Banquet: Doors Open & Cash Bar

7:30pm- Dinner

7pm-11pm Banquet - Cash Bar throughout

## Sat 28 Oct 2023

8am COFFEE

8:30am-10:15am Human Evolution

10:15am-1045am COFFEE

10:45am-12pm SYMPOSIUM: Creating A Socially Responsive Practice in Biological Anthropology

12pm-1:15pm Forensic Anthropology

1:15pm-1:30pm Closing Remarks

THURSDAY	TITLE	AUTHORS
8:00 - 16:00	TAG PICK UP (NOTE: REGISTRATION IS ONLINE ONLY)	
8:00 - 8:45	COFFEE	
8:45 - 9:00	<b>WELCOME</b>	
	<b>SESSION: Bioarchaeology</b>	
9:00 - 9:15	Isotopic Inquires into the Potato Famine: Investigating Origins of Individuals from Pointe-Saint-Charles Cemetery, Montreal, Quebec	<b>Lovatt C et al</b>
9:15 - 9:30	Isotopic evidence of sedentism in Archaic Age groups from the Antilles: multiple isotope data from Canímar Abajo, Cuba	Chinique de Armas Y et al
9:30 - 9:45	Early life and early death in a wet-nursing community: Diet and stress in infants from 18th-19th century Pointe-aux-Trembles, Québec	<b>Holland S et al</b>
9:45 - 10:00	Assessing the Biological Diversity Between the Cemeteries of Canímar Abajo Through Metric and Non-Metric Dental Traits	Lischka M et al
10:00 - 10:15	Lethal Violence in a Peruvian Child Mummy	<b>Andersen H et al</b>
10:15 - 10:45	COFFEE	
10:45 - 11:00	Nail Keratin Amino Acid Stable Isotopes Reveal Insights into Early Childhood Diet	<b>Salahuddin H et al</b>
11:00 - 11:15	Experiences of the Certosa Children: Patterns of growth and childhood stress at the turn of the 20th Century in Bologna, Italy	Nelson J et al
11:15 - 11:30	Investigation and Analysis of Hypogeum Burial Patterns in The Near East (Continuity or Change)	<b>Parsaei S</b>
11:30 - 11:45	Exploring the interplay of biological sex and gender in a late Bronze Age tholos tomb and ossuary in the island of Kefalonia, Greece	Sierra-Serrano E et al
11:45 - 12:00	Investigating inter- and intra- individual variation in short term diet using hair from mummy bundles at Pachacamac, Peru.	Wiliams JS et al
12:00 - 13:30	STUDENT LUNCHEON	
	<b>SYMPOSIUM: Restitution and repatriation/repatriation in biological anthropology: Defining and realising ethical practice, restoration of justice, return and redress. (Chairs: Julia Gamble and Victoria Gibbon)</b>	
13:30 - 13:45	Example of an ongoing repatriation of a Mesoamerican skeleton at the Université de Montréal. Ethical, scientific and political considerations.	Houle E et al
13:45 - 14:00	Possibilities and limitations of using DNA to reconnect missing Indigenous children with their families and communities	Hider J et al
14:00 - 14:15	Moving Toward Respectful Care Practices: A Census of the Ancestors at the Anthropology Laboratories, University of Manitoba	ten Bruggencate R et al
14:15 - 14:30	Engagement with Ancestral Remains, USA	Pfeiffer S
14:30 - 14:45	Distinguishing restitution from repatriation: An argument for restitutionary work	Gibbon VE and Rassool C
14:45 - 15:15	COFFEE	
	<b>SESSION: Primatology</b>	
15:15 - 15:30	Sharing space and parasites: Human's influence on Eulemur fulvus parasite ecology	<b>Cosby AE et al</b>



15:30	-	15:45	Nest building in wild infant chimpanzees at Ngogo, Kibale, Uganda	<b>Khayer T et al</b>
15:45	-	16:00	Monkeys who experience more feeding competition utilize social information to learn foraging skills faster	Arseneau-Robar TJM et al
16:00	-	16:15	Platyrrhines modify social behaviour across forest zones in a Costa Rican rainforest	Bolt LM et al
16:15	-	16:30	A preliminary analysis of the role of body size, phylogeny, and function on interspecific shape variation of the chimpanzee and bonobo distal femur	<b>Friesen SE et al</b>
16:30	-	16:45	A landscape archaeological approach to accumulative stone throwing (AST) in West African chimpanzees ( <i>Pan troglodytes verus</i> )	<b>Nakano R and Kalan AK</b>
16:45	-	17:00	Impacts of the social environment on infant development in Rwenzori Angolan colobus monkeys	Stead SM and Teichroeb JA
17:00	-	17:15	Protecting Lemurs through Education: Field trips with youth in Fort Dauphin	Walker-Bolton A et al
17:15	-	17:30	A wild perspective on handedness: why it matters	Kalan AK

FRIDAY

TITLE

AUTHORS

8:00 - 16:00 TAG PICK UP (NOTE: REGISTRATION IS ONLINE ONLY)

8:00 - 8:30 COFFEE

**SESSION: Health and Disease in the Past**

8:30 - 8:45 Searching for scourges in the Historical Cemetery of Notre-Dame in Montreal (18th century): Preliminary DNA results

B-Hardy M-H et al

8:45 - 9:00 New approaches to diagnosing anemia in bioarchaeology: Getting out of the hole.

Brickley MB

9:00 - 9:15 Exploring the use of DNA analysis to study stress in the past

**Brien NE et al**

9:15 - 9:30 Hardship and Humanity: Osteobiographical Insights into the Irish Famine Diaspora during the 1847 Typhus Epidemic in Kingston, Ontario  
9:30 - 9:45 Skin and Bone: Accidents, injury, and violence in industrializing London, 1760-1901

Kelly J

Mant M and Alker Z

9:45 - 10:00 Quantifying the accuracy of porous lesion scoring using macroscopic vs. micro-CT analysis

**Morgan B et al**

Ward A et al

10:00 - 10:15 In society's shadow: Structural violence at Pachacamac, Perú

10:15 - 10:30 Childhood health and identity in the Byzantine: A paleopathological analysis of juveniles from Thebes, Greece

Strickland E and Liston M

10:30 - 11:00 COFFEE

**SYMPOSIUM: Innovation and technology forensic anthropology/archaeology (Chair: Victoria Gibbon)**

11:00 - 11:15 Forensic Anthropology and the Arctic: Unique Challenges and Approaches

Young J

11:15 - 11:30 Exploring 3D modeling technologies: A practical exercise in rapid prototyping to support forensic facial reconstructions

Simpson T

11:30 - 11:45 Start with the Why: How Research in Scattered Remains Turned into a Podcast

Kjorlien Y

11:45	-	12:00	Minimally destructive and non-invasive approaches in ancient human and forensic DNA analysis	Tran CNH et al
12:00	-	13:30	LUNCH	
<b>SESSION: Biomedical Anthropology</b>				
13:30	-	13:45	Beer, Bones, and Biomechanics: Investigating the Impacts of Alcohol Use Patterns on Femoral Cross-Sectional Geometry in Young Adult Males	<b>Brent KE et al</b>
13:45	-	14:00	HIV-Status, Inflammation, and Epigenetic Age among a Diverse Cohort of Sexual and Gender Minority Young Adults	Gibb JK et al
14:00	-	14:15	Variation in habitual activity and body composition: a volumetric comparison of swimmers and runners	<b>Hertz MP et al</b>
14:15	-	14:30	Assessing how enthesal malformation impact locomotion and loading of bones.	Rabey KN et al
14:30	-	14:45	Nats'eji: Examining Indigenous wellness and healing at Stanton Territorial Hospital, Northwest Territories, Canada	Roher S
14:45	-	15:00	Mortality due to gendered violence and life stage vulnerability in South Africa.	Voegt CM et al
15:00	-	15:15		
15:15	-	15:45	COFFEE	
<b>SESSION: Skeletal Biology</b>				
15:45	-	16:00	Super-resolution imaging algorithm for the bony labyrinth of the human temporal bone using micro-computed tomography and deep learning.	<b>Jia S et al</b>
16:00	-	16:15	Measure twice before you cut once ? a comparison of molar odontometrics	Laughton JK
16:15	-	16:30	Beyond a Binary: Working towards best practices for estimating sex from human skeletal remains	<b>Reid S et al</b>
16:30	-	16:45	3D morphological analysis of human cortical bone remodeling spaces using micro-CT data	Wei X et al
16:45	-	17:00	The rotational profile of the lower limb in horseback riders, agriculturalists, and industrial individuals.	<b>Wollmann-Reynolds JS et al</b>
17:00	-	18:00	BUSINESS MEETING	
19:00	-	23:00	BANQUET	

SATURDAY

TITLE

AUTHORS

8:00 - 8:30 COFFEE

**SESSION: Human Evolution**

8:30 - 8:45 A micro-computed tomography approach to differential histology of fossil fragments from Koobi Fora

Astle A et al

8:45	-	9:00	Exploring the Utility of Bioinformatics Tools for the Analysis of Pathogen aDNA in Fossil Metagenomes	Bhattacharya A et al
9:00	-	9:15	Spatial approaches aid interpretations of Holocene Southern African Ancestral Khoesan dietary variation	Cameron ME et al
9:15	-	9:30	Helpful Hominin Hips: There is no evidence for major reorganization of the pelvis among hominins	Kurki H and Wall-Scheffler C
9:30	-	9:45	Children at Roonka, South Australia: Social and political burials	Littleton JH
9:45	-	10:00	Canalization and Plasticity in the Pelvis: An ontogenetic study of pelvic morphological variation in forager populations	<b>Mackinnon M et al</b>
10:00	-	10:15	Meet the Chibanians	Roksandic M
10:15	-	10:45	COFFEE	
<b>SYMPOSIUM: Creating A Socially Responsive Practice in Biological Anthropology (Chairs: Jose Sanchez, Lara Rosenoff Gauvin and Laura Kelvin)</b>				
10:45	-	11:00	Examining Community Engagement of Forensic Anthropologists in Humanitarian Contexts	Perez B and Spake L
11:00	-	11:15	Community Engaged Forensic Anthropology in Manitoba	Holland E
11:15	-	11:30	Critical Perspectives on the Ethics of Indigenous Cranial Casts in Anthropological Collections	Lameg D and Collins B
11:30	-	11:45	Rectifying Medicolegal Disparities for the Missing: Mississippi Repository for Missing and Unidentified Persons	Goliath JR and Cox JL
11:45	-	12:00	From lab to life: Integrating a human rights framework to bioarchaeology and forensic anthropology teaching	Sanchez J
<b>SESSION: Forensic Anthropology</b>				
12:00	-	12:15	Metric sex assessment from the sternum: a non-population-specific method using computed tomography (CT)	<b>Godwin KI and Scott S</b>
12:15	-	12:30	The intersection of forensic anthropology and gender diversity: Evaluating the identification of transgender individuals by Canadian forensic anthropologists	<b>Pigeon EC and Cahn J</b>
12:30	-	12:45	The Allocation Accuracies of Using the Tibia in Sex Estimation: Five Measurements Independently and Combinedly	<b>Shang Q and Albanese J</b>
12:45	-	13:00	Did you know Canada has a National Centre for Missing Persons and Unidentified Remains (NCMPUR)	Muhlig I
13:00	-	13:15	Assessing the Utility of Univariate and Multivariate Approaches for Estimating Sex Using the Femur	Bonello L and Albanese J
13:15	-	13:30	<b>CLOSING REMARKS</b>	

## POSTERS: Concert Ballroom Thurs-Fri

TITLE	AUTHORS
Authors with ODD number posters Thurs AM and Fri PM Authors with EVEN number posters Thus PM and Fri AM	
1 Possibilities of Peptide Analysis: Sex determination based on Y:X ratios in dental enamel amelogenin	Avery C et al
2 Can diaphyseal shape variables improve the reliability of juvenile age estimation methods applied across populations?	Behunin K et al
3 Preliminary insights into the effect of the Roman to Anglo-Saxon transition on early childhood vertebral growth in rural assemblages from southeast England.	Caldwell D
4 Women's Health in French-Canada: A Humanistic Approach	<b>Christenson R et al</b>
5 A Comparison of Micro-CT and Macroscopic Analysis of Mineralization Defects in Bones and Teeth in Children from 18th-19th century Canada and 17th-19th century Netherlands	<b>Cooke A et al</b>
6 Feeding Positional Behavior Preference in the Mantled Howler Monkey ( <i>Alouatta palliata</i> )	Costigan KC
7 A geometric morphometric analysis of the Salkhit calva from the Khentii Province, Mongolia	<b>Darvi A et al</b>
8 Embalming Effect on Osteopontin in Human Bone	Ferguson CL et al
9 A Probable Case of Metastatic Cancer in Roman Austria: Exploring Ancient Health, Lifestyle, and Activity	Gilmour R et al
10 Refining and Validating a Method of Microscopic Human Skeletal Sex Assessment of the Human Femur Using Cortical Bone Histology	Gregory-Alcock G and Rogers T
11 Changes in Active Behaviours for Howler Monkey ( <i>Alouatta palliata</i> ) in Relation to Riparian Habitats	Heffernan MB
12 Testing the Accuracy of Structured Light 3D Scanning for Archaeological Human Teeth	<b>Heinrichs E and Gamble JA</b>
13 Evaluation of Full Spectrum (IR/UV) Photography to Visualize Latent Fingerprints on Difficult Surfaces	Judd NRM et al
14 Global and Local Ancestry Estimation in a Large Captive Baboon Colony	<b>Kendall C et al</b>
15 Shape variation in the hominoid cuboid	Komza K et al
16 Impacts of social buffering on affiliative behaviour in Lemur catta	Kumpan LT et al
17 Sternal Rib Microfractures: A New Diagnostic Criterion for Nonadult Scurvy?	<b>Langlois MD et al</b>
18 Moving and managing animals in Hellenistic Thessaly: Insights from sequential dentine stable isotope analysis	Mah J et al
19 New proposed method for stature estimation in children from long bone lengths	Murray NJ et al
20 Howling Frequency and Prevalence in the Mantled Howler Monkey ( <i>Alouatta palliata</i> ) in relation to Time of Day.	Nazarova-Shamkina A
21 A Preservation Index for Contextualizing Linear Enamel Hypoplasia (LEH) Frequency Data: Toward Improving the Validity of a Palaeopathological Dataset	<b>Nikota R et al</b>
22 Age-related Changes in Femoral Robusticity in Medieval and Early Modern	Parker K
23 Microbiome Influences on Human Growth and Health Outcomes	Phillips N
24 Examining Dietary Variation within a Medieval (11th-15th c. AD) Cemetery from Osor, Croatia	Propst A et al
25 Oxygen Isotope Analysis of Geographic Origins and Mobility in the Catacombs of St. Callixtus (Rome, Italy)	Prowse TL and Rutgers LV
26 Trashed or Treasured? The Kozja Cave Child	San Filippo M et al
27 Exploring the Biological Affiliations of the Enigmatic Sopris Phase Culture of Southeastern Colorado Using Craniometric Variation	Schillaci MA and Schroeder L

28	Digital Dissections: Deep Learning Image Segmentation of MicroCT Scans of Ancient Hands.	<b>Schneider M et al</b>
29	Evaluating the advantages and limitations of gunshot trauma 3D reconstruction from postmortem CT scans	Semma Tamayo A and Spake L
30	Male Breast Cancer & Paleopathology: A Pilot Study Investigating a Possible Bias in Differential Diagnosis	Siek TJ
31	Lead Exposure in Ancient Corinth and Stymphalos (3rd to 7th c. A.D.): Preliminary Synchrotron X-ray Fluorescence Images and Bone Concentration Results	<b>Simpson RML et al</b>
32	Intangible Dimensions: Translating Anthropometric Measurements for Living People for Use with Computed Tomography (CT) Scans of Deceased Individuals	<b>Wiley AN et al</b>
33	Living With Physical Disability in the Late Intermediate Period of Peru: A Bioarchaeology of Care Case Study	Woodley K et al
34	Deep within the cave: Understanding Petnica Cave underwater burials	Fedora et al
35	Black Bone Disease – What is it and what does it mean for PMI?	Bertram B

# CABA 2023 Winnipeg

## Abstracts

Andersen, H(1), Nelson, A(1), Jenkyn, T(1,2), Ward, A(1), Watson(2), Fuentes, S(3), and Pozzi-Escot, D(3)

1. Anthropology, Western University
2. Kinesiology, Western University
2. University Wrocław Poland
3. Museo Pachacamac, Antigua Panamericana, Peru

### **Lethal Violence in a Peruvian Child Mummy**

Many Prehispanic societies in Peru engaged in forms of ritual violence, often including human sacrifice. The analysis of mummy bundles from the Late Intermediate Period (AD 1000-1476) MUNA cemetery at the site of Pachacamac, Peru, has demonstrated several examples of this behavior. Violence was exhibited in both adults and nonadults, with a higher frequency in adults, but a higher lethality in children. This poster presents a case study of one of these examples: a 6 year-old individual designated as E21A. This individual had 5 focal depression fractures in the posterior region of the skull, located on the parietal and occipital bones as well as a series of fractures to the facial skeleton that suggest an extremely violent blow, comparable to a modern-day car crash victim who had been ejected with great inertia. This burial context is also unique, as it is a bundle containing only the skull and a few postcranial bones. In this poster we explore the possible mechanisms for the injuries in order reconstruct this traumatic event, and to place this individual within the larger context of ritual violence on the Prehispanic Central Coast of Peru.

Arseneau-Robar TJM (1,2,3), Anderson KA (1,2), Sicotte P (3), and Teichroeb JA (1,2)

1. Department of Anthropology, University of Toronto Scarborough
2. Department of Anthropology, University of Toronto
3. Department of Biology, Concordia University, Montreal

### **Monkeys who experience more feeding competition utilize social information to learn foraging skills faster**

Animals must learn foraging skills to successfully survive and reproduce but the sources of interindividual variation in learning are poorly understood. For example, there is little consensus on the role motivation plays, even though it is a key factor impacting learning outcomes in humans. Here, we conduct a field experiment on a wild primate to investigate whether an individual's vulnerability to feeding competition impacts their motivation to learn a beneficial foraging technique. We provided a group of monkeys with a food reward (i.e., a half banana) that needed to be retrieved from a box. The monkeys discovered an efficient technique that consistently allowed them to retrieve the banana quickly, decreasing the risk of food loss to competitors. We found that individuals who frequently experienced feeding competition learned this efficient technique significantly faster than individuals who rarely foraged in the presence of a dominant competitor. They appeared to use social learning to learn faster as they were more attentive to the handling techniques others used and improved their foraging skills after opportunities to observe a skilled demonstrator. These findings support that an individual's vulnerability to feeding competition impacts their motivation to learn foraging skills that reduce food loss to competitors.

Astle A (1), Darvi A (2), and Cameron M (2)

1. Geosciences, Eberhard Karls University of Tübingen

2. Anthropology, University of Toronto

### **A micro-computed tomography approach to differential histology of fossil fragments from Koobi Fora**

Developmental and environmental differences alongside complex life histories contribute to variations within the bone microstructure of different animal taxa. These differences in bone histology have enabled researchers to identify taxa, with significant implications in palaeoanthropological work, potentially allowing for the separation of hominin from other fragmentary mammalian remains. Taxonomic identification using bone microstructure has largely been undertaken using transmitted light microscopy and thin sectioning to examine bone histology. However, recent studies have used micro-CT to identify mammalian taxa from fossil or bone remains. This study aimed to investigate the application of micro-CT to differential histological analyses, exploring its uses and limitations in comparison to thin-sectioning to determine whether this method provides a viable non-destructive substitute to this field of research. To assess the ability of micro-CT scanning in taxonomic identification, an analysis of two-dimensional histological features was conducted on individual slices from micro-CT scans of five samples of highly fragmentary fossils. These fossils, tentatively attributed as Bovidae from macroscopic analysis, were previously recovered from the hominin fossil-bearing site of Koobi Fora during surveys and are associated with formations dating to 1-3 MYA. They were not found in context with any hominin fossils. Histological characteristics observed from micro-CT scans were compared to descriptions of bone histology in known taxa from previous studies. Furthermore, segmentation was conducted on one of the fossils to explore the three-dimensional internal canal network, illustrating the additional information that this method can provide for differential taxonomic identification. Results indicate visible variation in bone microstructure that is useful in the elimination of taxa, however, details were harder to view using micro-CT than transmitted light microscopy, making species-specific identification difficult. This study highlights the informative abilities of micro-CT scanning in its application to differential histology and supports the continued use of thin-sectioning in this field of research.

Avery C, Amaro A, and Prowse T

Department of Anthropology, McMaster University

### **Possibilities of Peptide Analysis: Sex determination based on Y:X ratios in dental enamel amelogenin**

The first step in many osteological analyses is the assessment of biological sex. However, morphological methods are not always reliable, particularly when applied to prepubertal skeletal remains where sex-specific features have not yet developed, or to fragmentary remains where pelvic or cranial indicators are unobservable. To address this gap, biological anthropologists have turned to molecular methods to assess biological sex at the chromosomal level using peptides in dental enamel. In this study, peptide analysis was applied to five modern teeth from individuals of known biological sex (HiReb Ethics Approval: 4834-T). A novel method was used to identify the thresholds of Y:X ratios in the teeth, corresponding to biological male ( $>0.51$ ), biological female ( $<0.30$ ), and biologically ambiguous (between 0.31 and 0.50). To assess the utility of peptide analysis on archaeological specimens, the methodology was then applied to four archaeological teeth belonging to skeletons exhibiting clear morphological indicators of biological sex. This poster will present how peptide analyses can be used to explore gendered patterns of weaning and breastfeeding, pubertal timing, and mortuary practices; demonstrating the applicability of peptide analysis in a wide range of bioarchaeological studies.

B-Hardy M-H (1, 3), Duggan A (1,3), Kuch M (1, 3), Ribot I (4), and Poinar H (1, 2, 3)

1. Department of Anthropology at McMaster University
2. Department of Biochemistry at McMaster University
3. McMaster Ancient DNA Center
4. Université de Montréal

### **Searching for scourges in the Historical Cemetery of Notre-Dame in Montreal (18th century): Preliminary DNA results**

Eighteenth century Montreal was characterized by economic and demographic expansion resulting in new urbanization processes and an increasingly insanitary environment. Montreal's commercial harbour also acted as a major port for both trans-Atlantic migration and population dispersal within Canada. Consequently, with high levels of population movement through the port and city, the pathogenic load increased and repeated rounds of epidemics afflicted the city. Among the multiple epidemics Montreal suffered, measles, yellow fever, influenza, typhus and smallpox were the most frequent epidemics recorded. Infectious disease epidemics erupting in North American cities like Montreal activated numerous public health policies, including hygiene-focused campaigns, quarantines, inoculations and later, vaccination. This study, looking at a critical time during the peak of infectious cycles for most of these diseases in North America, is recontextualizing their presence in this period examining the political, economic and social factors putting the population at risk through the choices made to manage these virulent infections by public health authorities while searching for evidence of pathogens in the residents of 18th-19th century Montreal.

The Cimetière de la Première Église Notre-Dame and Cimetière Saint-Antoine were active in Montreal from 1696-1760 and 1799-1855, respectively, the same time frame as repeated epidemic waves hit the city. To investigate the presence and genetic diversity of infectious diseases, we selected samples of teeth and dental calculus of 85 children and young adults recovered during salvage excavations of historical cemeteries in Montreal for ancient DNA analyses. We will present the results of the aDNA pathogen screening for those individuals and place them within the context of the public health efforts to manage these deadly epidemics in Montreal.

Behunin K (1), Caccavari C (1), Cardoso HFC (2), and Spake L (1)

1. Binghamton University (SUNY)
2. Simon Fraser University

### **Can diaphyseal shape variables improve the reliability of juvenile age estimation methods applied across populations?**

Background: A key obstacle to reliable juvenile age estimation is the considerable cross-population variation in bone size-for-age over the course of development. This can lead to significant bias in age estimates when a method is used on an individual that differs from its reference population. We explore whether standardizing long-bone-length with breadth measurements, thereby creating measures of shape of the bone, may help produce more reliable estimates of age across populations.

Methods: A sample of 262 postmortem CT scans of US and Australian children (115 female and 147 male) aged 12 years and under were selected as the reference sample. Regression was used to generate age estimation equations for: 1) diaphyseal length; and 2) a metaphyseal breadth to diaphyseal length ratio. The equations were applied to a target sample consisting of 77 identified individuals (34 female and 43 male) from the Lisbon collection in Portugal, and the allocation accuracies of the 95% prediction interval were calculated.

Results: The shape variables had acceptable correlations with age prior to 5 years ( $R^2 = 0.74$ ), but not afterward ( $R^2 = 0.38$ ) This feature yielded considerably larger MSEs and therefore prediction intervals (up to +/- 5.5 years) for the ratio-based models, than for the diaphyseal length only models. When applied to the external sample, the variables yielded similar allocation accuracies in the younger age groups (74% for the ratio versus 79% for the



length only); but in the older age group, the ratio was more accurate (96%) than the diaphyseal length only model (60%).

Discussion: Findings suggest shape may provide more stable age estimates when applied across populations, specifically for older children. However, increased accuracy comes at the cost of a non-negligible loss of precision. The large prediction intervals entailed by this approach may render it impractical for use in bioarchaeological contexts.

Bhattacharya A (1), Dolphin A (1), and Doxey A (2)

1. Department of Anthropology, University of Waterloo
2. Department of Biology, University of Waterloo

### **Exploring the Utility of Bioinformatics Tools for the Analysis of Pathogen aDNA in Fossil**

Recent advancements in the analysis of the microbial content of ancient DNA (aDNA) recovered from archaeological sites—part of a broad field known as metagenomics—have enhanced scientific understanding of genetic variation and infectious disease processes in both the past and the present. Microbial genetic information retrieved from human fossil metagenomes may offer insight into the presence and diversity of ancient pathogens as well as enable broader investigations into disease load, pathogen evolution, and human–microbe interactions in the past. Although much metagenomic data from human skeletal remains has been published online in bioinformatics databases such as the NCBI Sequence Read Archive (SRA), few attempts have been made to further analyse such data. This exploratory project reviews the potential secondary uses of such publicly available metagenomic data in light of growing concerns about the destructive nature of traditional aDNA sequencing procedures. As the use of bioinformatics tools for the secondary analysis of fossil metagenomes and ancient pathogens is still in its infancy, this presentation discusses the potentials and limitations of such tools and databases, including their utility for investigating context-sensitive research questions of interest to anthropologists and in identifying and retrieving primary project metadata. As anthropologists and researchers increasingly turn to other avenues of non-destructive research, secondary aDNA studies and bioinformatics tools present exciting opportunities to maximise the utility of previously sequenced metagenomic data to creatively explore anthropological questions—if only one knows where to look.

Brianne Bertram  
University of Alberta

### **Black Bone Disease – What is it and what does it mean for PMI?**

Black bone disease is the result of using a tetracycline-based prescription drug. It is a cosmetic side effect of an anti-inflammatory acne treatment that affects roughly 4% of users and often goes unnoticed. Tetracycline staining results in various shades of black-brown discolouration that penetrates throughout the bone and throughout the body with seemingly no limitations thus far. If remains are recovered with penetrating staining, the examiner may be led to believe the remains are older, running the risk of impacting PMI assessment. This poster looks at the side effects of tetracycline staining and how we can work to prevent complications as this acne treatment becomes more popular.

Bolt LM (1,2), Kaser FVE (3), and Schreier AL (2,3)

1. Department of Anthropology, University of Toronto Mississauga

2. Maderas Rainforest Conservancy, Costa Rica and Nicaragua

3. Department of Biology, Regis University

### **Platyrrhines modify social behaviour across forest zones in a Costa Rican rainforest**

Social behaviour is a key adaptation for group-living primates, but may be impacted by anthropogenic habitat loss in primate range areas. To better understand the impact of deforestation on primate social behaviour, we investigated social behaviour rate and type (allogrooming, play, agonism, vocalization, copulation) in three species of platyrrhine primates across four landscape zones within a fragmented riparian forest in Costa Rica, La Suerte Biological Research Station (LSBRS). We studied capuchin (*Cebus imitator*), spider (*Ateles geoffroyi*), and howler monkey (*Alouatta palliata*) social behaviour across 100m riparian edge, 100m anthropogenic edge, forest interior, and 100m combined riparian and anthropogenic (combined) edge zones at LSBRS, and predicted that monkeys would show higher rates and more types of social behaviour in the higher-quality riparian edge and interior zones when compared to the lower-quality anthropogenic and combined edge zones. We collected 1341 hours of instantaneous focal data from 2017-2023 across the three monkey species. We found mixed support for our predictions, with capuchin monkeys having higher rates of social behaviour in combined edges compared to all other landscape zones ( $p < 0.001$ ), but no other species showing differences in social behaviour rates. In contrast, we found that all three species changed the types of social behaviour used in different landscape zones at LSBRS (all  $p < 0.001$ ). While most results were species-specific, we found that all species engaged in less play when in the riparian edge zone, likely due to higher predation pressure in this forest area at LSBRS. Our results indicate that platyrrhine species adjust their social behaviour across different habitat zones within the same forest, attesting to their resilience in degraded landscapes.

Bonello L (1) and Albanese J (2)

1. Department of Integrative Biology, University of Windsor

2. Department of Integrative Biology, University of Windsor

### **Assessing the Utility of Univariate and Multivariate Approaches for Estimating Sex Using the Femur**

When dealing with human skeletal remains in archeological and forensic settings, a correct sex estimation is crucial in developing a biological profile. The best indicators of sex can be found in the pelvis, but these bones are not always recovered. An alternative source of information for estimating sex is the femur, which yields high accuracies due to its excellent preservation and high sexual dimorphism. Using a carefully constructed sample of 566 individuals from the Coimbra Collection ( $n=238$ ) and the Terry Collection ( $n=328$ ), sex estimation methods using the femur were explored. Several standard femur measurements, including length, diameter, and joint dimensions were taken for the entire sample. Using logistics regression, several models were calculated to estimate documented sex. In this study, results demonstrated that joints outperformed length and mid-shaft diameter measurements. The best-fit univariate models included both joints, which provided allocation accuracies of 85.1% from the femur epicondylar breadth and 86.5% from the femur maximum head diameter. The best-fit multivariate model correctly allocated 88.6% of the sample, which included the femur maximum length, femur anterior-posterior diameter at midshaft, femur transverse diameter at midshaft, femur maximum head diameter, and femur epicondylar breadth. In addition to higher allocation accuracies for the sample, multivariate methods that included one or more joints increased certainty in any one case.

Brent KE (1,2,3), Komza K (3), and Cameron ME (3)

1. Western University Department of Anthropology

2. University School of Biomedical Engineering

3. University of Toronto Department of Anthropology

### **Beer, Bones, and Biomechanics: Investigating the Impacts of Alcohol Use Patterns on Femoral Cross-Sectional Geometry in Young Adult Males**

Alcohol consumption and reliance are prominent features in past and contemporary human populations. Although several studies have evaluated the effects of alcohol consumption patterns on bone biology, these studies have been largely focused on factors affecting material aspects of bone such as bone mineral content and density. It is important, however, to ascertain how alcohol consumption patterns may affect bone geometry and biomechanical properties: doing so is critical to contextualizing environmental factors that may contribute to human biology studies of bone biomechanics and may also inform clinical outcomes. The primary aim of this study was to ascertain whether young adult males with high-risk alcohol use patterns have lowered cross-sectional geometric property values at the subtrochanteric and midshaft femoral sections in comparison to those who use alcohol in a low-risk fashion, or not at all. Through the evaluation of post-mortem full-body computed tomography scans from seventy-five known individuals, as accessed through the New Mexico Decedent Image Database, this study found that individuals who use alcohol in a high-risk manner tend to exhibit significantly decreased cross-sectional cortical areas, second moments of area, and section moduli in the femur, which represent lessened compressive and tensile strength, bending rigidity, and bending strength, respectively. Moreover, these effects are more frequently significant at the midshaft of the femur in comparison to the subtrochanteric location. These results likely arise from reduced bone formation and remodelling in high-risk alcohol users in addition to the possible uncoupling of bone formation and resorption. Additionally, the effects of alcohol are likely more frequently significant at the midshaft due to canalization at the subtrochanteric location. Future human biology studies considering bone biomechanical properties should take alcohol use risk into account when selecting study individuals, as it can be considered a factor that affects bone geometry and may serve as a confounding variable.

Brickley MB

Department of Anthropology, McMaster University

### **New approaches to diagnosing anemia in bioarchaeology: Getting out of the hole.**

Anemia is a significant health condition in many current communities globally and was likely to have also been important in the past. With the current understanding of the importance of this condition for overall health outcomes, particularly in women of childbearing age and their children, there has been considerable interest in trying to reconstruct this aspect of poor health in past communities. However, despite specific studies for a century, there is still a lack of consensus on the paleopathological diagnosis of anemia. Studies that clearly set out the contribution of anemia to health in past communities are lacking. Because identifying evidence of marrow hyperplasia has to be the gold standard for diagnosing anemia in paleopathology, establishing frameworks that move away from porotic lesions is proposed to facilitate higher levels of more accurate diagnosis of acquired anemia. With explicit comparisons of approaches in clinical and paleopathology work, I will consider frameworks employed to diagnose anemia in paleopathology and the problems that have arisen in evaluating cranial lesions. Using an analogy with the diagnosis of osteoporosis, I argue that acquired anemia is better approached as a condition requiring metric evaluation of bone structures, supplemented by careful consideration of lesions using both a biological and life-course approach. This paper opens the conversation on the better diagnosis of anemia in paleopathology; it starts the iterative process of achieving some consensus and progress on diagnosing acquired anemia in paleopathology and provides a foundation for considering congenital anemia.

Brien NE (1), Scott AB (2), and Addison JA (3)

1. Department of Biology, McMaster University,

2. Anthropology Department, University of New Brunswick,

3. Biology Department, University of New Brunswick

### **Exploring the use of DNA analysis to study stress in the past**

This research explored the potential use of DNA analysis to study stress in past populations. The gene NR3C1, which has been studied extensively in modern clinical settings, becomes methylated (the addition of a small carbon-hydrogen group) in response to early-life stress and has been implicated in later-life diagnoses of PTSD, anxiety, depression, and personality disorders. NR3C1 is of interest to bioarchaeologists because its well-established relationship with early-life stress means it may provide a more sensitive way to assess experiences of stress in past populations. This applies particularly in cases where observable skeletal changes are unlikely, for example if a stress experience is particularly acute, or if the individual is past a certain age when skeletal changes are likely to occur (see O'Donnell et al., 2023). Therefore, this preliminary research explored the potential of using NR3C1 methylation to molecularly explore stress in past populations. Using modern DNA, a method was developed to amplify the exon 1F promoter region of NR3C1, and genetic sequencing confirmed the success of the method. Subsequently, ancient DNA (aDNA) was extracted from six unassociated tooth samples from the 18th century the Fortress of Louisbourg skeletal collection to test the viability of the method in ancient DNA. When the method was applied to these archaeological samples it was not successful; however, this could be the result of low aDNA yields and/or the extent of damage to the aDNA. Future research using samples with higher aDNA yields is required to accurately assess the viability of this method in aDNA. Overall, this research presents a novel and unique exploration of how molecular approaches may be used to help answer bioarchaeological questions about stress in the past and provides a basis for future research on this approach.

Caldwell D

Department of Anthropology, University of Alberta

### **Preliminary insights into the effect of the Roman to Anglo-Saxon transition on early childhood vertebral growth in rural assemblages from southeast England.**

Measurements of vertebral neural canal size and vertebral body height can be used to assess the conditions of growth during childhood. This project utilizes these dimensions to explore the biocultural environment of rural communities in late Roman and early Anglo-Saxon southeastern England. The departure of the Roman empire from England in 410 AD marked a significant turning point in the cultural and political landscape of the romanized British population, yet little is truly understood about the process by which Germanic culture took hold and the effect of this transition on the people who experienced it. In this preliminary phase of data collection, vertebral measurements were taken from late Roman non-adults (n=46) and adults (n=35), and early Anglo-Saxon non-adults (n=47) and adults (n=10). Growth comparisons between Romano-British and Anglo-Saxon assemblages will be made by plotting vertebral measurements against dental development scores to create growth profiles. By comparing the vertebral measurements of Late Roman and Early Anglo-Saxon non-adults with individuals who reached adulthood in these assemblages, as well as with modern data, it is possible to make inferences on how social upheaval impacted the biocultural environment of Romano-British and Anglo-Saxon children. This research is part of a larger study on the biocultural effect of the Roman to Anglo-Saxon transition on growth that also incorporates long bone measurements and paleopathological data.

Cameron ME (1), Manalo RDC (1,2), and Zhang C (1,3)

1. Department of Anthropology, University of Toronto

2. Department of Anthropology, McMaster University

3. Yong Loo Lin School of Medicine, National University of Singapore

### **Spatial approaches aid interpretations of Holocene Southern African Ancestral Khoesan dietary variation**

Stable light isotope properties indicative of dietary composition have been intensively investigated among Holocene Southern African Ancestral Khoesan skeletal remains. Analyses have assessed regional distributions of isotopic information along the southern and western Cape coasts, with regions often defined by local biomes. However, such regional analyses may mask the important influence of local environmental or site-specific factors. Here, we use spatial analyses to assess how previously published stable nitrogen ( $\delta^{15}\text{N}$ ) isotopic data from Holocene Ancestral Khoesan remains are distributed across the Southern African Cape coast. Hot spot analyses and spatial interpolation methods were used to determine if individuals with certain  $\delta^{15}\text{N}$  values clustered together on the Cape coast and if these clusters could be connected to local environmental or archaeological characteristics, such as local biome or archaeological evidence of distinct resource exploitation patterns.  $\delta^{15}\text{N}$  values indicative of high trophic level sources of protein do not necessarily cluster based on biome classifications. Variation may be better explained based on marine resource accessibility and abundance. Hot spots of  $\delta^{15}\text{N}$  values indicative of high trophic level protein sources were found around sites previously identified as having archaeological evidence of a high degree of marine resource exploitation, particularly the Robberg Peninsula and the region around Saldanha Bay. Current work seeks to further clarify how site-specific factors may have affected dietary variation among Ancestral Khoesan individuals.

Chinique de Armas Y (1), Hernández Godoy ST (2,3), Viera Sanfiel LM (1), Buhay WM (1), and Laffoon J (4,5)

1 Department of Anthropology, University of Winnipeg

2 Group for Research and Development of the Directorate of Culture of Matanzas, Matanzas, Cuba

3 Department of Socio-Cultural Studies, University of Matanzas

4 Faculty of Archaeology, Leiden University, Leiden

5 Faculty of Science, Vrije Universiteit, Amsterdam

### **Isotopic evidence of sedentism in Archaic Age groups from the Antilles: multiple isotope data from Canímar Abajo, Cuba**

The early populations that inhabited the Antilles were traditionally understood as highly mobile groups of hunters/fishers and gatherers. While more recent data demonstrated that some populations engaged in the production of domestic plants and cultivars, questions remain about other aspects of their lifeways, including whether the adoption of horticultural practices was accompanied with a decrease in residential mobility. The level of sedentism in a population is an instrumental variable to understanding community social relations and complexity, their adaptations, and lifeways. Here we combined enamel strontium ( $87\text{Sr}/86\text{Sr}$ ), oxygen ( $\delta^{18}\text{O}_{\text{en}}$ ) and carbon ( $\delta^{13}\text{C}_{\text{en}}$ ) isotopes of 45 human teeth from the site of Canímar Abajo - where the oldest human remains from the insular Caribbean have been reported - to examine the mobility patterns of early Antillean groups. In contrast with traditional narratives, the homogeneous strontium isotope values observed in most individuals from the older funerary area of the site (cal BC 2232 – 800) are consistent with the pattern expected for a sedentary population subsisting primarily on local resources obtained close to the coast. The isotopic evidence reveals that between cal AD 360 – 1030, the mound is reused for funerary practices by both local communities and non-local individuals. It is possible to identify a higher dynamism and mobility during this period, with influxes of individuals from more distant locations and with diverse dietary and burial traditions. The isotope results of the Canímar Abajo individuals provide the earliest isotopic evidence of populations with low level residential mobility in the Antilles.

Christenson R (1), Ribot I (2), and Brickley M (1)

1. Department of Anthropology, McMaster University

2. Département d'Anthropologie, Université de Montréal

### **Women's Health in French-Canada: A Humanistic Approach**

Women are typically generalized as homemakers and mothers in studies of the past; discussions of women's health often occur within the context of motherhood, but women's health is as dynamic and complex as the health of men. Using individuals from two historical French-Canadian cemeteries, the health experiences of women in the past are explored. Two females from historical French-Canada were selected for osteobiographical analysis. Osteobiographies were constructed using standard age and sex assessments and visual analysis of macroscopically visible pathological lesions. Metacarpal radiogrammetry and micro-CT rib scans were used to visualize the quantity and quality of the bone. Individual 7A2-S11 was estimated to be a female between the ages of 30 and 49 at the time of death. Radiogrammetric measurements indicated this individual had a low amount of bone, and the rib scans showed evidence of mineralization defects. The pelvis shows evidence of a healing fracture, and the head of the left femur is flattened. Individual 2E13 was estimated to be a young female, between the ages of 16 and 20. The radiogrammetric assessment indicated a high bone amount, and severe mineralization defects were visible in the micro-CT scan of their rib. This individual's skull was plagiocephalic, and several of the vertebrae were ankylosed. Both ulnae bow posterolaterally on the distal ends. Both individuals analyzed here show evidence of chronic conditions that impacted their bone quality and quantity. Evidence of healing and the ability to survive chronic poor health despite little or no access to medical care is a testament to the resiliency and strength of these women. By analyzing the experiences of these individuals through an osteobiographical approach, we are reminded that the past consists of dynamic individuals. Recognizing the agency and individuality of the people within our samples broadens the scope of bioarchaeology to include a humanistic perspective.

Cooke A (1), Morgan B (1), Langlois M (1), Nguyen J (1), Ribot I (2), Waters-Rist A (3), Van Der Merwe A (4), Schats R (5), and Brickley M (1)

1. Department of Anthropology, McMaster University

2. Département d'Anthropologie, Université de Montréal

3. Department of Anthropology, The University of Western Ontario

4. Department of Medical Biology, Section Clinical Anatomy and Embryology, University of Amsterdam

5. Faculty of Archaeology, Laboratory for Human Osteoarchaeology, Leiden University

### **A Comparison of Micro-CT and Macroscopic Analysis of Mineralization Defects in Bones and Teeth in Children from 18th-19th century Canada and 17th-19th century Netherlands**

The development of techniques for investigating disease in past groups coupled with growing interest in non-adults in the archaeological record can increase our understanding of childhood health. Although there has been considerable interest in rickets, to date no comparisons have been made between skeletal indicators of rickets and mineralization defects in bones or teeth (interglobular dentin [IGD]). This study aimed to address this gap in knowledge with a sample of 64 individuals (aged 5m-18y) from two Quebecois collections (Saint-Antoine [1799-1854 CE] n=8; Pointe-aux-Trembles [1709-1843 CE] n=12), and three collections from the Netherlands (Arnhem [1650-1829 CE] n=23; Eindhoven [1650-1850 CE] n=6; and Alkmaar [1716-1830 CE] n=15). Core skeletal lesions were assessed macroscopically, and a tooth underwent micro-CT imaging for all individuals. Micro-CT reconstructions of the teeth were independently reviewed using Dragonfly (v. 2021.3) by three recorders and instances of IGD were scored as present, absent, or indeterminate. Assessment of the micro-CT reconstructions of the teeth were done prior to confirmation of the macroscopic diagnoses. Although many instances of agreement between indicators were recorded, cases of disconnect were identified. Possible explanations for this disconnect include the inability of micro-CT to pick up lower grade IGD, co-occurrence of scurvy, and relative differences between dental and skeletal development alongside bone remodeling. The latter is especially true in the Netherlands sample, as periods of IGD occurred primarily in early life, but overall age was greater, increasing the likelihood of remodeling obscuring the skeletal evidence of mineralization defects. The presence of both

indicators allowed for interpretation of disease history across the life course of the individuals. This investigation demonstrates the value of combining different datasets for understanding aspects of childhood health.

Cosby AE (1), Rajaobelina MM (2), and Steffens TS (3,4)

1. Integrative Biology, University of Guelph
2. Anthropologie, Université d'Antananarivo
3. Sociology & Anthropology, University of Guelph
4. Planet Madagascar, Guelph, Ontario, Canada

### **Sharing space and parasites: Human's influence on *Eulemur fulvus* parasite ecology.**

In the realm of ecological interactions, the disease facilitation hypothesis posits that introduced species may escalate parasitic infections among native hosts by acting as vectors or reservoirs, or by modifying the environment to favor heightened parasite survival or transmission. This novel hypothesis serves as a framework for comprehending understudied dynamics underlying host-parasite relationships in disturbed ecological communities. This study investigates a specific facet of the disease facilitation hypothesis, employing *Eulemur fulvus* (common brown lemur) as the endemic species and humans as the introduced counterpart. The study encompassed two groups of *E. fulvus*, each occupying ranges of varying proximity to human settlements. Fecal samples, behavioural observations, and habitat characteristics were collected over a three-month field season in 2022 in Ankarafantsika National Park to investigate the potential ramifications of human presence on *E. fulvus*' parasite ecology. Numerical disparities in parasite load and genera were detected between the *E. fulvus* groups. The farther group exhibited a higher overall parasite load, primarily driven by Strepsirhini-specific parasites, while the closer group showed higher levels of human-specific parasites. However, neither of these comparisons reached statistical significance. Furthermore, distinctions in habitat composition, such as tree heterogeneity and species assembly, were also observed, exhibiting a correlation with proximity to human settlements. These results lend some support to the idea that human intervention may exert a discernible influence on the parasite ecology of *E. fulvus*. While this study did not yield statistically significant findings, possibly due to methodological limitations, it underscores the need for further empirical validation of the disease facilitation hypothesis. By employing humans as a biological model species in this hypothesis, this research sheds light on the potential ramifications of human activity on the health and well-being of wildlife within shared environments, from a disease ecology perspective.

Costigan KC

Department of Anthropology, University of Toronto, Mississauga

### **Feeding Positional Behavior Preference in the Mantled Howler Monkey (*Alouatta palliata*)**

The ways the physicality of an organism interacts with the environment are selected for behaviors. The way that an organism rests is due to its biology and environment. This poster looks at the activity budget of mantled howler monkeys (*Alouatta palliata*) and their positional behavior to determine their preferred feeding position and whether or not feeding positional behavior is affected by sex. This study was completed at the La Suerte Biological Field Station in Costa Rica. It used 20 minute continuous time focal samples to determine rates of feeding and the positional behavior associated with feeding on individuals throughout the day. It determined that sitting was the most prevalent behavior during feeding (64%), followed by tail suspension (35%). It also showed that female and male feeding positions were different, with females utilizing tail suspension much more than males (females suspending while feeding 51% as opposed to males only spending 18%) and males sitting more than females (males sat while feeding 80% of the time while females only sat for 48%). These results adhere to what is known about the species at other sites in Costa Rica and suggest that sitting is an evolutionarily adaptive behavior for arboreal primates. The sex-based differences adhere to what we know about the energy costs of reproduction in primates. It also supports the idea that certain feeding positions might occur more when searching for low-quality foods versus higher-quality ones. Upright posture has been hypothesized to be advantageous for a multitude of reasons but, one observation is that it allowed for primates to manipulate objects easier and allow for cognitive

and social development. The prevalence of sitting during feeding indicates that the adaptation that allowed for our hominin ancestors to start towards bipedal locomotion and tool-use may have begun before the divergence between catarrhines and platyrrhines.

Darvi A (1), Schroeder L (2,3), and Viola B (1)

1. Department of Anthropology, University of Toronto

2. Department of Anthropology, University of Toronto Mississauga

3. Human Evolution Research Institute, Department of Anthropology, University of Cape Town,

### **A geometric morphometric analysis of the Salkhit calva from the Khentii Province, Mongolia**

Central to our understanding of human origins are the past population histories of Early Upper Paleolithic (EUP) *Homo sapiens* from Eurasia, as the continent itself served as the meeting ground for them and other hominin groups such as the Neanderthals and Denisovans. One of the few EUP fossils from Eastern Eurasia that can inform our understanding of hominin interactions during this period is a partial skullcap from the Salkhit Valley in north-eastern Mongolia. Previous studies of the Salkhit calva pointed out several ancestral features, including the presence of a frontal keel and well-developed brow ridges, shared with Middle Pleistocene *Homo*, as well as derived features, including parietal eminences positioned high and back and the absence of a sagittal keel, common to *Homo sapiens*. This combination led prior morphological analyses based on linear measurements to explore Salkhit's affinity to groups such as Neanderthals or *Homo erectus*. Cautiously the calva was attributed to archaic *Homo sapiens*, an outdated designation traditionally used for fossils that are anatomically and chronologically intermediary to recent *Homo sapiens* and *Homo erectus*. However, more recent genetic analyses showed Salkhit to be related to present-day East Eurasian populations and carrying similar amounts of Neanderthal and Denisovan DNA as other EUP *Homo sapiens*. In this work, we use geometric morphometric methods to resolve this incongruence. Using a combination of landmark and sliding semi-landmark data and a comparative sample of recent *Homo sapiens*, fossil *Homo sapiens*, Neanderthals, Middle Pleistocene *Homo*, and *Homo erectus*, we find Salkhit to be of clear recent human origin, affirming the results of prior palaeogenomic analyses. The ancestral morphology of the Salkhit calva reflects its population history, expanding our understanding of morphological diversity in EUP *Homo sapiens*.

Fedora E (1), Turner J (2), San Filippo M (1), Robson S (1), Starović A (3), Peckoza V (4), Đurić M (5), and Roksandic M (1)

1) Department of Anthropology, University of Winnipeg

2) Department of Biology, University of Winnipeg

3) National Museum of Serbia, Belgrade, Serbia;

4) Petnica Science Centre, Valjevo, Serbia

### **Deep within the cave: Understanding Petnica Cave underwater burials**

A burial chamber with more than 25 individuals, dated to between 2nd and 4th century CE, was uncovered in Petnica Cave (Valjevo, Serbia) in a submerged chamber made accessible after a drought. These burials are unique among those in Late Antiquity, as they were deposited deep inside the cave in a location difficult to access. The important question was about the identity of this population. Archaeological research offered several possibilities of linking the burial to the burials outside the cave, a ritual space within the cave or a burial of an infant within the cave. Morphological and metric analyses were used to build osteobiographic profiles by examining the age, sex, pathologies, and non-metric traits. The minimum number of individuals was 25. The age categories ranged from infancy to adulthood. Elements from different excavation groupings were congruent, indicating that these individuals conformed to a single burial population which was post-depositionally mixed, possibly due to their falling into the water from a ledge in the chamber. Similar non-metric traits were found among all individuals. This study provides basic demographic data for the buried population and this unique burial requires more archaeological and biological data to identify which population they belonged to.



Ferguson CL, Smith AC, and Rogers TL  
Department of Anthropology, University of Toronto,

### **Embalming Effect on Osteopontin in Human Bone**

The purpose of this research was to determine if the embalming process preserves osteopontin in human bone, by comparing bone protein intensity and count in embalmed versus unembalmed remains through laser scanning confocal microscopy. Through this, greater clarity as to the research uses of embalmed remains in forensic anthropology can be ascertained as there is no previous research on the effect of embalming fluid at the histological level. For this research 7 embalmed samples, with a postmortem period of six months (cadaveric), and 9 unembalmed samples (biopsies) were collected from the left iliac crest. The samples were labeled with osteopontin polyclonal antibody and AlexaFluor 555 secondary antibody. They were visualized under laser scanning confocal microscopy and processed using BitPlane™ Imaris® v.9 to compare the median pixel intensity and protein count in each sample. The results of this study found that there was a significant difference between the median protein counts of the two samples ( $p < 0.001$ ). Further, this study found that there was a significant negative correlation between protein count and postmortem interval ( $r = -0.861$ ,  $p < 0.001$ ). The difference in protein counts and the correlation indicates that the osteopontin proteins in the embalmed samples were not preserved throughout the six-month postmortem embalming period. It appears embalming fluid does not reach the organic material at the histological level. This research indicates that embalmed remains can be treated similarly to unembalmed remains, as there appears to be no osteological impact of the embalming process.

Friesen SE(1), Conaway MA (1), and Schroeder L(1,2)

(1) Department of Anthropology, University of Toronto Mississauga

(2) Human Evolution Research Institute, Department of Anthropology, University of Cape Town

### **A preliminary analysis of the role of body size, phylogeny, and function on interspecific shape variation of the chimpanzee and bonobo distal femur**

Distal femur morphology in hominids determines the range of flexion, extension, and rotational movements of the knee. In Pan, it also helps stabilize the knee and transmits force from the thigh to the leg during knuckle-walking and tree-climbing. Early hominin distal femora exhibit a mosaic of features that likely reflects some combination of bipedalism and tree-climbing. However, reconstructing locomotor behaviour inferred from closely related taxa is a challenge because variation of Pan distal femora is poorly understood. Here, we present a 3D geometric morphometric analysis of the role of size, group membership, and function on distal femora shape in a sample of 24 bonobos, and 20 chimpanzees representing different subspecies. Shape variation was initially visualized using a principal component analysis (PCA), and a Procrustes ANOVA was performed to determine the influence of group membership and centroid size. Chimpanzees and bonobos separated on PC1, with group membership representing 10% of the total variation in the ANOVA ( $p = 0.001$ ). As allometry was significant ( $p = 0.025$ ), an allometry-corrected PCA was also performed. Landmarks were then subset to test the following functional predictions based on previous literature using Procrustes ANOVA: 1) The shape of the femoral condyles reflects group membership; 2) The shapes of the femoral condyles and the intercondylar fossa reflect body size; and 3) The shape of the femoral trochlea reflects differences in tree-climbing frequency between eastern chimpanzees and bonobos. Prediction one was supported with species contributing ~13% of the total sample variance ( $p = 0.001$ ). Prediction two was partially supported as size and species were both significant and contributed roughly equal variance. Prediction three was supported with a post-hoc pairwise test finding a significant difference ( $p = 0.001$ ) between bonobos and eastern chimpanzees. Further analyses including more primate species are needed to determine whether these differences between groups reflect phylogenetic relationships or differences in locomotor behaviour.

Gibb JK (1), Mustanski (2,3), Schrock JM (2), D'Aquila RT (2,4), and McDade TW (1,5)

1. Department of Anthropology, Northwestern University

2. Institute for Sexual and Gender Minority Health and Wellbeing, Northwestern University

3. Department of Medical Social Sciences, Northwestern University

4. Division of Infectious Diseases, Department of Medicine, Feinberg School of Medicine, Northwestern University

5. Institute for Policy Research, Northwestern University

### **HIV-Status, Inflammation, and Epigenetic Age among a Diverse Cohort of Sexual and Gender Minority Young Adults**

**Introduction:** Epigenetic aging, characterized by changes in gene expression not driven by DNA sequence alterations, has been linked to health outcomes more accurately than chronological age. Especially in marginalized communities like the sexual and gender minority (SGM), unique life stressors and health disparities might significantly influence their epigenetic aging trajectory. This study explored how Human Immunodeficiency Virus (HIV) status and inflammation may further modify epigenetic age markers among SGM young adults.

**Methods:** Utilizing the RADAR study cohort, a diverse group of young men having sex with men, transgender women, and gender nonbinary people, a subset of 100 participants was chosen based on HIV status and inflammation levels. DNA methylation patterns were assessed using the Illumina Infinium Human MethylationEPIC Beadchip array. Epigenetic age markers were compared across groups, and their relationship with inflammation was evaluated using statistical analyses.

**Results:** Participants' average chronological age was 24.2 years, with epigenetic ages ranging from 32.4 to 42.5 years depending on the method used. ANOVAs highlighted significant disparities in epigenetic age measures across HIV-inflammation groups in DunedinPACE ( $M = 1.05$ ;  $SD = 0.105$ ;  $p < .001$ ), Horvath Clock 1 ( $M = 42.5$ ;  $SD = 5.00$ ;  $p < .001$ ), Horvath Clock 2 ( $M = 41.8$ ;  $SD = 5.46$ ;  $p < .001$ ), Hannum Clock ( $M = 41.5$ ;  $SD = 4.76$ ;  $p < .001$ ), PhenoAge Clock ( $M = 32.4$ ;  $SD = 6.12$ ;  $p < .001$ ), and DNAmTL ( $M = 7.28$ ;  $SD = 0.167$ ;  $p < .001$ ).

**Discussion:** The marked variation in epigenetic aging markers among SGM individuals, particularly in relation to HIV status and inflammation, emphasizes the need for targeted interventions to better support optimal aging, and ensure all members of our society can live healthy, long lives."

Gibbon VE (1) and Rassool C (2)

1. Division of Clinical Anatomy & Biological Anthropology, Department of Human Biology, University of Cape Town

2. Department of History, University of the Western Cape

### **Distinguishing restitution from repatriation: An argument for restitutionary work**

Through museum collecting practice, the deceased, possessions, plants and animals were turned into objects, removed from their communities and places of origin, they were segregated and divided into museum classificatory systems. In purposeful and proactive acts of return, the terms 'repatriation' and 'restitution' have often been used interchangeably. We will critically discuss the politics of these terms and their differences. Repatriation refers to the legal, administrative and logistical matters of returning across national borders. However, restitution is a preferred concept highlighting deeper meanings of return to the proper owner, with restitutionary work being time-consuming, emotional, often painful, enriching acts of restoration and transitional justice. Restitution is about the embodiment and empowerment of choice over all aspects of the return. We will present an argument that terminology matters. While restitution may involve repatriation, repatriation is not a substitute for acts of restitution.

Gilmour RJ (1), Cicalo V (1), Igl R (2), and Pollhammer E (3)

1. Department of Sociology & Anthropology, Mount Royal University

2. ARDIG - Archäologischer Dienst GesmbH, St. Pölten, Austria

3. Office of the Lower Austrian Federal Government, Department of Art and Culture, Archaeological Park Carnuntum, Bad Deutsch-Altenburg, Austria

### **A Probable Case of Metastatic Cancer in Roman Austria: Exploring Ancient Health, Lifestyle, and Activity**

Palaeo-oncological cases are common in the palaeopathological literature, but few Roman comparative examples are available and none integrate cross-sectional methods to understand how cancer might have impacted a person's physical activity. We present a case of skeletal metastatic cancer in a middle to old aged possible-male from Roman Carnuntum, Austria. Using long bone cross-sectional shape analyses, we compare this individual to other Roman contexts to illuminate how this disease may have affected their function and activity. The skeleton is incomplete with a combination of diffuse lytic and blastic lesions. The interior pelvic and sacral surfaces exhibit the greatest pathological changes, consisting primarily of mounds of woven and spiculated new bone. Additionally, new bone is laid down amongst trabecular struts, infilling medullary canals and causing endosteal cortical thinning and porosity. Some epiphyseal ends also exhibit an undulating, moth-eaten appearance. The lesion patterning and appearance is consistent with possible prostate cancer that metastasized to elements in the spine, hips, and arms. Preliminary comparisons of the distal radial shaft total bone area ( $156.5\text{mm}^2$ ) place the individual within the typical range for males at other Roman provincial sites (e.g., Ancaster, UK:  $98.1\text{-}211.3\text{mm}^2$ ). In adults, bone atrophy at the periosteal margin typically requires long and sustained unloading and can indicate considerably altered mobility and impairment. While this individual undoubtedly experienced symptoms related to their ailment, these provisional results suggest that their physical activity was not substantially altered or impaired in the months/years prior to their death.

Godwin KI (1) and Scott S (2)

1 Department of Anthropology, University of Manitoba

2. Forensic Science Department, University of Toronto Mississauga

Affiliation of Godwin was to the University of Toronto Mississauga in the Forensic Science Department at the time the research was conducted.

### **Metric sex assessment from the sternum: a non-population-specific method using computed tomography (CT)**

The purpose of this research was to develop a metric method for sex assessment from the sternum on individuals of unknown ancestral affiliation using post-mortem computed tomography (CT) scans. Given that the sternum is recovered in up to approximately 30% of forensic cases overall, having the ability to assess sex accurately from this bone is useful for identification purposes (Scott & Jantz, 2022). Current metric methods for sex assessment developed from CT scans of the sternum are population-specific. However, ancestral affiliation may be difficult to discern in forensic cases, particularly in instances where incomplete skeletal remains are recovered; methodologies to this end are necessary. This method was developed using CT scans from (New Mexico Decedent Image Database (NMDID)), making it non-invasive and efficient in jurisdictions where post-mortem CT scans are collected. Five measurements of the sternum were collected from 110 individuals (55 male, 55 female) of known sex who were over the age of 25. Any individuals demonstrating pathological conditions affecting sternal measurements were excluded. Inter-observer and intra-observer testing were conducted via an unpaired t-test. Univariate and multivariate discriminate function analyses were performed to obtain predictive equations for sex. All equations were cross-validated. The t-tests conducted for inter-observer and intra-observer error show no statistically significant difference between the original measurements ( $p>0.05$ ) and the new measurement groups, indicating high reliability of this method of sex assessment. Univariate equations demonstrated up to 81.8% accuracy. For multivariate equations, accuracies ranged from 74.5% to 78.2%. The results of the present study indicate that sex can be predicted reliably with  $>80\%$  accuracy in individuals of unknown ancestral affiliation.

Scott, S., & Jantz, R. L. (2022). Survivability versus rate of recovery for skeletal elements in forensic anthropology. *Journal of Forensic Sciences*, 67(5), 1758-1765. <https://doi.org/10.1111/1556-4029.15087>

Goliath JR (1,2), and Cox JL (1)

1. Department of Anthropology and Middle Eastern Cultures, Mississippi State University
2. Cobb Institute of Archaeology, Mississippi State University

### **Rectifying Medicolegal Disparities for the Missing: Mississippi Repository for Missing and Unidentified Persons**

In North America, a lack of missing and unidentified persons repository data at regional and national levels continues to impact identifying missing and unidentified people, particularly from historically marginalized communities. These communities are at greater risk of going missing because they are less likely to be reported missing, less represented in media coverage, and have fewer resources allocated to their cases. These issues are further compounded by socioeconomic and health disparities impacting these communities. The Mississippi Repository for Missing and Unidentified Persons was developed to serve as a statewide missing persons database and collaborative tool to address these disparities. The Repository was implemented to increase public access to missing persons information, facilitate data sharing of missing and unidentified persons' information across regions, and elucidate socioeconomic and medicolegal disparities affecting missing persons using geospatial analysis. Preliminary analyses have shown that Black, Indigenous, and Multiracial individuals were overrepresented in the Repository compared to their general population percentage in Mississippi. Of all the missing persons resolved, 62% of those found deceased were Black. Moreover, Black men and women were twice as likely to be found deceased than their White counterparts. These disparities are also present in looking at health outcomes. Mississippi ranks as the unhealthiest state in the U.S. and among the worst in racial health disparities. Compared to White Mississippians, Black Mississippians have the highest mortality rate from cancer, diabetes, heart disease, homicide, hypertension, renal disease, and stroke. Combining missing persons data with socioeconomic and health factors will provide a greater understanding of who goes missing and how we can help identify and resolve these cases in Mississippi.

Gregory-Alcock G (1), and Rogers T (2)

1. Department of Anthropology, University of Toronto,
2. Department of Anthropology, University of Toronto, Mississauga

### **Refining and Validating a Method of Microscopic Human Skeletal Sex Assessment of the Human Femur Using Cortical Bone Histology**

Ten histomorphological variables of human femoral cortical bone were examined to assess their ability to discriminate between the biological sexes. The exact midshaft of the femur may not be available in forensic contexts, thus proximal and distal midshaft sections were compared to determine whether significant differences exist. Anterior femoral cross-sections from 24 individuals (12 male 12 female) were examined using light microscopy. Histomorphometric measurements collected using Fiji and Adobe Photoshop were analyzed with IBM SPSS. Rossi's (2018) discriminant function formula was tested and found to be biased towards females, resulting in an accuracy of 91.7% for females, and 62.5% for males, with an overall accuracy of 75%. Two new variables, embedded osteon density and drifting osteon density, not analyzed by Rossi (2018) were examined in this study in an effort to increase accuracy and reduce bias. Using discriminant function analyses, formulae generated distinguished between the sexes with high overall classification ( $\geq 83\%$ ) and cross-validated accuracies ( $\geq 75\%$ ). Discriminant function analyses demonstrated that proximal midshafts produced higher accuracies overall than distal midshafts, suggesting that when the exact midshaft of the femur is unknown, it is better to sample more proximally than distally. This study demonstrated that biological skeletal sex can be recognized histologically. Validations studies are the next step.

Rossi V. A Pilot Study for Developing a Microscopic Method of Adult Skeletal Sex Assessment Using Cortical Bone Histology of the Human Femur. Unpublished. 2018.

Heffernan MB (1, 2)

1. Department of Anthropology, University of Toronto
2. Maderas Rainforest Conservancy, Miami, FL

### **Changes in Active Behaviours for Howler Monkey (*Alouatta palliata*) in Relation to Riparian Habitats**

Riparian edges are critical ecological features that promote biodiversity across habitats. This study aimed to determine the role of rivers and riparian edges in impacting animal behaviour. Additionally, a greater understanding of the importance of specific habitat features impacting animals can benefit conservation efforts. Prior research has indicated increases in locomotive or travelling behaviours in riparian edge based on heightened predation pressure and intensified food resource availability. I therefore predicted that animals would demonstrate more locomotive behaviours when in closer proximity to riparian edges. The mantled howler monkey (*Alouatta palliata*), an arboreal platyrrhine primate that lives in a variety of habitats including riparian forest, was studied to determine changes in locomotion and postural behaviours in different habitat areas. Monkeys were studied at the La Suerte Biological Station in Limon Province in Costa Rica, and observational data were categorized and compared based on proximity ( $\leq 100$  meters) to riparian edges of Rio La Suerte. The point sampling method was used on individual focal monkeys of all ages and sexes to collect 25 hours of data, with the primates sampled for 30 mins each with points taken every 30 seconds. My results indicated little increase of locomotive behaviours based on proximity to the riparian edge, although feeding behaviour increased when in riparian edge, likely due to richer food resources being present. Further research on this species should focus on other factors affecting behavioural changes within their habitat.

Heinrichs E (1) and Gamble JA (1)

Department of Anthropology, University of Manitoba

### **Testing the Accuracy of Structured Light 3D Scanning for Archaeological Human Teeth**

3D scanning technology has many different applications in all varieties of disciplines, including bioarchaeology. One of these applications is digitally preserving archaeological material before destructive testing. The goal of this study is to evaluate accuracy of 3D virtual models produced using a structured light scanner in relation to the original (physical) teeth. 3D virtual models of archaeological human teeth ( $n=30$  mandibular canines and  $n=19$  maxillary first molars) from the post-medieval site of Koekelberg (Belgium) were produced using an HP 3D Scan Pro S3 structured light scanner. Teeth were then measured for full length, and for mesiodistal and buccolingual crown width. Digital calipers were used to take the physical measurements, while the virtual models were measured using the HP 3D Scan Pro software version 5.6.0. The results were evaluated using the IBM SPSS Statistics Version 29. Results show high correlations between the real and virtual measurements in all instances. High correlation was apparent for all metrics with the composite sample ( $r = .99$  for length and  $r = 1.00$  for both mesiodistal and buccolingual dimensions,  $p < .001$ ). These results stayed consistent with the subdivided sample across all metrics with the lowest correlation being  $r = .95$  for the molar crown to root length. The consistently high correlations between virtual and real examples are promising, with implications for preservation of valuable archaeological teeth in instances where they can be ethically scanned. Accuracy of such models is particularly important where destructive testing might occur in future. There are also implications for research collaboration, teaching, and controlled instances of public engagement. The ethics of displaying and using human remains in any form would play a role in these possibilities and should be a central focus before pursuing such avenues.

Hertz MP (1), Murray A (2), and Stock, JT (1)

1. Department of Anthropology, Western University
2. Department of Anthropology, University of Victoria

### **Variation in habitual activity and body composition: a volumetric comparison of swimmers and runners**

There is evidence for differences in the relative strength/rigidity of upper to lower limb bones between swimmers and runners, an observation that has been supported in studies of both bioarchaeological material and comparisons

of living athletes. It is unknown whether this variation is also reflected in differences in the distribution of soft tissue within the body, and whether differences in the distribution of muscle and fat track the pattern of variation observed in the skeleton. This study investigates patterns of limb volume and surface area by comparing long-term runners (n=42) and swimmers (n=27) to a recreational control group (n=26), to determine whether patterns of morphological variation previously observed in the skeleton are also reflected in soft tissue. Limbs segmented from three-dimensional surface scans captured using a Size Stream 3D Body Scanner were compared to one another across groups using ANOVA and Tukey HSD tests.

Swimmers had larger amounts of their limb volume and surface area concentrated in their arms, relative to their legs, and runners had more of their limb volume and surface area concentrated in their legs, relative to their arms. The same patterns held true for muscle mass in both swimmers and runners. These results suggest that swimming results in more upper body muscle volume and that running results in a greater degree of lower-limb muscle recruitment and deposition. Non-impact loading results in demonstrable differences in body morphology, emphasizing the importance of activity throughout the life course. This study suggests that patterns of phenotypic variation observable in the skeleton reflect those of the body as a whole and lend confidence to our interpretations of variation and habitual behaviour in the past. This study highlights the differential impacts of loading versus non-loading activities across the life course, improving the contextualization of activity patterns in both contemporary and archaeological contexts.

Hider J (1, 2), Jamieson J (2), Marciniak S (1, 2), B-Hardy M-H (1, 2), and Poinar H (1, 2)

1. McMaster Ancient DNA Centre, McMaster University

2. Department of Anthropology, McMaster University

### **Possibilities and limitations of using DNA to reconnect missing Indigenous children with their families and communities**

Genetics and biological anthropology have significant legacies of racism and colonialism, including institutionally mandated and permitted unethical and extractive research practices on Indigenous communities. We have a responsibility to acknowledge the impacts and to educate researchers about this past so as not to repeat it. We also have a responsibility to engage in more ethical research and in activism. We are creating videos about the limitations and uses of DNA to reconnect children who died at residential schools to their families and communities as part of Survivor-led and Indigenous-led investigations. These videos will provide accessible information to Indigenous communities about how DNA could be used as part of a holistic approach to finding the children. Our focus is to share our knowledge with communities without an agenda and acknowledging the distrust for settler researchers. This approach is ethically engaged, and differs from traditional research practices because it prioritizes the needs of the community over the needs of the researcher. One way in which we are practicing this is by getting feedback from Indigenous individuals about the scope, content, and applicability of these videos. Through preliminary feedback, we have added a video on the uses and limitations of using sedimentary DNA for linking children to their communities. We reflect on key considerations for ethically engaged work as well as solutions to barriers in reconciliation work. We have found that flexibility of timelines and transparency about the risk and possibilities of DNA research have been essential to building relationships. This work is done on the timeline of our Indigenous collaborators and we work to show that we are genuine in wanting to help, as trust has been broken by a history of poor interactions between Indigenous Nations and universities. We focus on rebuilding trust, versus convincing people to work with us.

Holland E

Department of Anthropology, Brandon University

### **Community Engaged Forensic Anthropology in Manitoba**

As a practicing forensic anthropologist, I regularly work with law enforcement and the Office of the Chief Medical Examiner to help identify the remains of unknown individuals and determine what happened to them. This is what

I expected in the course of the discipline. What I did not predict was the direct way in which I would become involved with other groups and organizations doing work that is linked to larger social issues such as MMIWG2S+ and Truth & Reconciliation. From training members of Drag the Red, to authoring a feasibility study on searching a landfill, to working with First Nation communities on residential school investigations, the myriad of opportunities to collaborate and contribute has grown. I would like to share my experience with you by examining these opportunities through the lens of social responsiveness and community engagement. This is not a talk based on research. It is instead based on my experience and the potential ways forensic anthropologists can contribute to a socially responsive biological anthropology.

Holland S (1), Morgan B (2), Nguyen J (2), Brickley MB (2), Ribot I (3), and Waters-Rist A (1)

1. Department of Anthropology, Western University
2. Department of Anthropology, McMaster University
3. Département d'Anthropologie, Université de Montréal

### **Early life and early death in a wet-nursing community: Diet and stress in infants from 18th-19th century Pointe-aux-Trembles, Québec**

During the 18th-19th centuries, high rates of infant mortality were observed in Pointe-aux-Trembles, a rural community near Montréal, Québec. Historical sources suggested infant feeding practices, such as wet-nursing, played a role in these high mortality rates. Stable isotope analysis can reconstruct the breastfeeding and weaning practices of past populations as breast milk has higher stable carbon and nitrogen isotopic values than alternative infant foods. Deciduous teeth form incrementally, beginning in utero and continuing into early life. Since teeth do not remodel, the analysis of different layers can reveal an infant's feeding history. Periods of nutritional or disease stress during growth can also be identified via altered isotopic signatures. This study uses stable carbon and nitrogen isotope analysis of 62 incremental dentine samples to identify breastfeeding, weaning, and stress in ten infants (<3 years of age) from 18th-19th century Pointe-aux-Trembles, Québec. Stress episodes are investigated via twinned isotope and paleopathological analyses, focused on enamel hypoplasia and metabolic diseases. Eight of 10 infants display evidence of breastfeeding, with weaning foods introduced 2-5.5 months after birth. Nine of 10 infants have skeletal lesions indicative of scurvy, rickets, and/or anemia, and eight have enamel hypoplasia. Combined with isotopic signatures of stress in three individuals, these results reveal a challenging early-life environment for infants. This work sheds light on the brief lives of infants from a documented wet-nursing community, while highlighting the value of integrating paleopathological information into paleodietary research.

Houle É, Jacome C, and Ribot I  
Département d'anthropologie, Université de Montréal

### **Example of an ongoing repatriation of a Mesoamerican skeleton at the Université de Montréal. Ethical, scientific and political considerations.**

Since the last decades, bioarcheology has encountered, major changes both in its conceptual framework and its practices. As a field which interacts directly with human remains, ethical issues are now at the forefront of its preoccupations. The osteological collection maintained at the Université de Montréal (anthropology), being in part inherited from research conducted during the last century, does not escape these considerations. For instance, the re-discovery within the departmental collections of a box containing the skeletal remains of a child (el niño) of Mesoamerican origins, raised some ethical considerations. Ongoing efforts focused therefore on the repatriation of el niño to the country of origin. First, both original and up-dated osteological inventories will be presented here. Second, the individual's journey will be traced back from the site of El Arbolillo (Mexico Basin) to the university collections at Montréal. Finally, as the challenges encountered will be highlighted, this will lead us to a discussion about international (and national) repatriations and Quebec context.

Jia S (1), Fraser R (2,3), and Reznikov N (1,4,5)

1. Department of Bioengineering, McGill University
2. Department of Pathology, McGill University
3. Maude Abbott Medical Museum, McGill University
4. Department of Anatomy and Cell Biology, McGill University
5. Faculty of Oral Health and Dental Medicine, McGill University

### **Super-resolution imaging algorithm for the bony labyrinth of the human temporal bone using micro-computed tomography and deep learning.**

The inner ear structure first appears in the evolutionary record 400 million years ago and is highly conserved across many clades of animals. In the human embryonic development, the inner ear cavity becomes encased in the petrous part of temporal bone, which is the densest part in the skeleton of humans and other mammals. It contains the otic capsule (with three semilunar canals and the cochlea) that forms via enchondral ossification and never remodels. Attributable to its high mineralization for unique mechanical and acoustic properties, petrous bone becomes a valuable source of well-preserved ancient DNA for osteoarchaeologists.

Current medical imaging technologies like clinical computed tomography (CT), and dental cone beam CT (CBCT) have insufficient spatial resolution for meaningful petrous bone imaging. Safety measures often entail minimizing radiation dose and exposure time, degrading signal-to-noise ratio. To overcome image resolution barriers, a deep learning-based Conditional Generative Adversarial Network (cGAN) was constructed to perform upsampling of tomographic data. The model is trained on 3D images of a human fetal temporal bone from the Maude Abbott Medical Museum (MAMM). The bone was imaged using Yxlon FF35 micro-CT with stepwise magnification increments to form superimposable low-resolution and high-resolution training sets. The purpose of upsampling is to improve the definition of fine details of the image. The scan confirms that the fetal cochlea attains near adult size by gestational week 24 (cochlea basal turn width 8.5mm). We further test the model's generalization ability on the 3D image of an adult temporal bone (cochlea basal turn width 9.1mm, MAMM). Once further refined, this cGAN model will be transferable to other 3D images of the human cranium, leading to a better understanding of the petrous bone development and growth, and congenital and acquired ear disorders.

Judd NRM (1), Knaap W (1), and Lowe A (2)

1. Forensic Science Program, University of Toronto Mississauga
2. Forensic Identification Services, Ontario Provincial Police, Orillia, Ontario, Canada

### **Evaluation of Full Spectrum (IR/UV) Photography to Visualize Latent Fingerprints on Difficult Surfaces**

Full-spectrum (IR/UV) photography has the potential to capture and visualize infrared (IR) and ultraviolet (UV) light that traditional digital-single-lens-reflex (DSLR) photography cannot capture. The purpose of this study was to determine if IR/UV photography could visualize latent fingerprints on difficult surfaces better than traditionally used DSLR photography. IR/UV photography has been used in various subfields including forensic pathology, odontology, and anthropology with recent uses in fingerprint visualization. This study is the first of its kind to look at the efficacy of visualizing latent fingerprints using IR/UV photography on stainless steel, soft plastic, and pig skin. Four donors aged 16 to 56 years deposited six fingerprints onto three substrates; stainless steel, soft plastic, pig skin. Each fingerprint was photographed with five different camera-light combinations before processing and after processing with UV-fluorescent fingerprint powder creating a total sample size of 360 fingerprint photographs. Each photograph was individually graded using the Bandey Scale (Home Office fingerprint evaluation scale) and results were analyzed using Kruskal Wallis and Mann-Whitney U tests. The tests showed no statistical significance in fingerprint grading between the various camera-light combinations both with and without processing.



Kalan AK  
Department of Anthropology, University of Victoria

### **A wild perspective on handedness: why it matters**

Laterality and the evolution of handedness have long fascinated scholars across multiple disciplines ranging from neurobiology, developmental psychology, archaeology, and animal behaviour. The uniquely human trait of an almost universal right-handed population-level bias has been of much interest given its influence on brain lateralization, specifically left-hemispheric specialization. This lateralization has wide-ranging implications for the evolution of tool use and manufacture, as well as language. Despite the long history of research, there remains no consensus on how and why laterality, and by extension handedness, evolved. A comparative perspective using nonhuman primates is therefore crucial for illuminating the evolutionary origins of population-level handedness. In this talk, I argue that although the current corpus of literature on handedness is dominated by studies conducted in captivity, wild populations provide a much-needed window into the potential selection pressures that may have influenced the emergence, and utility, of population-level handedness and individual-level hand preference. Focussing on wild chimpanzees, I review findings of handedness and hand preference in various tool use behaviours, their conflicting results, and share new data that may help to clarify, or support, these previous studies. As one of our closest living relatives, chimpanzees possess a diverse set of tool use behaviours and show significant variability across populations therefore they provide an excellent opportunity to examine the interaction of handedness and tool use behaviour within a relevant socio-ecological setting. Moreover, I argue that the flexibility observed within a population can provide critical insight into the adaptiveness of hand preferences on an individual level. By sharing my current research on this topic, I invite discussion and feedback on the proposed analyses to improve future comparability and presumed relevance for the evolution of laterality.

Kelly J  
WSP E&I Canada Ltd., Burlington, ON.

### **Hardship and Humanity: Osteobiographical Insights into the Irish Famine Diaspora during the 1847 Typhus Epidemic in Kingston, Ontario**

Approximately 1,600 men, women, and children died of typhus fever shortly after arriving in Kingston, Ontario, on what are now known as “coffin ships” while fleeing the Great Hunger (or Irish Famine) between 1847 and 1848. Buried at the Kingston General Hospital, this mass grave was subject to an archaeological investigation between 2021 and 2022, ahead of necessary development to update hospital facilities. This excavation resulted in the analysis and disinterment of 55 burials, 53 of which are associated with the 1847-1848 epidemic, representing all that remains of this mass burial event.

Individuals ranged in age from perinatal to over 50 years old and over half (57%) of those recovered were under the age of 20. Osteological analysis yielded evidence of chronic nutritional stress, disease, and behavioural patterns consistent with the working class. Archaeological evidence indicates that despite the extraordinary public health crisis each person was given a coffin burial, and in some cases, shrouds, demonstrating efforts made by the community to provide the most respectful treatment in death that the situation would allow.

Mass burial sites for the victims of typhus and the Great Hunger are unfortunately not singular and are present throughout the route that Irish immigrants would have travelled along the St. Lawrence River, however, few such sites have been investigated in detail. This work represents a rare opportunity for bioarchaeological analysis of one such mass burial site in Canada associated with this migration event and provides a poignant glimpse into the challenges faced by Irish immigrants during the Great Hunger, highlighting their struggles and the measures taken by the local community to provide dignity and respect in death.

Kendall C(1), Debortoli G (2), Nooranikhojasteh A, Christian D (4,5), Newman D (4,5), Cole S (4,5), Sayers K (5), Parra E (2), Schillaci M (3), and Viola B (1)

1. Department of Anthropology, University of Toronto

2. Department of Anthropology, University of Toronto Mississauga

3. Department of Anthropology, University of Toronto Scarborough

4. Texas Biomedical Research Institute, San Antonio, Texas

5. Southwest National Primate Research Center, San Antonio, Texas

### **Global and Local Ancestry Estimation in a Large Captive Baboon Colony**

Baboons (genus *Papio*) are Old World Monkeys from the subfamily Cercopithecinae and have been extensively studied both in the wild and in captivity. Hybridization studies in primates have become a topic of interest due to the discovery that not only do almost all species of primate hybridize to some degree, but modern humans and archaic hominins also engaged in this behaviour. Baboons, due to frequent hybridization both in wild and captivity between different (sub)species make a good model for the study of admixture in the Genus *Homo*.

Here, we report on the global and local ancestry estimates of over 800 captive olive and yellow baboons and their hybrids from the Southwest National Primate Research Center (SNPRC) in San Antonio, Texas. We used whole genome sequencing from public genome archives from 51 high coverage (>15x coverage) founders of the colony to improve through genetic imputation and phasing the genomes of the remaining 850 low coverage (mean ~5x coverage) baboons sequenced. We calculated global ancestry estimation for each sample and local ancestry estimation for non-founder animals. Additionally, we calculated *Fst* values, created a list of 1566 ancestry informative markers, and report newer baboon genetic maps. We generated a dataset of over 6.6 million high confidence variants aligned to the newest baboon genome and saw good agreement between the global ancestry software with *r2* values over 0.9. We discovered several errors in the SNPRC pedigree regarding species assignment and highlight evidence from local ancestry data of distant admixture in putative purebred animals used to create the colony. Collectively, our results indicate a need for deeper genomic assessment of captive baboon populations to understand hybridization in the past. Lastly, our resources will be helpful for those undertaking research using baboons in the future.

Khayer T (1), Desruelle K (2), Curteanu C (2), Sellen D (3), Watts D (4), and Bădescu I (2)

1 Département de Sciences Biologiques, Université de Montréal

2 Département d'Anthropologie, Université de Montréal

3 Department of Anthropology, University of Toronto

4 Department of Anthropology, Yale University

### **Nest building in wild infant chimpanzees at Ngogo, Kibale, Uganda**

All great apes build nests. Nests in trees or on the ground provide apes with a safe and comfortable place where they can sleep and rest at night and during the day. Nest building is thus a necessary skill that individuals learn and practice early in life, but little is known about the factors affecting the expression of this behavior in infancy. We studied the development of daytime nest building behaviour of 72 wild infant chimpanzees (*Pan troglodytes schweinfurthii*) at Ngogo, Kibale National Park, Uganda. We evaluated the effects of infant age (0-2, >2-4, >4 years) and sex (female, male), maternal parity (primiparous, multiparous), and data collection period (2013-2014, 2018) on the probability of showing nest building, and on bout rates (frequency/hour) and durations. We found older infants were more likely to build nests than younger ones (Generalized Estimating Equations, GEE:  $p < 0.001$ ). Nest building likely requires more observation of others in early infancy and sufficient physical development to manipulate tree branches before older infants (> 2 years, Tukey HSD:  $p < 0.05$ ) start practicing. Infant females were more likely to build nests than males (GEE:  $p < 0.05$ ), in line with other developmental markers suggesting that females may be under greater selective pressure to gain independence at younger ages than males in chimpanzees. Once infants started practicing nest building, they did so with similar rates and durations, regardless of age, sex, or parity of their mothers. Infants in 2013-2014 were more likely to build nests

than those in 2018 (GEE:  $p < 0.05$ ) and spent less time building each nest ( $p < 0.05$ ). This highlights the importance of considering data collection period in analyses using longitudinal data.

Kjorlien Y

### **Start with the Why: How Research in Scattered Remains Turned into a Podcast**

The challenge with any research is using it to affect a change in the world. Knowledge mobilization has been a priority in the Canadian research landscape for the past decade. However, it is only half the equation of affecting a change: the knowledge must be used after it's been mobilized. The purpose behind my research on finding patterns in the way remains are scattered due to scavenger activity is to increase the discovery and recovery rate of remains to help investigators close cases, increase the positive identification rate of unknown decedents, and to provide as many remains as possible to the next of kin. The problem is multi-fold: searchers and law enforcement members don't read or have access to scholarly publications; searchers and law enforcement members tend to use search strategies based on anecdotal evidence; and family members don't know that recovery rates are an issue. How could I get information to these people in a way they'd find reputable and would use?

I started a podcast in 2020 to disseminate valuable information about the dead to people who need it. As of December 2022, the podcast has been downloaded +60k times, and currently ranks within the top 5-10% of podcasts (Buzzsprout global stats, March 2023). However, am I affecting a change in the world? Are searchers, family members, and law enforcement listening and using the information in their efforts to discover scattered remains? TBD.

Komza K (1), Schroeder L (1,2), Davies TW (3), and Viola B (4)

1. Department of Anthropology, University of Toronto Mississauga
2. Human Evolution Research Institute, University of Cape Town
3. Department of Human Evolution, Max Planck Institute for Evolutionary Anthropology
4. Department of Anthropology, University of Toronto

### **Shape variation in the hominoid cuboid**

Living hominoids practice a wide range of locomotor behaviours that may be reflected in the shape of their foot bones. The morphology of the cuboid is important because it contributes to midfoot mobility in non-human apes, and to midfoot stability and a longitudinal arch in humans. Differences in cuboid morphology between genera are well-understood, but less is known about differences between species from the same genus, and between subspecies. Here we analyzed the cuboid shape of *Gorilla gorilla gorilla* (n=28), *Gorilla beringei beringei* (n=6), *Gorilla beringei graueri* (n=8), *Homo sapiens* (n=40), *Hylobates* sp. (n=46), *Pan paniscus* (n=18), *Pan troglodytes* ssp. (n=60), *Pongo abelii* (n=15), and *Pongo pygmaeus* (n=28) to understand how it corresponds to locomotor variation. Cuboids were surface scanned and their shape was analyzed using three-dimensional geometric morphometrics. We used fixed landmarks and sliding curve and surface semilandmarks to capture the entire morphology of the cuboid. Semilandmarks were then slid to minimize bending energy, after which a Generalized Procrustes Analysis was used to align landmark configurations. Differences in shape were visualized using a principal component analysis.

The most variation can be attributed to proximodistal length of the cuboid. All great apes possess short cuboids, whereas humans and gibbons possess the longest cuboids. Humans also show a distinct morphology characterized by a flat facet for the fourth metatarsal, and a long, medially-positioned cuboid beak. We also find more subtle differences in calcaneal facet shape between mountain (*G. b. beringei*), grauer (*G. b. graueri*), and western lowland gorillas (*G. g. gorilla*), and between Bornean (*P. pygmaeus*) and Sumatran orangutans (*P. abelii*). Bonobos and chimpanzees also differ in the morphology of the lateral border, despite their locomotor similarities. Overall, we find that the shape of the cuboid reflects broad differences in locomotion, as well as more subtle differences between closely-related species.

Kumpan LT (1), Drea CM (2), and Teichroeb JA (1)

1. Department of Anthropology, University of Toronto, Scarborough

2. Department of Evolutionary Anthropology, Duke University

### **Impacts of social buffering on affiliative behaviour in *Lemur catta***

Sociality is observed across diverse taxa but is especially widespread and complex among primates. To reconstruct the potential evolutionary pathways for sociality in primates, an understanding of the ways that social relationships exert positive or buffer negative physiological effects, such as stress, is essential. Here I examine the social buffering of stress in captive ring-tailed lemurs (*Lemur catta*) at the Duke Lemur Center, by determining if conspecifics influence the endocrine response to, and recovery from, a controlled stressor, and the behavioural consequences of this stressor to the focal individual and their group members.

I characterized the physiological and behavioural outcomes of social buffering on these individuals (N = 14) using an experimental manipulation and two blood draws. The experimental manipulation was a standard netted capture functioning as a stressor that occurred under two conditions: a social condition, where individuals could see and hear their group members, and a solitary condition, where individuals were sensorily isolated from their group members. Behavioural data focused on affiliative behaviour given and received by focal individuals was collected in the 4-day period surrounding the stressor to explore how social buffering impacts group dynamics. Interestingly, Wilcoxon signed-rank tests indicated that there were no differences between baseline and post-stressor rates of affiliative behaviour given ( $Z = 0.907$ ,  $p = 0.382$ ) or received ( $Z = -0.189$ ,  $p = 0.867$ ) by socially buffered individuals, or affiliative behaviour given ( $Z = 0.823$ ,  $p = 0.849$ ) or received ( $Z = 0.907$ ,  $p = 0.382$ ) by individuals in the solo condition.

Kurki H (1) and Wall-Scheffler C (2)

1. Department of Anthropology, University of Victoria

2. Department of Biology, Seattle Pacific University

### **Helpful Hominin Hips: There is no evidence for major reorganization of the pelvis among hominins**

The evolution of the hominin pelvis is commonly modeled as a series of stages driven largely by the requirements of bipedal locomotion, obstetrics, and thermoregulation. The earliest hominins (Australopiths) possessed mediolaterally (ML) wide, but anteroposteriorly (AP) compressed pelvic canals and flaring iliac blades. Early Homo was much the same, but with minor AP expansion due to larger neonatal brain size. Middle Pleistocene Homo saw further AP expansion in an already broad-bodied form. Finally, Homo sapiens saw a significant ML reduction and AP expansion resulting in a unique pelvic shape relative to other Homo species. These patterns are complicated by changes to canal dimensions with overall pelvic breadth, and degree of iliac blade flaring. This study examines pelvic canal dimensions relative to bi-iliac and bi-acetabular breadths in 9 archaeologically-derived human skeletal samples and published dimensions of hominin fossil pelvises. Relative to measures of pelvic breadth, there is substantial variation in canal dimensions in fossil hominins and both sexes of Homo sapiens. While AP dimensions are relatively short in Australopiths for the most part, pelvic breadths are not relatively larger compared with Homo, early, late or contemporary. There is no clear story of ML reduction and AP expansion consistently across Homo, nor within our own species. Given variation in relative dimensions within both sexes of Homo sapiens, and the fossil pelvises, it is clear that no one (or 2) fossils can stand in for pelvic form for a hominin grade (e.g. Australopiths, early Homo, etc.), or perhaps even species, and that pelvic shape and dimorphism evolution within the hominin lineage did not follow a single trajectory. Given the dearth of Middle Pleistocene Homo pelvises from warmer climates and that the Kebara Neandertal is likely distorted, our picture of pelvic form in later Homo is incomplete.

### **Critical Perspectives on the Ethics of Indigenous Cranial Casts in Anthropological Collections**

Human remains play an undeniable part of research and education, spanning countless disciplines such as biological anthropology, archaeology, and anatomy. The access to reference and teaching collections can be incredibly beneficial to professionals and students with the determination of sex, ancestry, or cause of death. The acquisition of anatomical and skeletal collections today follow standards that have an emphasis on the consent of the individual. However, this has not always been the case and institutions across the world are engaging with the importance of ethical conduct, repatriation, and reconciliation. The University of Manitoba's Department of Anthropology recently discovered skull casts of Indigenous peoples from southern Africa and Australia within their collection. Likely obtained by the department in the 1960s, preliminary investigation indicates a lack of documented consent from the individuals or their descendants, transgressing the boundaries of modern ethical curation standards. Archival work and consultation with professionals in related fields followed the initial investigation. Determining the voyage of these casts and developing a narrative for their arrival at the University of Manitoba has been the primary goal of this project, with a focus on the roles that Samuel Morton, Charles Ward, and their institutions had in the acquisition, distribution, and reproduction of human remains for profit.

Langlois MD (1), Nguyen J (1), Morgan B (1), Ribot I (2), Schats R (3), van der Merwe AE (4), Waters-Rist A (5), and Brickley MB (1)

1. Department of Anthropology, McMaster University
2. Département d'Anthropologie, Université de Montréal
3. Faculty of Archaeology, Laboratory for Human Osteoarchaeology, Leiden University
4. Department of Medical Biology, Section Clinical Anatomy and Embryology, University of Amsterdam
5. Department of Anthropology, The University of Western Ontario

### **Sternal Rib Microfractures: A New Diagnostic Criterion for Nonadult Scurvy?**

Scurvy has no pathognomonic skeletal lesions, which has made it difficult to identify in archaeological contexts. The patterning of macroscopically visible lesions on bone is the primary diagnostic tool for nonadult scurvy. But the often-fragmentary nature of archaeological remains may result in lesion patterning being difficult to detect, particularly in those who experienced pathological conditions. A series of histological studies in the early 20th century identified microfractures in the trabecular structure of the sternal rib in association with scurvy. Yet, microfractures are not currently used in the diagnostic criteria in paleopathology. The aim of this study is to determine whether microcomputed tomography (micro-CT) can be used to detect microfractures in sternal ribs in place of traditional histology, and whether these can be used in conjunction with lesion patterning to aid in diagnosing cases of nonadult scurvy in the past. To that end, using Dragonfly (v.2021.4) software, we assessed nine micro-CT slices from a sternal rib from 79 individuals from two Quebecois collections (Saint-Antoine [1799-1854 CE] n=8; Pointe-aux-Trembles [1709-1843 CE] n=18), and four collections from the Netherlands (Arnhem [1650-1829 CE] n=24; Eindhoven [1650-1850 CE] n=6; Alkmaar [1716-1830 CE] n=15; and Zwolle [1675-1828 CE] n=9) for evidence of trabecular fractures. Findings suggest that while micro-CT can be used to identify unhealed trabecular fractures, when observed in dry bone such fractures are not correlated with other lesions used to suggest a diagnosis of nonadult scurvy. These findings indicate that the study of microfractures in archaeological bone has limited usefulness as a diagnostic tool.

Laughton JK

Department of Anthropology, University of Alberta

### **Measure twice before you cut once - a comparison of molar odontometrics**

When the Baikal Archaeology Project (BAP) collects human teeth for stable isotope and aDNA analyses, the teeth are documented and imaged prior to further use. Unless done in the field, dental measurements are not taken in advance of such destructive methods. In this presentation, I will provide a comparison of dental measurements

taken on physical teeth and dental casts to measurements taken on 2D images of said teeth, looking to address any discrepancies between the two methods. I then use the data to make recommendations regarding tooth protocols on archaeological projects. If, as clinical literature has suggested, measurements taken from digital images are sufficient for research, then as long as teeth are imaged prior to their use in destructive analyses projects can continue as normal. The “digital remains” can be kept in perpetuity for study and can be easily accessed and reinvestigated as needed by any individual anywhere. However, should digital measurements not be sufficient, or prove to be more cumbersome and difficult to work with, then protocols must be put in place on projects to measure teeth prior to any further analyses. The teeth used in this project are isolated molars (subsample n=53) from the middle Holocene of the Cis-Baikal region of Siberia, Russia.

Lischka M (1), Chinique de Armas Y (2), Hernández Godoy ST (3,4), and Roksandic M (2)

1. Department of Anthropology, University of Manitoba
2. Department of Anthropology, University of Winnipeg
3. Universidad de Matanzas. Matanzas, Cuba
4. Grupo de Investigacion de la Direccion Provincial de Cultura de Matanzas. Matanzas, Cuba.

### **Assessing the Biological Diversity Between the Cemeteries of Canímar Abajo Through Metric and Non-Metric Dental Traits**

The Canímar Abajo site in Matanzas, Cuba has been critical for demonstrating diversity between Archaic Age groups; however, biological differences between the site’s cemeteries are unclear. Recent research in dietary traditions, dental modifications and morphology indicates greater cultural and biological differentiation among Archaic Age groups. These findings contrast with genetic studies which could not distinguish significant differences among the sites examined. Canímar Abajo includes at least 213 well-preserved individuals within two cemetery components: the Old Cemetery (OC, 1380-800 cal BCE) and the Young Cemetery (YC, cal 360-950 CE), separated by 1,200 years of a midden layer. Similar dental modification patterns have been identified in both cemeteries. Conversely, the cemeteries differ in observed burial practices, dietary traditions, and mobility patterns. This study compares metric and non-metric dental traits from adult permanent dentition to assess the biological diversity between the OC and YC individuals. Archaic Age groups have received less attention when compared to later Ceramic Age arrivals, and previous studies have been impacted by small sample sizes and poor preservation of skeletal materials. An assumed cultural and biological homogeneity has persisted within Caribbean archaeology and has not been questioned rigorously enough. As part of a larger multidisciplinary study, this research combines different lines of evidence to understand site-specific variations within Cuban Archaic populations and the early peopling of the Caribbean.

Littleton JH  
The University of Auckland

### **Children at Roonka, South Australia: Social and political burials**

Reanalysis of Holocene burials from Roonka, South Australia, in collaboration with the River Murray and Mallee Aboriginal Corporation, demonstrates that the burial of children less than 12 years involved some of the greatest investment of time and people. While the frequency of child burials (33%, N = 216) might be read as a simple reflection of child mortality, analysis of preservation and site formation demonstrates that the burials should not be interpreted in this way. Rather the burial of children followed a different set of ideas that remained consistent over 8000 years. Single primary interments of people at all ages occurred at the site, but most non-adults are buried with an adult (74%, N = 77), predominantly male. These co-interments involve variable periods of delay before burial of the child. I argue that at Roonka the mortuary pathway is structured around reasserting the child’s relationships beyond the immediate family ensuring a safe afterlife journey. For children burial was at once political, reaffirming broader relationships, and personal, signifying sentiment. Their treatment reflects the centrality of children and their community relationships in this Aboriginal social world.

Lovatt C (1), Beaumont J (2), and Koon H (2)

1. Department of Anthropology, Western University

2. Faculty of Life Sciences, University of Bradford

### **Isotopic Inquires into the Potato Famine: Investigating Origins of Individuals from Pointe-Saint-Charles Cemetery, Montreal, Quebec**

Bioarchaeological evidence surrounding the voyage of the Irish to Canada during the Great Famine (1845-1852) holds significant importance in the contemporary understanding of pre-famine diet and health, as well as the migratory history of the Irish. Using samples from 11 individuals from the Pointe-Saint-Charles cemetery in Montreal, Quebec, dietary lifeways were created by analyzing the isotopic ratio values of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  in incremental dentine and bone collagen. The combined analyses of  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  in incremental dentine and bone collagen profiles allowed for the identification of dietary changes that are indicative of migration from Ireland or Britain. Mean collagen isotopic values of the later formed rib samples ( $\delta^{15}\text{N}$  11.6‰,  $\delta^{13}\text{C}$  -19.8‰) versus earlier formed compact bone samples ( $\delta^{15}\text{N}$  11.3‰,  $\delta^{13}\text{C}$  -20.5‰) suggest the diet shifted away from a C3 potato-based diet to a C4 maize-based diet. Seven out of the nine individuals displayed temporal changes in incremental dentine  $\delta^{13}\text{C}$  consistent with this dietary change. Two migrant individuals had unique pre-famine dietary profiles that may suggest an origin in Britain rather than Ireland. Two non-adults whose teeth were forming during the trans-Atlantic voyage display isotopic evidence of nutritional and/or physiological stress at the end of their lives. This study demonstrates the value of combining historical information with isotope data to elucidate individual lifeways, thereby providing insight into the diet, health, and geographic origins of migrants whose stories are not well known.

MacKinnon M (1), Kurki HK (1), Cowgill L (2), and Harrington L (3)

1. Department of Anthropology, University of Victoria

2. Department of Anthropology, University of Missouri

3. Department of Anthropology, University of Alberta

### **Canalization and Plasticity in the Pelvis: An ontogenetic study of pelvic morphological variation in forager populations**

This study sought to investigate pelvic morphology throughout growth and development using a geometric morphometrics approach, and to consider the ecological factors shaping this growth. In an ontogenetic sample of pelvic bones from four forager populations (Later Stone Age southern Africans, n=72; Indian Knoll, n=39; Sadlermiut, n=44; Point Hope, n=15), ilium and ischium morphological variation show distinct patterns from one another when plotted against age. From the results of a principal components analysis, the main axis of ilium morphological variation shows a degree of separation between high-latitude and low-latitude foraging groups and does not show a relationship with age, while the main axis of ischium morphology does not show group separation and instead captures age-related changes. These findings may imply a greater degree of adaptive response in the ilium to environmental stimuli, or may reflect body shape differences, while ischium morphology appears more constrained and between-group differences are not apparent. Cross-sectional geometric (CSG) data of long bones, representing habitual loading and activity patterns, were used to examine the impact of loading on pelvic morphology. Long bones are highly plastic and responsive to loading and environmental stimuli, and results from this study show that group differences in CSG are notable from approximately five years of age. Pelvic morphology, however, does not seem to show influences of habitual behaviours, as no relationship was found between pelvic shape and CSG data. The human pelvis has been shown to be highly evolvable in comparison with other great apes, but in comparison to CSG data of long bones, ilium and ischium morphology appear relatively canalized. As has been hypothesized about joint surface and epiphyseal morphology, it may be that the functional significance of the pelvis has led to a form that is more canalized and less plastic than the cross-sectional parameters of long bones.

Mah J (1), Bishop K (1, 2), Karapanou S (3), Haagsma M (4), and Garvie-Lok S (1)

1. Department of Anthropology, University of Alberta

2. TMHC Inc., London ON

3. Larissa Ephorate of Antiquities, Diachronic Museum of Larissa, Greece

4. Department of History and Classics, University of Alberta

### **Moving and managing animals in Hellenistic Thessaly: Insights from sequential dentine stable isotope analysis**

Since 2004 the Kastro Kallithea Archaeological Project (KKAP) has undertaken a long term exploration of domestic economy, subsistence, and land use in Hellenistic Thessaly (323-31 BCE). As a part of this research, stable isotope analysis has been used to study aspects of sheep, goat, and pig management. One of these studies completed sequential carbon, oxygen, and strontium stable isotope analysis of sheep and goat tooth enamel to reconstruct seasonal herding patterns at the Hellenistic site of Kastro Kallithea. That study demonstrated that some animals were managed locally, while others were herded in mountain or coastal areas far from the site, moving seasonally between pasturing areas. Understanding these animals' movements provides contextual information about human trade and mobility, and is essential to the ongoing human stable isotope research in the region. Our current pilot project aimed to add further context to our understanding of animal management processes, by conducting sequential dentine analysis of collagen carbon and nitrogen stable isotopes for three of the sheep and goat teeth used in the initial study. We anticipated that dentine collagen stable nitrogen and carbon isotope values would vary both between and within teeth, reflecting seasonal and regional variation in pasturage and fodder. Our results confirm this variation and suggest that management strategies recorded at the Hellenistic site involved both free grazing and foddering. Our pilot study showcases the well-rounded research potential of a combined sequential dentine and enamel stable isotope analysis. This research adds to the current picture of human life in Ancient Kallithea, a topic that has been widely debated in recent decades. As a result of our initial findings, different animal management or procurement strategies were recorded from sheep and goats found at different households, contributing additional fodder to the agropastoral debate.

Mant M (1) and Alker Z (2)

1. Department of Anthropology, University of Toronto Mississauga

2. Department of History, Lancaster University

### **Skin and Bone: Accidents, injury, and violence in industrializing London, 1760-1901**

The Skin and Bone project explores the embodied experience of injury, accidents, and interpersonal violence of over 65,000 Londoners during the Industrial Revolution (1760-1901). Osteoarchaeological datasets from the Museum of London Centre for Human Bioarchaeology in combination with contemporary general hospital (Middlesex, Royal London, Guy's, St. Thomas') and criminal justice records (England and Wales Criminal Registers, Millbank Prison Register, Home Office Prison Licenses, Metropolitan Police Habitual Criminal Register) from London, which note age, sex, and occupation alongside many bodily features (such as wounds and scars), provide a means of accessing and contextualizing embodied experiences of industrializing London. This research charts the possibilities of studying the impact of industrialization and urbanization on the material human body by drawing together methodologies from bioarchaeology, history, and the digital humanities. This project has generated an open-access multivariate database and is developing innovative approaches to studying and visualizing the historic body during this period. Clustering of injuries suggestive of hand-to-hand combat is evident in the male individuals, while potential evidence of gender-based violence in the female dataset is more subtle. Layering the osteoarchaeological and text-based data sources highlights how violence is literally embodied as healed (e.g., remodelled fracture trauma in a skeleton; a fading scar) and unhealed (e.g., bones showing evidence of healing processes; fresh wounds requiring hospital treatment) injuries are considered within individual bodies and across the broader sample. This work is considered within the ecological model of violence, which emphasizes the interconnections between individual, relationship, community, and society.



Morgan B (1), Schats R (2), Ribot I (3), and Brickley MB (1)

1 McMaster University, Department of Anthropology

2 Leiden University, Faculty of Archaeology

3 University of Montréal, Department of Anthropology

### **Quantifying the accuracy of porous lesion scoring using macroscopic vs. micro-CT analysis**

In paleopathology, macroscopically-visible porous orbital lesions have long been linked to acquired anemia. However, other conditions also cause orbital porosity (e.g. scurvy, taphonomy, etc.) and a researcher's ability to differentiate between sources of porosity and recognize lesions caused by marrow hyperplasia is crucial to anemia diagnosis. Evidence of marrow hyperplasia (e.g. enlarged trabecular spacing) is most easily identified through visualization of internal marrow space microarchitecture, but this is only possible non-destructively through imaging technology. We hypothesize that when researchers rely on external lesion appearance alone, identifying changes related to marrow hyperplasia and assigning etiology of orbital porosity will be less accurate. Therefore, the purpose of this study was to evaluate the amount of error that exists when diagnosing anemia and evaluating porous lesions using external macroscopic appearance compared to visualization of the whole bone using micro-CT imaging. Participants assessed 10 photographs of nonadult orbital porosity and assigned lesions sources and anemia diagnoses following given diagnostic guidelines. They repeated this process with orbit micro-CT reconstructions from the same individuals. Agreement between the photograph diagnoses and the micro-CT diagnoses were calculated using Coehn's Kappa coefficient. Agreement was also calculated between assigned lesion etiology in the photos versus the micro-CT reconstructions. The average rate of false negatives for anemia diagnosis through photographs was 30%, meaning that those with less developed porous lesions were being missed. The average rate of false positives was 16%, suggesting that some individuals with no internal evidence of marrow hyperplasia were being diagnosed with anemia. Agreement in lesion etiology between the two visualization methods was slight ( $\kappa=0.12$ ), and observers tended to assign different lesion etiologies in photographs compared to micro-CT reconstructions. This research emphasizes that caution is needed when evaluating marrow hyperplasia based solely on external lesion appearance, and highlights the importance of careful evaluation of porous lesions generally.

Muhlig I

Missing Persons DNA Operations RCMP

### **Did you know Canada has a National Centre for Missing Persons and Unidentified Remains (NCMPUR)**

The National Centre for Missing Persons and Unidentified Remains (NCMPUR) is a unit within the Sensitive and Specialized Investigative Services (SSIS) branch of the RCMP. It is Canada's national centre that provides law enforcement, medical examiners, and chief coroners with specialized investigative services in support of missing persons and unidentified remains investigations, as well as assisting law enforcement with international parental abduction cases. The NCMPUR mandate focuses heavily on information management and improving operational effectiveness. MC/PUR, the national Missing Children/Persons and Unidentified Remains database, is the foundation of the NCMPUR's information mandate. This database facilitates the analysis of investigative data to determine potential links between occurrences and is the basis for Canada's Missing website, the national public website that contains information on missing children, missing persons, and unidentified remains cases. Operational effectiveness improvement is achieved through the development of investigative best practices, training for police, and original research such as the effectiveness of hyperspectral imaging and satellite imagery to locate missing remains. The National Missing Persons DNA Program (NMPDP) is a program that is delivered in partnership with NCMPUR and the National DNA Data Bank (NDDB). Based on the DNA Identification Act, NCMPUR will authorize DNA that can be uploaded into the three humanitarian indices. The NDDB will analyze and compare profiles within the humanitarian indices, and where permitted by legislation, will also compare these profiles to the four criminal indices housed by the NDDB. While originally conducting STR and YSTR analyses, the NDDB is now also capable of conducting mitochondrial DNA testing. This paper introduces the National Centre for Missing Persons and Unidentified Remains and the National Missing Persons DNA Program and their

roles in the search for missing persons, the identification of found human remains, and the protection of privacy rights of DNA donors. The potential contributions of forensic anthropologists will also be discussed.

Murray NJ (1), Spake L (2), Cervantes M (1), Albanese J (1,3), and Cardoso HFV (1)

1. Department of Archaeology, Simon Fraser University

2. Department of Anthropology, Binghamton University

3. Department of Biological Sciences, University of Windsor

### **New proposed method for stature estimation in children from long bone lengths**

Existing stature estimation methods for children rely on data from the Denver growth study, where a sample of 20 “white” children of middle- to upper-socioeconomic status were measured longitudinally. The lack of and limited range of variation in the Denver growth study limits the applicability of those methods. This study addresses these limitations by developing a new, more generic and inclusive method independent of sex, age, ancestry, or other group statuses. A sample of 142 children 12 years of age and younger from the Hamann-Todd Human Osteological Collection and the New Mexico Decedent Images Database was used to sample a wide range of human variation. Five equations were developed using least squares linear regression to estimate stature from the maximum diaphyseal lengths of the humerus, radius, ulna, femur, and tibia. The linear regression model for the humerus provides the estimates with the greatest precision, evidenced by having the smallest prediction error ( $\pm 3.73$  cm) and the highest  $R^2$  (0.98). The second-best model is the femur, with the second-smallest prediction error ( $\pm 4.02$  cm) and an  $R^2$  (0.978) comparable to the tibia. The regression model for the ulna provides the poorest stature estimates with the largest prediction error ( $\pm 4.45$  cm), however, the  $R^2$  (0.974) is comparable to the other long bones. Internal validation tests confirm that the humerus is the best-performing model. When the equations are tested back in the sample, the humerus shows the smallest mean of the absolute residuals (2.77 cm). The five linear regression equations can be more widely applicable as they rely on a larger sample size and a combination of datasets that incorporate the largest range of variation in stature-for-long bone length currently available. In addition, the equations are independent of sex, age, and other group affiliations.

Nakano R and Kalan AK

Department of Anthropology, University of Victoria

### **A landscape archaeological approach to accumulative stone throwing (AST) in West African chimpanzees (*Pan troglodytes verus*)**

In Boé National Park in Guinea-Bissau, a community of wild Western chimpanzees (*Pan troglodytes verus*) has been observed engaging in a potentially cultural behaviour: accumulative stone throwing (AST). Individuals habitually throw rocks at particular trees, making AST a unique instance of non-foraging stone tool use. Although previous research suggests that AST has a communicative function and is influenced by the trees' acoustic properties, it is unclear what factors impact individual site selection. Repeated throws at the same location leave conspicuous sites on the landscape; therefore, a landscape archaeological approach permits the cross-temporal study of AST trees as archaeological sites connected to human- and chimpanzee-created aspects of this shared landscape. I identify patterns in the spatial proximity of certain resources, landscape features, and chimpanzee and human space-use to AST sites by mapping their distribution using QGIS. The study area encompasses approximately 100 km<sup>2</sup>, with data drawn from spatially explicit observations collected during reconnaissance surveys by previous research teams in 2014 and 2017. These include indirect chimpanzee observations, tree and rock sources, landscape features and signs of human activity. The presence or absence of AST sites is modeled in R using binomial generalized linear models to determine the influence of resources, features and space-use elements on the likelihood of AST site presence. Consistent with predictions based on research on chimpanzee ranging patterns, AST sites are more likely to occur in areas with high frequencies of food trees and in the territorial core, an area of high chimpanzee use which contains an abundance of nesting sites and reliable food sources. Improved understanding of primate behaviour can inform inferences relevant for hominin evolution and

the development of behavioural flexibility and provide support for the maintenance of biological and cultural diversity in endangered chimpanzee populations.

Nazarova-Shamkina A

Department of Anthropology, University of Toronto Mississauga.

### **Howling Frequency and Prevalence in the Mantled Howler Monkey (*Alouatta palliata*) in relation to Time of Day.**

Vocalizations are prominent behaviour in many primate species, and long-distance vocalizations such as howls are especially noteworthy in howler monkeys (*Alouatta spp.*). There are many hypotheses evaluating the evolutionary function of howling in the mantled howler monkey (*Alouatta palliata*), and a consensus is that this behaviour is used for inter-group spacing. To better understand the function of howling in this species, I investigated whether howling occurred at different rates at different times of day. Based on research findings from other sites, I predicted that howling rate would be highest during the earliest part of the day (i.e., morning, 5:00-8:00), lower during the middle of the day (i.e., midday, 8:00-13:00), and lowest in the latest part of the day (i.e., afternoon, 13:00-17:00). Data were collected using all-occurrences sampling for howling behaviour in June 2023 at La Suerte Biological Research Station, Costa Rica, with 30 hours of data collected in total. In accordance with my predictions, the howling rate was highest in the morning (mean rate of 8 howls/hour), lower at midday (3.9 howls/hour), and lowest during the afternoon (3.1 howls/hour). My results are consistent with those found at other sites and support the inter-group spacing hypothesis. Mantled howler monkeys likely howl at the highest rates in the morning to establish daily ranges and can howl at lower rates during midday and afternoon because daily ranges are already established, and further energy expenditure is unnecessary. My findings add to understandings of how time of day affects mantled howler monkey howling behaviour.

Nelson JS (1), Harrington L (1), Holland E (2), and Cardoso HFV (3)

1. Department of Anthropology, University of Alberta
2. Department of Anthropology, Brandon University
3. Department of Archaeology, Simon Fraser University

### **Experiences of the Certosa Children: Patterns of growth and childhood stress at the turn of the 20th Century in Bologna, Italy**

The late 19th century was a time of social, political, and industrial upheaval throughout Italy, with many citizens moving to urban centres in search of employment. Historical accounts describe rapid population increase and strain on city infrastructure, resulting in deplorable conditions and widespread poverty. This project investigated how these circumstances affected the children of impoverished families living in Bologna, Italy during this time. Anthropometric measurements (diaphyseal lengths; vertebral neural canal diameters; developing tooth lengths) were recorded from children (n=61) between 0-18 years of age from the Certosa Collection, a documented skeletal assemblage comprising the remains of Bologna's poorest citizens. These measurements were comparatively assessed against age and sex specific standards of typical development, with discrepancies between expected growth and attained growth serving as evidence of non-specific stress. Results show that the Certosa children were stunted in their appendicular growth (mean composite z-score  $\leq -2$ ). Similar findings were observed in the axial skeleton, with 90% of individuals in the study sample showing evidence of diminished growth (mean z-score of  $\leq -2$ ) in a neural canal diameter of at least one spinal region. Dental measurements also indicate that the permanent teeth were significantly reduced in length-for-age ( $p < 0.05$ ). The findings of this research demonstrate that the physiological development of the Certosa children was adversely affected, consistent with factors related to their low socioeconomic standing. Skeletal and dental biomarkers show that stressors were likely present from in utero development as a result of poor maternal health. Increasing frequency and severity of growth deviations with age were observed in all three biomarkers, suggesting accumulating environmental stressors throughout childhood. This research provides evidence of the deleterious impact that the impoverished conditions experienced by the Certosa children had on their physical health and development.

Nikota R (1), Harrington L (1), Kurki H (2), and Sawchuk E (1,3)

1. Department of Anthropology, University of Alberta
2. Department of Anthropology, University of Victoria
3. Cleveland Museum of Natural History

### **A Preservation Index for Contextualizing Linear Enamel Hypoplasia (LEH) Frequency Data: Toward Improving the Validity of a Palaeopathological Dataset**

The scoring of linear enamel hypoplasia (LEH) is presented as a straightforward activity in guides such as Buikstra & Ubelaker's (1994) Standards or the BABA0 Guidelines (2004). Recording of LEH is widely undertaken as part of osteobiographic analysis, serving as both an accessible and informative marker of individual life history. The present study explores the reliability of LEH scoring in an aim to improve both the accuracy of LEH datasets and the expediency of their collection in larger bioarchaeological burial assemblages. Reflecting on efforts to study LEH in two disparate environments, a curated 19th C. cemetery assemblage from England and a newly excavated group of middle Holocene burials from arid northern Kenya, we present the concept of a "preservation index" as an aid to contextualizing LEH frequency data. We also present recommendations for moving beyond "Standards" to improve the validity of LEH scoring through the use of portable digital microscopy. Field imaging modalities are compared with resource-intensive, university-based imaging modalities (scanning electron and focus-variation microscopy) to evaluate the potential gains to reliably identifying hypoplastic lesions in enamel under variable taphonomic conditions. We argue that straightforward tables of LEH frequencies presented in the literature may belie the challenges to evaluating lesions that display a wide range of biological expression, recovered under a wide range of conditions. A "preservation index" may serve to contextualize LEH frequency data to improve comparisons of this informative pathological marker across bioarchaeological study populations.

Parker K (1,2)

1. Department of Anthropology, Economics, and Political Science, MacEwan University
2. Department of Anthropology, University of Manitoba

### **Age-related Changes in Femoral Robusticity in Medieval and Early Modern**

The aim of this poster is to compare age-related changes in femoral robusticity in medieval and early modern Denmark. Using two cemetery samples, the cemetery of Tirup (1150-1350 CE) and the Black Friars cemetery (1240-1607 CE), the cross-sectional geometric properties (CA, %CA, Imin, Imax, Ix, Iy, J, and diaphyseal shape) of 206 CT scanned femora were analyzed. Samples were grouped by site and period for analysis. Scans were conducted at the femoral midshaft and Ward's triangle in the femoral neck. Age-at-death was estimated using transition analysis.

It was hypothesized that femoral robusticity would decrease significantly with age in both the femoral shaft and neck in all samples. The results do not fully support this hypothesis. Few significant differences existed between age categories for any cross-sectional geometric property of the femoral shaft in either cemetery collection or sex. This suggests that bone and bone strength are being maintained into old age in medieval and early modern individuals, with the exception of anteroposterior bending rigidity ( $p=0.033$ ) and bending rigidity along the minimum axis ( $p=0.040$ ) which increased significantly with age among rural medieval males. In the femoral neck, a decrease in the amount of bone (%CA) was noted in females with age from both the rural ( $p_{\text{Tirup}}=0.010$ ) and the urban samples (not significant). This decrease does not correspond with a significant decrease in measures of rigidity, suggesting that among females, bone is being lost at the femoral neck but the femur's ability to resist bending and fracturing is being maintained. Interestingly, bone strength and rigidity at the femoral neck (and %CA) increased with age for medieval males, significantly so for Imin in rural males ( $p=0.047$ ). Increased physical activity and multiparity (in females) are likely the causes of bone maintenance (and increase) with age in the samples.

Parsaei S

Department of Anthropology, University of Manitoba

### **Investigation and Analysis of Hypogeum Burial Patterns in The Near East (Continuity or Change)**

The greatest mysteries of human existence are creation and death. One of the concepts that has plagued humankind is the creation of the universe and humans, followed by the approach of death and the world after life. Stories and myths that depict the world after death and describe the continuance of human existence in another world have been developed through the seeking of the mystery of immortality, the fear of death, and human curiosity about the happenings of the world after death. Burial is one of the most significant manifestations of human life since it represents not only the people's religion and culture but also their thoughts and beliefs about death and the world after life. Burial patterns in any society are a function of the religious and ideological beliefs of that region. Climate, social status, gender, age, and the continuation of cultural patterns in the region's traditions all have an impact on the burial pattern. Burial patterns alter with the entrance of new faiths, although these changes are minor, and we witness the persistence of burial practices, including hypogeum burial, which has varied over time. Burial in underground tombs accessible through steps or sloping surfaces is one type of burial. These tombs, which were sometimes used to bury an individual and sometimes a family, were made up of one or more rooms in which the individual was buried in a variety of ways, including placing the body on the room's floor or platform, burying the body in jars or coffins, and even burying the ashes of cremated bodies. The royal tombs of Ur in Mesopotamia are one of the first examples of crypt burials. In Egypt, there is also evidence of hypogeum tombs, the earliest of which is a tomb in the south of Cairo that goes back 4,400 years. This kind of burial was also discovered in Iran throughout the Middle and New Elamite eras. Despite the passage of time and religious change, the tradition of burial in the hypogeum has persisted with minimal change. The Islamic period saw the continuation of the tradition of burial in underground tombs. Despite the shift in faith and philosophy, the persistence of the crypt burial custom throughout the Islamic period is particularly intriguing. Despite changes, a practice that began in the third millennium BC and has been impacted by variables such as religion, climate, and the cultural patterns of each region has continued in varied geographical and cultural areas. The purpose of this research is to investigate archaeological evidence of hypogeum tombs in Near Eastern geography. Investigating the geographical regions where the earliest examples were discovered, the cultures and ethnic groups they belonged to, the religious practices and worldviews these people held over time, during various eras, and eventually looking into the factors that have influenced the persistence and evolution of the hypogeum burial tradition.

Perez B and Spake L

Anthropology Department, Binghamton University

### **Examining Community Engagement of Forensic Anthropologists in Humanitarian Contexts**

Forensic anthropology has been applied to human rights violations for several decades. Such application of forensic humanitarian action took place in El Salvador, where one of the most notorious massacres of the country's civil war occurred in El Mozote, Morazán region, in 1981. After the civil war ended, the Argentine Forensic Anthropology Team (EAAF) arrived in El Salvador in 1992 to exhume the mass graves. Their work was pivotal in corroborating that a massacre occurred in 1981 and has been essential to the ongoing prosecution of perpetrators. Though humanitarian forensic action clearly plays an important role in transitional justice processes, little is known about how citizens experience the work of forensic anthropologists in their communities. The purpose of this study was to explore how EAAF members engaged with the community of El Mozote while conducting excavations between 1992-2004, and how this engagement contributed to the community's satisfaction with their work. Interviews were conducted using a semi-structured questionnaire with a total of twenty interviewees in over two weeks of fieldwork in the Morazán region of El Salvador. All interviewees were alive at the time of the massacre in 1981, and all were old enough in 1992-2004 to remember the work done in the region by the EAAF. Interviews were recorded, transcribed, and analyzed in NVivo. Preliminary assessment of data reveals that participants provided positive feedback to the work conducted by the EAAF. Specific actions that the team took to engage with the community included: introductions with stakeholders prior to the onset of

excavations, and providing regular updates to families about the progress of the work. Interviewees affirmed the credibility of the EAAF vs. that of government anthropologists. This case study can be seen as a precedent on how forensic anthropology teams should engage with the communities they serve.

Pfeiffer S (1,2)

1. Department of Anthropology, University of Toronto;

2. Center for the Advanced Study of Human Palaeobiology (CASHP), Department of Anthropology, George Washington University

### **Engagement with Ancestral Remains, USA**

In the US, engagement with Indigenous communities differs somewhat from Canadian approaches. Another distinction is that discoveries of enslaved persons' burials and their presence in collections now call for responses. There are parallels between the US public dialogue about the burials of enslaved persons and debates in other countries about human remains from previously ignored communities. Recently passed federal legislation has created an African American Burial Grounds Preservation Program. It has broad support from professional associations, but it remains unfunded. It should create a registry of cemeteries, which does not now exist. A proposed African American Graves Protection and Repatriation Act was tabled in 2022, with less professional support but some strong advocacy. Some states, like Maryland, have taken actions to document the needs of historic African American cemeteries. Recent genomic research based on the Catocin Furnace (MD) community suggests a constructive approach. While it is not clear how this kind of reconciliation fits into the broader framework of African American priorities, anthropologists are playing a role.

Phillips N

Western University

### **Microbiome Influences on Human Growth and Health Outcomes**

The microbiome is a critical component to human growth and health, yet the influences of cultural practices on microbiome dynamics and the resulting growth and health consequences remains largely unexplored. To indirectly examine cultural practices altering growth and health outcomes derived from modified microbiome dynamics, this project uses the cultural practices of breastfeeding and childhood antibiotic exposures as microbiome-modifying variables. To assess these cultural practices' influence on growth, anthropometric measures (height, weight, BMI, body fat percentage, and waist circumference) were evaluated via T-Test and ANOVA statistical testing between exposed and unexposed groups, whereas health outcomes (diagnosed medical, dental, and psychological conditions) were assessed based on the frequency of condition occurrences between groups using Chi-square tests. Based on a sample size of approximately 500,000 U.K. Biobank participants, this study demonstrated a difference in growth and health outcomes between groups exposed to microbiome-influencing cultural practices compared to groups without exposures. While preliminary, this research presents connections between cultural practices modifying microbiomes leading to altered growth and health outcomes.

Pigeon EC and Cahn J

Forensic Science, Trent University

### **The intersection of forensic anthropology and gender diversity: Evaluating the identification of transgender individuals by Canadian forensic anthropologists**

Transgender and gender-diverse individuals present unique challenges when it comes to sex estimation in forensic anthropology. These challenges have not been previously assessed in Canada. This study explores the nature of these challenges and how they affect forensic anthropologists in Canada. It is necessary to find what challenges the field is facing before they can be appropriately addressed. In order to study what people in the field currently believe to be of importance when it comes to the identification of transgender and gender-diverse individuals, 126

students and professional forensic anthropologists were anonymously surveyed. Further, six of the professional forensic anthropologists were also interviewed. Using thematic analysis of both the survey and interviews, this study found that while professional forensic anthropologists are generally open-minded and that research is being done to aid with the identification of transgender and gender-diverse individuals, there are still issues in the field. These issues include a continued perception of sex estimation as binary, a lack of standardization in Canada, an assumption that cases involve a cisgender individual, and transphobic beliefs some students still hold. Further, it was found that forensic anthropologists are often confined by what law enforcement expects of them. There is still more work to be done to address the inequity faced by marginalized communities, and it will take cross-disciplinary work to reach a solution. The only way to address issues with inclusivity in sex estimation is for forensic anthropologists to work together and change how sex estimation is perceived in death investigations by all involved.

Propst A (1), Čaušević -Bully M(2), Novak M(3), and Prowse TL(1)

1 Department of Anthropology, McMaster University

2 University of Franche-Comté, CNRS, Chrono-environnement

3 Centre for Applied Bioanthropology, Institute for Anthropological Research, Zagreb, Croatia

### **Examining Dietary Variation within a Medieval (11th-15th c. AD) Cemetery from Osor, Croatia**

The medieval cemetery (11th-15th c. AD) associated with Saint Peter's Monastery is located within the coastal town of Osor on the Croatian island of Cres. This Benedictine monastery was founded in 1018 AD and was the site of significant ecclesiastical reforms along the Croatian coast. The cemetery was the burial site for two communities in Osor: the monastic community of Saint Peter's Monastery (11th-13th centuries) and the lay population of Osor (13th-15th centuries). Stable isotope analysis of carbon ( $\delta^{13}\text{C}$ ) and nitrogen ( $\delta^{15}\text{N}$ ) derived from rib collagen was conducted on 129 individuals to explore intrapopulation variation in diet. Of these individuals, 61 were from monastic burials and 68 from lay burials. Stable isotope results indicate consistency in carbon values between the monastic and lay communities ( $x = \delta^{13}\text{C} -18.8\text{‰}$  and  $x = \delta^{13}\text{C} -18.8\text{‰}$ , respectively), but a statistically significant variation in nitrogen values ( $x = \delta^{15}\text{N} 10.4\text{‰}$  and  $x = \delta^{15}\text{N} 10.8\text{‰}$ , respectively). Because the monastic burials primarily pre-date the lay burials, these data suggest a slight increase in higher trophic level foods in the later (lay) population. Within the lay sample, stable isotope values indicate further dietary variation based upon burial location ( $\delta^{13}\text{C}$  mean range:  $-18.3\text{‰}$  to  $-19.1\text{‰}$ ;  $\delta^{15}\text{N}$  mean range:  $10.4\text{‰}$  to  $11.2\text{‰}$  across the 5 burial sectors), which correlate with differences in socio-economic class inferred through archaeological evidence (i.e., burial location and grave goods). This poster examines the intrapopulation variation in diet, the connection to socio-economic differences within the lay population, and how diet relates to the cultural and socio-economic landscape within Osor's medieval population.

Prowse TL (1) and Rutgers LV (2)

1. Department of Anthropology, McMaster University

2. Department of History and Art History, Utrecht University

### **Oxygen Isotope Analysis of Geographic Origins and Mobility in the Catacombs of St. Callixtus (Rome, Italy)**

Stable oxygen isotope ( $\delta^{18}\text{O}$ ) investigations of geographic origins and mobility among communities in the ancient capital city of Rome (Italy) report relatively high levels of non-local origins (i.e., 20-30%). This is not surprising given the city's role as the political and economic center of the Roman Empire during the 1st to 5th centuries CE. One segment of Rome's population that has received comparatively less attention in isotopic studies of mobility was interred in the Christian catacombs on the outskirts of Rome. These subterranean catacombs were used between the 2nd and 5th centuries CE, serving as the final resting place for thousands of Christian inhabitants of Rome. This study analyzes  $\delta^{18}\text{O}$  in the enamel of 29 permanent first and second molars from the Catacombs of St. Callixtus to investigate geographic origins and mobility in this sample. All teeth are from the 'Liberian' region of these catacombs (mid-3rd to early 5th centuries CE). The  $\delta^{18}\text{O}$  data in the St. Callixtus sample range from -

6.6‰ to -3.8‰ (mean  $-5.0 \pm 0.9$ ‰). Conversion of the data to drinking water values ( $\delta^{18}\text{O}_{\text{dw}}$ ) results in a range of -10.3‰ to -4.7‰ (mean  $-7.7 \pm 1.4$ ‰). Reported estimates for the expected  $\delta^{18}\text{O}_{\text{dw}}$  range of water consumed by the inhabitants of Rome accounts for variability introduced by the consumption of non-local water from aqueducts (expected local range: -8.7‰ to -3.6‰). Seven of the 29 individuals (24%) from St. Callixtus have  $\delta^{18}\text{O}_{\text{dw}}$  values outside this local range. All seven have more negative  $\delta^{18}\text{O}_{\text{dw}}$  values suggesting that, as children, they were drinking water from locations further inland or at higher elevations on the Italian peninsula. These results are discussed in relation to  $\delta^{18}\text{O}$  data from the sites of Casal Bertone, Isola Sacra, and the Catacombs of Saints Peter and Marcellinus.

Rabey KN (1,2,3), Moore E (1,4), and Berry FB (1,3,5)

1. Department of Surgery, University of Alberta
2. Neuroscience and Mental Health Institute, University of Alberta
3. Women and Children Health Research Institute, University of Alberta
4. Faculty of Nursing, University of Alberta
5. Department of Medical Genetics, University of Alberta

### **Assessing how enthesal malformation impact locomotion and loading of bones.**

Entheses are specialized structures that attach muscle to bone, transfer contractile forces, and are often used in anthropology to reconstruct past behaviours. If altered, muscle positioning can impair normal joint biomechanics, disrupt load transfer, and lead to premature wear. Despite their critical role, little is understood about enthesal formation. Our lab has generated a unique mouse line with enthesal malformations allowing us to monitor the development and maturation of these key musculoskeletal connections. Compound heterozygous  $\text{Prx1}^{-/-};\text{Foxc1}^{+/-};\text{Foxc2}^{+/-};\text{Sox9}^{+/-}$  mice have regular bone growth but do not form entheses. These mice are viable and mobile and provide a model to study how muscle function and bone loading are impacted when entheses are conceded. Kinetic and kinematic data were collected on these mutant mice ( $n = 10$ ) and compared to wild type mice ( $\text{WT} = 7$ ) at 8 weeks of age. The right fore- and hindlimbs were micro-CT scanned to compare bone mineral density (BMD) between groups. Mutant mice had lower body weights ( $19.18 \pm 1.7\text{g}$ ) than WT ( $22.67 \pm 0.78\text{g}$ ). Despite enthesal malformation, the mutant mice could easily locomote though they used a slightly different gait. Compared to WT ( $p < 0.05$ ), they had a lower range of motion for all joints and particularly at the shoulder. They exhibited internal rotation and adduction of the hip joints. Mutant mice had reduced step length, reduced step time (duty factor), and a lower centre of gravity. Micro-CT scans showed that despite the lack of entheses, there was minimal BMD differences (ex. humeral shaft  $0.28$  and  $0.29 \text{ g/cm}^3$ ) indicating that the structural abnormalities influenced the ability of the limbs to transmit muscle loads. This project aimed to develop a better understanding of how muscles and bone connect, and brings into question some of our preconceived interpretations of behaviour from enthesal surfaces.

Reid S (1), Albanese J (1, 2), and Sierra-Serrano E (2)

1. Department of Integrative Biology, University of Windsor
2. Department of Archaeology, Simon Fraser University

### **Beyond a Binary: Working towards best practices for estimating sex from human skeletal remains**

As society has begun to accept gender as a social construct, we must begin to consider sex as a biological construct. Sex can be defined using various biological frameworks: genetic, hormonal, anatomical, phenotypic, physiological, etc. For example, using chromosomal data, there are at least five sexes (X0, XX, XY, XXY, XYY) that occur in *Homo sapiens* at frequencies that are consistently measured. Changing the current biological framework will shift the number of sexes away from a binary, and change who is grouped into a given sex. When focusing only on skeletal variation, individuals are repeatedly allocated to different groups when using different criteria. Within any given sample of individuals, data has always shown that skeletal variation is continuous and does not fall into two discrete sexes; the number of categories for assessing variation changes with each approach for estimating sex; and allocation of specific individuals varies with the constructed categories, the skeletal



elements assessed, and the classification criteria. Furthermore, on an individual level, any one person will manifest a mosaic of traits and these traits have been ascribed as only maleness or femaleness.

A binary approach to sex limits our understanding of human skeletal variation, undermines the identification of unknown individuals in forensic contexts, constrains our understanding of past populations, and perpetuates harmful stereotypes about sex and gender. This paper is a steppingstone towards deconstructing existing sex estimation methods as the critical steps to re-constructing a non-binary approach to sex estimation that will provide a better understanding of variation in *Homo sapiens* in the past and present.

Roher S

1. Well Living House, Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto, Ontario
2. Institute for Circumpolar Health Research, Yellowknife, Northwest Territories,

### **Nats'eji: Examining Indigenous wellness and healing at Stanton Territorial Hospital, Northwest Territories, Canada**

In the Northwest Territories, Canada, where over 50% of the population is Indigenous, local Indigenous leaders and Elders have emphasized the need for better access to Indigenous healing at Stanton Territorial Hospital. In support of these calls, this presentation reports findings from a community-based and qualitative study which sought to: (1) examine how Indigenous patients and biomedical healthcare providers understand and experience the Indigenous wellness services at Stanton Territorial Hospital, and (2) explore how patients and providers might envision Indigenous healing successfully working with biomedical hospital care.

The study was conducted from May 2018-June 2022 and was overseen by a regional Indigenous advisory committee. Guided by Two-Eyed Seeing and a narrative approach, it involved 41 interviews with Indigenous Elders, patient advocates, healthcare providers, and policy makers, and iterative sharing circles with Indigenous Elders. Elders and patient advocates emphasized that while the Indigenous wellness services at Stanton Hospital play a critical role connecting patients with cultural supports, the hospital was still not effectively bringing Indigenous healing into hospital care. Participants suggested that structural factors (i.e., policy and governance decisions) and deeply rooted forces (i.e., racism, colonialism, and biomedical dominance) underlie the delivery of care at Stanton Hospital and inhibit the integration of Indigenous healing. Additionally, participants' responses revealed three models for how Indigenous healing could successfully work with biomedical hospital care. This presentation may be valuable to individuals and communities who are interested in examining opportunities for Indigenous and biomedical healthcare collaboration.

Roksandic M (1) and Bae C (2)

1. University of Winnipeg,
2. University of Hawai'i

### **Meet the Chibanians**

What would it take to move the field of Palaeoanthropology from the proverbial "Muddle in the Middle" towards a more optimistic "Solving of a Chibanian Puzzle." During a recent (May 2023) workshop in Novi Sad, Serbia the group of invited participants who are active in the research on the Chibanian (Middle Plesitocene) hominins endeavoured to come up with a roadmap that will: 1) help coherently talk among each other to understand the complexity of human evolution in the Chibanian; 2) help communicate this complex picture in a way that will dispel some myths and be more understood by non specialist and the general public. We sought to identify concepts and perceptions that underlie the intensive current debate, viewing that as key to future efforts to resolve related questions. Much discussion centered particularly around two long-standing Chibanian hominin species: *Homo heidelbergensis* and *H. rhodesiensis*. With respect to the former species, questions were raised about the varying ways the taxon name has been used (i.e., to encompass either a very restricted group – only the holotype – or a very wide group of fossils). With respect to the latter, the meeting's participants discussed the ethics of

continuing to use taxonomic names that were created as honorifics for individuals who, given their racist and/or genocidal actions, are identified as a blight on the history and dignity of humanity. Here we present the most salient moments of the workshop and the conclusions – as we see them – as organizers of the whole endeavour.

Salahuddin H, Waters-Rist, and Longstaffe FJ  
The University of Western Ontario

### **Nail Keratin Amino Acid Stable Isotopes Reveal Insights into Early Childhood Diet**

This study investigates the utility of compound-specific isotope analysis (CSIA) of amino acids (AA) for reconstructing early childhood diet. To test the applicability of CSIA-AA, we analyzed fingernail samples from three modern mother-infant dyads. We hypothesize that the AA stable isotopic compositions of maternal nail keratin will provide insights into maternal diet and health during gestation and lactation, while child nail keratin will reflect growth and the transition from exclusive to mixed breastfeeding. Fingernail samples were collected before and after birth from the mother, and until six to twelve months of age from the child. A detailed survey was used to reconstruct the pair's diet and health. Nail keratin samples were hydrolysed and converted to their N-acetyl methyl esters to obtain  $\delta^{13}\text{CAA}$ . Values of  $\delta^{13}\text{C}$  for essential (E)AAs (phenylalanine (Phe), valine and leucine) are good indicators of dietary components (i.e. protein, lipids, or carbohydrates) as they remain largely unchanged through periods of stress or growth. In particular,  $\delta^{13}\text{CPhe}$  for all individuals (avg.  $-24.36 \pm 1.26\text{‰}$ ) confirm that C3 based foods made up a larger portion of diet. Fluctuations larger than 1‰ in  $\delta^{13}\text{C}$  of non-essential (NE)AAs (glutamate, alanine, and glycine) accompanied by unchanged  $\delta^{13}\text{CEAA}$  indicated physiological stress. Enrichment in  $^{13}\text{C}$  ranging from 1.0 to 3.3‰ in these NEAAs was noted at the time of birth for two of the three pairs. Glycine, considered a conditionally essential AA, displayed the most intra-individual variability. When paired with glutamate, it was most effective in tracking changes in early childhood diet and increasing physiological demands during accelerated growth. Our results highlight the potential of stable isotope analysis of AAs as a valuable proxy for maternal-child diet and health dynamics in archaeological and anthropological research.

San Filippo M (1) and Robson S (1)

With contribution from Fedora E(1), Roksandic M(1), Mihailović D(2), Kapuran A(2), and Đurić M(3)

1. Department of Anthropology, University of Winnipeg
2. Faculty of Philosophy, University of Belgrade
3. Faculty of Medicine, University of Belgrade

### **Trashed or Treasured? The Kozja Cave Child**

In June 2023 a fragmented human child's skull dating to the Copper Age (around 3800 BCE), was excavated in Kozja Cave in Rudna Glava, Eastern Serbia. The skull was recovered within a cache of Bubanj-Salcuta culture pottery fragments which were being recovered from what is believed to be an early copper smelting site. Though a number of burials have previously been uncovered from this cultural group, the circumstances surrounding the Kozja Cave individual make this find unique and intriguing. Using cranial reconstruction, developmental, and morphological analyses, the skull was assessed to determine the individual's age-at-death and observe any pathologies or non-metric traits. This analysis was used in creating the individual's osteobiography which, combined with context of burial, was assessed to determine the circumstances which lead to the skull being found resting within the pottery cache of Kozja cave. We propose that the child was part of a secondary burial belonging to a Bubanj-Salcuta cultural group. These findings are supported by a lack of evidence of post-cranial skeletal elements within the pit, the positioning and preservation of the bones which suggests that they were placed there intentionally, as well as pottery fragments consistent with Bubanj-Salcuta culture which were found above and below the skull. While secondary burials are not uncommon practice for other regional contemporary peoples, they have not previously been observed among the Bubanj-Salcuta cultural complex. Thus, these results make this site the first of its kind for the Salcuta in Serbia.

Sanchez J

Forensic Science Program, University of Toronto Mississauga

### **From lab to life: Integrating a human rights framework to bioarchaeology and forensic anthropology teaching**

Incorporating socially responsive knowledge in the classroom requires students to become educated in the problems of society, experience and understand social issues in the community, and attain skills to act on those problems. Bioarchaeology and forensic anthropology are fields of anthropology that can greatly contribute to several contemporary social issues, but it can often be difficult for students to see the contemporary or broader applications of these two fields. In part, the issue may stem for these fields? history of not explicitly integrating and engaging with social theory. This, however, has been changing with the more recent integration of theoretical frameworks, such as structural violence, intersectionality, queer theory, and necroviolence, in bioarchaeological and forensic anthropological research. While these theoretical paradigms may still come across as abstract and intangible, their real-world applications are more apparent when they are integrated within a human rights framework. This presentation will outline how a human rights framework can be successfully integrated into course design, how it can be used to show students the way theory and practice merge, the ways in which students can actively engage in socially responsive research, and ultimately highlight how, through bioarchaeological and forensic anthropological practices, practitioners can work with and for historically excluded groups and contribute to redress and restorative justice in a myriad of ways.

Schillaci MA(1) and Schroeder L (2)

1 Department of Anthropology, University of Toronto Scarborough

2 Department of Anthropology, University of Toronto Mississauga

### **Exploring the Biological Affiliations of the Enigmatic Sopris Phase Culture of Southeastern Colorado Using Craniometric Variation**

The cultural and biological affiliations of the Sopris Phase (ca. AD 950-1250) culture of the American Southwest remain largely unknown despite more than 50 years of archaeological research. Occupying a geographic region encompassing southeastern Colorado and northeastern New Mexico, this archaeologically defined culture was positioned geographically—and perhaps also culturally—between Plains cultures to the north and east, and Puebloan cultures to the south and west. Previous archaeological research has variously linked the Sopris Phase to Puebloan, Plains Woodland, Plains Village, and even Athabaskan peoples; with each of these possible affiliations having potentially profound implications for regional culture history. The material culture from Sopris Phase archaeological sites has not provided clear answers regarding affiliation with any one of these culture groups. The research presented here examines the biological affiliation of four Sopris Phase individuals, two pre-Sopris Phase individuals, and one Apishapa Phase individual, using a multivariate analysis of craniometric variation. Mahalanobis distances between each of these seven individuals and the centroids of three possible ancestral descendant groups including Northern Caddoan (ancestral Pawnee & Arikara), Puebloan/Tanoan (ancestral Tewa, Towa and Northern Tiwa), and Numic (ancestral Ute, Shoshone, Comanche) were generated using the pooled within-group variance-covariance matrix (vcv), as well as each of the ancestral descendant group vcv matrices. Analyses also included group level biological distances based on the R matrix. The findings of the study were arguably inconclusive, with results indicating that multiple affiliations were possible for several Sopris Phase individuals, while two individuals likely are not affiliated with any of the ancestral descendant groups. Results differed depending on whether the pooled within-group vcv or the ancestral descendant group vcv was used to generate Mahalanobis distances. These inconclusive findings might reflect either the limitations of these craniometric data for elucidating biological relationships, or possibly, the effects of genetic drift.

Schneider M (1), Nelson A (1), Jia S (2), and Reznikov N (2)

1. Department of Anthropology, Western University

2. Department of Biomedical Engineering, McGill University

### **Digital Dissections: Deep Learning Image Segmentation of MicroCT Scans of Ancient Hands.**

CT imaging is increasingly vital in biological anthropology, especially regarding mummified remains, owing to its non-invasive approach and superior skeletal visualization compared to 2D radiographs. However, CT datasets are extensive and require time-consuming analysis to complete “digital dissections” of bone from mummified tissues; deep learning algorithms aid these analyses by categorizing images based on human-identified patterns. MicroCT scans (130kV, 150ua, 82.55µm) of two mummified human hands from ancient Egypt are used to demonstrate the application of deep learning for 3D image segmentation. One hand, severed proximal to the carpals, was purchased in Egypt by collector George Sulman and donated to the Chatham-Kent Museum in 1945. The other hand belongs to Lady Hudson, a mummified female from the Roman Period (30 BC to AD 395) of ancient Egypt. The 3D image files were uploaded into Dragonfly (Version 2022.2). A single supervisor, MS, trained a deep learning neural network to recognize three data classes (bone, mummified tissue/bandages, and background noise) by manually segmenting twenty of the 1922 slices in the Sulman dataset. The now-trained deep learning network was used to segment the remaining slices belonging to the Sulman hand and applied to Lady Hudson’s dataset, performing the three-class segmentation in entirety with no manual intervention. Results from the segmentation allow for excellent visualization of mummified tissues and skeletal feature. For example, the 3D skeletal segmentations revealed significant bone modelling for both hands along the flexor digitorum superficialis insertion points along the middle phalanges. Such bone remodelling can indicate extensive manual labour for both individuals; however, few comments can be definitively made due to the unknown provenance of both individuals. Future research regarding the mummified hands will focus on the bony abnormalities, who’s presence has not been identified in the absence of the streamlined approach of deep learning for segmentation and visualization.

Semma Tamayo A and Spake, L

Department Anthropology, Binghamton University

### **Evaluating the advantages and limitations of gunshot trauma 3D reconstruction from postmortem CT scans**

The interpretation of gunshot wounds to long bones remains a challenge in forensic anthropology. Postmortem computed tomography (CT) provides a new data source for studying gunshot wounds. This study examines the advantages and challenges associated with 3-Dimensional gunshot fracture reconstruction from CT scans. Postmortem CT scans of 33 individuals with gunshot wounds in long bones were selected from the New Mexico Decedent Image Database (NMDID). Images were processed using automated thresholding segmentation protocols to visualize skeletal tissue using 3D Slicer 5.3.0 and InVesalius 3.0. The segmented volumes were imported into Blender 3.6 LTS, which was used for fragment realignment for fracture reconstruction. Observation of traditional gunshot wound characteristics were made to explore the usability of the scans for trauma analysis. When it was possible, fracture reconstruction allowed the observation of defects that would otherwise not be easily observable on raw DICOM scans. 3D fracture realignment was more successful in bones with less fracture comminution to the diaphysis, allowing the realignment and characterization of the fracture type. However, several factors complicated reconstruction, and in some cases rendered it impossible. The presence of artifacts of similar pixel intensity corresponding to projectile fragments embedded in the wound caused image noise overlapping bone trauma. Fractures occurring in the metaphyseal region were complex to segment due to the cortical/trabecular tissue ratio. Additionally, observations of bone surface traits such as beveling, cortical delamination, and edge sharpness, were difficult to record due to loss of bone texture during segmentation. The evaluation of trauma from CT scans in forensic anthropology offers an opportunity to observe different types of fractures in context. Less comminuted fractures provided the best results for 3D fracture realignment, suggesting that fracture observation and reconstruction from CT scans in low energy impacts is a promising area for further research.

Shang Q and Albanese J  
Department of Integrative Biology, University of Windsor

### **The Allocation Accuracies of Using the Tibia in Sex Estimation: Five Measurements Independently and Combinedly**

With increasing research conducted on the utilization of different skeletal elements for sex estimation, considerable attention has been directed towards the long bones. The strength and density of leg bones enhance their likelihood of preservation and increase the probability of discovery by forensic investigators at the crime scene. The tibia, classified as a long bone, exhibits pronounced sexual dimorphism and is an integral component of the lower limb skeletal structure. The present study focused on five measurements of the tibia, and a total of eight analyses were conducted to assess both univariate and multivariate approaches for estimating documented sex. The data used for this research are from the Terry collection (n=324) and the Coimbra collection (n=232). The results showed that the most effective measurement had an overall allocation accuracy of 88% and a 4.8% allocation accuracy difference between male and female. The findings demonstrate that as the number of multivariate measurement variables increases, there is a corresponding improvement in the accuracy and reliability of sex estimation.

Siek TJ  
Department of Anthropology, McMaster University

### **Male Breast Cancer & Paleopathology: A Pilot Study Investigating a Possible Bias in Differential Diagnosis**

Paleopathological research in neoplastic disease is slowly shifting in focus from simply asking if cancer existed in the past, to more nuanced questions regarding prevalence, causative risk factors, and neoplastic typology. In this vein, this pilot study examines the paucity of male breast cancer (MBC) in paleopathology. In the modern clinic, MBC is considered rare as the number of men diagnosed is much lower than women; thus, breast cancer is socially viewed as a “woman’s disease”. This pilot study considers whether this view has been carried over into palaeopathology and asks, when presented with metastatic lesions in the skeleton of a male, was breast cancer considered in the differential diagnosis, and if so, was it rejected and why? A review was undertaken of the CRAB database created by the Paleo-Oncology Research Organization. The inclusion criteria were limited to adult remains who were assessed as biological male or possible male, and who exhibited lesions differentially diagnosed as metastasis. Data collection included publication, demographic, and contextual information, as well as if MBC was considered in the differential diagnosis and if it was rejected, the reasoning or justification as to why. Eighty-five publications from 1932 to 2022 were identified, reporting 78 biological males and seven possible males. Of the 85, MBC was included in the differential diagnosis for 13 cases and rejected each time. In ten cases the diagnosis was rejected based on sex, citing clinical rarity in males, and in five cases rejection was due to lesion type and/or distribution. This pilot study suggests that there may be bias in the diagnosis of metastatic lesions when sex is estimated to be male. It is argued that although MBC is deemed rare in the modern clinic, this should not be the primary reason to discount it from differential diagnosis in paleopathological contexts.

Sierra-Serrano E (1), Reid S (2), and Albanese J (1, 2)  
1. Department of Archaeology, Simon Fraser University  
2. Department of Integrative Biology, University of Windsor

### **Exploring the interplay of biological sex and gender in a late Bronze Age tholos tomb and ossuary in the island of Kefalonia, Greece**

If the estimation of biological sex has an enormous weight into an unknown individual’s biological profile, the exploration of gender as a distinct and valuable indicator is gaining significance. The study of gender in bioarchaeology has a rich history, yet it has traditionally aligned with a binary framework similar to biological sex. Challenging the validity of the binary gender approach will lead to a broader and deeper understanding of

past life. Yet, this approach should not be executed without caution, as our current perceptions of gender and sex are not what they might have been in the past. Within any given group of individuals, skeletal variations consistently demonstrate a continuous spectrum rather than a clear-cut division between two sexes. Moreover, on an individual level, people exhibit a mix of traits, making the categorization of male, female, etc, a subjective choice linked to societal views on normativity. Similarly, when considering gender, bioarchaeologists should scrutinize whether their work inadvertently reinforces the notion of “normal, constant, universal genders,” a concept that does not hold true. Instead, the objects or indicators observed offer fragments of what gender might have represented within specific historical contexts. In this presentation, we will explore the interplay between biological sex and gender through the analysis of skeletal remains from a late Bronze Age tholos tomb and ossuary in Tzannata, on the island of Kefalonia, Greece. In conclusion, reconstructing both gender and biological sex as a complex continuum is crucial for advancing our understanding of past societies in bioarchaeology.

Simpson RML (1), Swanston T (2,3), Coulthard I (4), Varney TL (5), Vignjevic M (3), and Garvie-Lok S (1)

1. Department of Anthropology, University of Alberta

2. Department of Anthropology, Economics, and Political Science, MacEwan University

3. Department of Biological Sciences, MacEwan University

4. Department of Chemistry, University of Western Ontario

5. Department of Anthropology, Lakehead University

### **Lead Exposure in Ancient Corinth and Stymphalos (3rd to 7th c. A.D.): Preliminary Synchrotron X-ray Fluorescence Images and Bone Concentration Results**

This project seeks to explore patterns of lead (Pb) exposure in Late Roman and Early Byzantine populations from Corinth and Stymphalos, Greece, using an individual life history perspective and high-resolution chemical analytical techniques. Textual and material evidence attest to widespread cultural lead use during this period, but direct chemical evidence from the bioarchaeological record is lacking, as is our understanding of how this would have impacted the health of ancient populations. Ancient Corinth was an epicenter of trade, industry, and politics in the Roman East, and the population who buried their dead in nearby Stymphalos represents a rural, agrarian yet culturally-similar contrast to Corinth. We obtained bone and tooth sample pairs from several individuals spanning multiple burial sites from Corinth and Stymphalos and undertook inductively coupled plasma-mass spectrometry (ICP-MS) of bone samples and synchrotron radiation X-ray fluorescence imaging (SR-XFI) of two bone samples and one tooth sample (BioXAS, Canadian Light Source). ICP-MS results demonstrate a clear dichotomy between urban and rural lead exposure: Corinth bone samples ranged from 3.62 to 157.73  $\mu\text{g/g}$  Pb, while Stymphalos bone samples ranged from 0.54 to 40.27  $\mu\text{g/g}$  Pb. However, it is presently unclear the extent to which diagenesis (post-mortem contamination) could be influencing these concentration values. The exploratory SR-XFI scans demonstrate evidence of both diagenetic and biogenic (lifetime) uptake, including evidence of short-term variability in lead uptake during life. During the next phases of the project, we aim to determine enamel lead concentrations and perform SR-XFI on a larger sample set to gain deeper insights into population lead exposure.

Simpson T

University of Alberta

### **Exploring 3D modeling technologies: A practical exercise in rapid prototyping to support forensic facial reconstructions**

A case study is presented detailing the exploration of rapid prototyping to support forensic facial reconstruction. A KONICA MINOLTA Range 7 Non-Contact 3D Digitizer was used to digitize the fragmented and burned remains of an unidentified person. Scans were edited using the Rangeviewer software and the images were converted into a printable mesh using the Geomagic Design X program. Using PrusaControl software and an Original PRUSA i3 MK3 printer, a 3D analog of the damaged cranium was successfully printed and used as a base to support a forensic clay-based 3D reconstruction. This presentation will review lessons learned during this

process, present limitations of the technology, and identify areas of research needed to support forensic facial reconstructions.

Stead SM and Teichroeb JA

Department of Anthropology, University of Toronto Scarborough

### **Impacts of the social environment on infant development in Rwenzori Angolan colobus monkeys**

A range of factors have been shown to affect infant growth and development in mammals, including predation and infanticide risk, food availability, and allomaternal care. In this study, we sought to determine what factors affect the rate at which Rwenzori Angolan colobus (*Colobus angolensis ruwenzorii*) infants achieve physical independence from their mothers. Angolan colobus monkeys are arboreal and thus developing infants must learn to move safely among tree branches. Until then, infants are handled (held or carried) by their mothers and sometimes other group members (allomothers). To determine physical independence, we collected 15-minute scans (n=2365) and noted whether the infant was being handled and by whom (mother or allomother). For each day of data collection (n=144), we calculated the proportion of scans that an infant was independent (not handled). We assessed whether core unit characteristics (size, number of adult males) and allomaternal care had an impact on infant independence, as well as infant age and sex. Only infant age ( $\beta=0.41396\pm0.03418$ ,  $p<2e-16$ ) and number of males in a core unit ( $\beta=-3.91970\pm1.88701$ ,  $p=0.0378$ , range=1-5 males) significantly predicted infant independence. Controlling for age, infants living in units with a greater number of males were less likely to be independent. Though infanticide has never been observed in this species, it has been suspected on several occasions. In other species of black-and-white colobus, a greater number of males in a social group leads to a greater risk of infanticide. If the same is true for Rwenzori Angolan colobus, it could explain why infants in core units with more males achieve physical independence more slowly: handling by mothers or allomothers provides protection from a potential infanticidal attack. More research is needed to determine (1) whether infants or handlers are primarily driving this trend and (2) whether variation in infant dependency has any long-term fitness impacts.

Strickland E and Liston M

Anthropology Department, University of Waterloo

### **Childhood health and identity in the Byzantine: A paleopathological analysis of juveniles from Thebes, Greece**

In bioarchaeology, children are critical to understanding the health experiences of past populations. As dependents in their early years, and subject to continuous physiological, social, and environmental changes as they age, juveniles are particularly vulnerable to injury, stress, and illness. Limited publications address juvenile health, identity, and experience in Byzantine Thebes, Greece presenting a need for child-centered skeletal research to fill this gap. Repurposed into a cemetery in the early Byzantine period, the former Sanctuary of Apollo in Thebes revealed high rates of leprosy, cancers, and other pathologies across the adult skeletal sample. It is hypothesized that this cemetery may have been reserved for sick individuals, due to its proximity to the early Christian church of St. Luke the Evangelist. In antiquity, Luke was considered to be a physician, potentially making this a place of pilgrimage for those suffering ailments. This study investigates this hypothesis as it relates to juvenile skeletal material recovered from the Byzantine period burials. Fifty-nine juveniles were studied, of which sixteen (27%) presented with evidence of skeletal and/or dental pathologies. Through the process of differential diagnosis, juvenile leprosy, metabolic diseases, infections, and dental pathologies were found to dominate the sample. Drawing on sources from antiquity, this research explores why children also may have been interred in this cemetery. Additionally, this research addresses cultural, social, and environmental factors shaping childhood health and identity in the Byzantine period.

ten Bruggencate R, Meloche C, Gamble J, and Holmes G  
Department of Anthropology, University of Manitoba

### **Moving Toward Respectful Care Practices: A Census of the Ancestors at the Anthropology Laboratories, University of Manitoba**

The Department of Anthropology at the University of Manitoba (UM) is currently engaged in an active Ceremony of Rematriation and Repatriation of Indigenous Ancestors housed in its laboratory facilities. This Ceremony has been guided by a Council of Indigenous Elders, Grandmothers, Grandfathers, and Knowledge Keepers, who have emphasized the need to proceed with respect and care in identifying the Ancestors housed at UM to ensure they are returned to their relatives. Here, we discuss a critical first step in this Ceremony: collecting information about Ancestors in our care to support meaningful consultation with Indigenous descendant communities. This includes basic MNI and site location data, as well as narrative information about burial sites and the ways in which Ancestors arrived at the University. This information was collected from archives housed in the UM Department of Anthropology, provincial archaeological records, conversations with former department members, and published and unpublished sources. Information about the Ancestors and their burial belongings was checked through a direct census and recorded in a standardized format. Narrative information was compiled into a plain-English description for each site represented by Ancestors in our care, and then associated with site location data in an interactive map. As we move forward with the proactive Rematriation and Repatriation Ceremony at UM, the information gathered during the census process will be provided to community partners during consultations. We will also discuss how the Ceremony's framework of respectful care informed census work with other groups of people housed at UM. It is our hope that what we've been taught through this Ceremony will be helpful for biological anthropologists engaged in community-led repatriation at other institutions.

Tran CNH (1,2), Del Giacco L (1,2), Cardoso H (1,2), and Yang D (1,2)

1. Department of Archaeology, Simon Fraser University
2. Centre for Forensic Research, Simon Fraser University

### **Minimally destructive and non-invasive approaches in ancient human and forensic DNA analysis**

As genetic research continues evolving and the value of such information is increasingly recognized, interest in ancient and forensic DNA has rapidly grown. With ancient human and forensic DNA, methods that involve utilizing skeletal or dental materials are often applied to optimize DNA recovery. This raises concerns regarding the ethics of destructive sampling as invasive approaches may be unwelcomed. From a forensic perspective, invasive techniques cause distress and disturbance to the decedent's family and/or their community. In an archaeological context, invasive techniques compromise the integrity of human remains for long term preservation and curation. We argue that, when considering invasive methods, it is imperative to balance the value gained from genetic information with ethical concerns and strive to minimize any destructive sampling. When working with DNA, consent as well as effective community consultation and engagement are key to developing a respectful strategy for bone sampling and data storage. Based on our own research and a review of the literature, we propose the use of practical sampling strategies that minimize the invasiveness of DNA analysis by: (1) targeting small skeletal elements that are numerous; (2) selecting dental materials over skeletal elements; (3) using the most efficient DNA extraction methods that require only trace amounts of bone materials; (4) employing sampling methods that minimally alter bone structure and surfaces; and (5) exploring alternative sources of genetic materials, such as sedimentary DNA that has leached from human remains. With this presentation, we are creating a space for open dialogue and we encourage ongoing conversations as the fields of ancient and forensic DNA continue to grow and garner more interest.



Voegt CM (1), Gibbon VE (1), Dinkele E (1), Galloway T (2)

1. Department of Human Biology, University of Cape Town

2. Department of Anthropology, University of Toronto Mississauga

### **Mortality due to gendered violence and life stage vulnerability in South Africa.**

Injury mortality is a significant public health concern in South Africa, with previous research providing a snapshot of the gender and age mortality patterns. However, the role of sociocultural, economic and structural forces in shaping these violent and accidental deaths is relatively unexplored. To understand the ways that gender and life stage are conceptualised and discussed in forensic-based research and whether these patterns are indicative of disparities and inequalities, a thematic analysis approach was employed. This study utilised a mixed methods approach and observed alarming violent death rates against men and boys, where male deaths outnumbered female deaths for all causes-of-death. In quantitative analyses, men faced a fourfold higher homicidal rate than women. Additionally, the highest death rate occurred during early adulthood (20-34 years). These findings were mirrored by qualitative analyses where gendered violence and life-stage vulnerability were identified themes. Gendered violence was identified as a pivotal cause of injury mortality among both men and women. This finding was in keeping with the global epidemic of violence against women and children, however, relatively unexplored in understanding violence against men and boys. While young adults appeared to be most at risk, unique challenges that amplify the risk of injury mortality within life stages were identified as contributors to a heightened risk of violence. This thematic analysis uncovered the complex, interconnected network and nuanced dynamics that underpin the susceptibility to injury and perpetuation of risk across different genders and ages. These themes illustrated how power imbalances, social norms, inequities, and depictions of masculinity contribute to gendered violence. Whereas developmental processes and pressures perpetuate violence during the life stages. The findings presented may be used to inform interventions that can assist in reducing the disproportionately high injury mortality rates in South Africa.

Walker-Bolton A, Ralison D, and Milliassse R

Red Book Challenge Conservation Education Madagascar

### **Protecting Lemurs through Education: Field trips with youth in Fort Dauphin**

In the summer of 2023 we conducted meetings with young people ages three to twenty-three in Fort Dauphin, Madagascar, culminating in two field trips to see lemurs in the wild for twenty-four participants at Nahampoana Reserve. This work was funded by the International Conservation Fund of Canada. Our aim was to answer the question “Do young people in Fort Dauphin remember more true and detailed facts about a nature reserve when they participate in a presentation and field trip rather than a presentation only?”; we predicted that they would. The purpose of this question was to determine the value of the field trips that we were offering to young people in Fort Dauphin and whether the field trips achieved our goal of educating the young participants on conservation of Madagascar’s plants and animals. Our surveys used a variety of data collection methods including drawing analysis. Our results show that A) when posed with the question “do you believe it is important to protect nature?” 58% strongly agreed with the statement from the presentation only, and 100% strongly agreed from the field trip and presentation B) A greater number of participants answered questions on the lemurs present at the reserve correctly when they had participated in a presentation only than those who participated in the field trip C) A greater number of participants created drawings that were more specific when they had participated in the field trip. Upon analysis after the study, we had the additional outcome of assessing our survey methods, resulting in several ideas for improvement. These include 1) keeping the ages of the participants in the control group consistent with the study group 2) giving the interpreter a script to read when explaining the survey 3) having input from participants on how to design the survey.

Ward A (1), Nakahodo N (1), Woodley K (1), Watson Jiménez L (2), Fuentes S (3), Pozzi-Escot D (3), Williams J (4), and Nelson A (1)

1) Department of Anthropology, Western University

2) University Wrocław, Poland

3) Museo Pachacamac, Perú

### **In society's shadow: Structural violence at Pachacamac, Perú**

The concept of structural violence is a useful analytical framework as it highlights the mechanisms of harm embedded in mundane social structures. However, because it has only had limited use outside of Euro-American, capitalist-style political economic contexts, the true efficacy of the framework is unclear. This paper presents the analysis of evidence for structural violence in 63 individuals (36 adults, 27 nonadults) from the Late Intermediate to Late Horizon Periods (12th to 15th century CE) buried outside the sanctuary walls of Pachacamac, Perú. Contextual evidence was gathered from the Spanish Chronicles, ethnographic research and archaeological data. Analysis included nonspecific stress markers, dental conditions, osteoarthritis and physical trauma, as they related to age and or sex, as well as the lethality of the trauma. There was no evidence of resource-based structural violence amongst the burial community, but a pattern of blunt force trauma to the posterior cranium indicates that there was a form of structural violence present in this community. Reflecting on this study, the usefulness of structural violence as an analytical framework is highly contingent of the quality of the contextual data as overly coarse information can impede the ability to draw connections between the harm and the underlying social structure, i.e., the framework may be of limited employ in communities where contextualising evidence is limited. Despite this, using the framework highlights the importance of a broader perspective on violence, particularly in that space where physical and structural violence are inextricable.

Wei X, Loundagin LL, and Cooper DML

Department of Anatomy, Physiology and Pharmacology, University of Saskatchewan

### **3D morphological analysis of human cortical bone remodeling spaces using micro-CT data**

Microscopic investigation of bone internal turnover is an important tool for biological anthropologists to understand human health, disease and adaptation across space and time. Currently, studying cortical bone remodeling in humans is only possible *ex vivo*, and remodeling spaces are commonly examined in cross-section which cannot capture the 3-dimensional complexity or multiple phases of the remodeling process that may vary with age. The purpose of this study was to investigate the 3D morphology of remodeling spaces in human cortical bone across multiple decades. Sections of the anterior femoral mid-shaft from 33 males and 22 females aged 20-86 were scanned using micro-CT and 162 remodeling spaces exhibiting typical morphology were isolated. A radial profile representing the averaged 3D remodeling space was created and a custom Matlab script defined the zones of remodeling, namely, resorption, reversal and formation. The length and area of the formation and resorption zones, and the maximum radius had a weak negative correlation with age. However, there was no relationship between age and net resorption, estimated by either the ratio of resorption to formation radii or the ratio of net resorption to formation area. These results indicate that older individuals may have smaller remodeling spaces but the balance between resorption and formation per remodeling event may be relatively consistent with age. Interestingly, we did not observe age-related differences in reversal zone length or area, seemingly contradicting the notion that an extended reversal phase contributes to the age-related increase in cortical porosity, but this may differ if atypical remodeling spaces were included. Indeed, we observed great variation in the size, shape and inter-connectivity of remodeling spaces such that comparing typical and atypical remodeling events is a logical future step, highlighting the potential of 3D analysis to provide a more holistic understanding of human bone remodeling dynamics in biocultural contexts.

### **Intangible Dimensions: Translating Anthropometric Measurements for Living People for Use with Computed Tomography (CT) Scans of Deceased Individuals**

In the wake of the Covid-19 pandemic, virtual methods have become increasingly valuable. Even before public health measures required many researchers to shift how we thought about safe and ethical data collection, anthropologists had been developing respectful methods for studying human phenotypic diversity including virtual methods that are non-invasive and/or avoid removing human biological materials from their communities of origin or institutions of preservation. However, applying anthropometric standards typically used to study living people to study phenotypic diversity in a virtual context presents certain methodological challenges. These challenges include: 1) the inability to reposition body portions as one could in living people or tangible skeletal remains; 2) the inability to take curved measurements in common CT analysis software programs like Avizo. Since scans are often initially positioned for medical purposes, which may diverge from anthropometric methods, solutions to these challenges proposed in the clinical literature are often not applicable to anthropological research questions. This poster presents solutions used to address these challenges in a current project using the New Mexico Descendent Image Database—a large online database of recently deceased individuals from medicolegal contexts—to study variation in common anthropometric measurements across different psychosocial stress contexts using Avizo. The first challenge outlined above is addressed using a combination of database measurements recorded directly from cadavers, rearranging common equations for calculating anthropometrics to solve for unknowns, and using multiple views to properly position measurements. The second issue is solved by reorienting scans to take cross-sections at the location and orientation of the desired metric, creating a scale, then exporting these images to Fiji for measurement. Thus, while anthropometrics can be difficult in virtual settings, they can be undertaken. These methodological adaptations allow for the anthropometric analysis of virtual cadavers in a comparable manner to standard anthropometric methods for living people.

Williams JS (1), Nelson AJ (2), Watson L (3), Fuentes S (4), and Pozzi-Escot D (4)

1. Anthropology, Trent University
2. Anthropology, Western University
3. Archaeology, University of Wrocław, Poland
4. Museo Pachacamac, Lurín, Perú

### **Investigating inter- and intra- individual variation in short term diet using hair from mummy bundles at Pachacamac, Peru.**

Pachacamac is a large, monumental, administrative and pilgrimage center on the central coast of Peru that served as the capital of the Yschma culture prior to the Inca conquest ca. 1470 A.D. The significance of this site as a pilgrimage center during the Inca Period is well understood, but its role as focus for peregrination in earlier periods is not well understood. In 2015, a large Late Intermediate Period cemetery (1100 A.D.-1470 A.D.) was discovered during the construction of a new national museum (MUNA), and in 2019 the Mummies as Microcosms Project began working with Museo Pachacamac to undertake a paleoradiographic and bioarchaeological survey of the collection of mummy bundles from the MUNA cemetery. In concert with these analyses, hair was opportunistically sampled from 38 mummy bundles and analyzed for the stable isotopes of C and N to investigate short term diet prior to the Inca conquest of the site. Preliminary data from eleven individuals showed limited variation. When incremental  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  are compared within an individual hair shaft (i.e., monthly diet), values are virtually identical from month to month for 8/9 individuals. One individual (with the longest hair shaft) showed considerable variability in incremental  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$ ; this could reflect seasonal variation in diet or movement. In contrast, a comparison of the average/bulk  $\delta^{13}\text{C}$  and  $\delta^{15}\text{N}$  for all eleven individuals, demonstrates inter- individual variation. This suggests that diet, although mostly constant from month to month, was not the same for all individuals. Cultural factors like movement or physiological differences like breastfeeding or pathology could also explain this variation. This analysis provides important data to test for the presence of

pilgrims in this cemetery and to provide baseline data for diet prior to the Inca conquest of Pachacamac and the central coast more broadly.

Wollmann-Reynolds JS, Stacey E, Peterson N, Al-Zayadi C, Viola B, and Cameron ME  
Department of Anthropology, University of Toronto

### **The rotational profile of the lower limb in horseback riders, agriculturalists, and industrial individuals.**

The rotational profile of the lower limb includes femoral torsion, tibial torsion, and talar neck angle (TNA), which collectively affect the mobility of the hips, rotation of the knees, and angle of the foot during walking and standing. All three measures are likely developmentally plastic. Generally, femoral torsion is understood to decrease while tibial torsion is thought to increase with higher muscular activity. TNA is hypothesized to increase with greater compressive forces. Despite this broad understanding, little research has explored how specific activities affect these three angles, or how the rotational profile might relate to more common lines of evidence for inferring behaviours, like cross-sectional properties (CSP). Here, we examine how the rotational profile of the lower limb varies between Avar horseback riders (n=42), Early Bronze Age (n=36) and Early Middle Age (n=22) agriculturalists from eastern Austria, and industrial era individuals (n=45) from Canada. Lower femoral and tibial torsion was expected in Avar horseback riders due to increased activity in the hip abductors and greater external rotation at the hip and ankle. Higher TNA was expected in Early Bronze Age individuals due to greater compressive forces at the ankle. All variables in the rotational profile and CSPs were derived from whole-bone 3D models. Differences between groups were assessed using ANOVA and post hoc Tukey's pairwise tests. Relationships between femoral and tibial torsion and CSPs were evaluated with Pearson's correlations. There were significant differences in femoral and tibial torsion between the groups, which was driven by higher average torsion in both the femur and tibia in the Early Bronze Age compared to all other groups. There were no significant differences in TNA. There were some correlations between femoral torsion and CSP, but none in the tibia. Future studies will explore these relationships in living elite athletes with known patterns of loading

Woodley K (1), Nelson AJ (1), Watson L (2), Williams J (3), Fuentes S (4), and Pozzi-Escot D (4)

1. Department of Anthropology, Western University
2. University of Wroclaw, Poland
3. Department of Anthropology, Trent University
4. Museo Pachacamac, Peru

### **Living With Physical Disability in the Late Intermediate Period of Peru: A Bioarchaeology of Care Case Study**

The aim of this project is to explore and understand the lived experience of a mummified individual with a functional disability, who lived along the central coast of Peru during the Late Intermediate Period (AD 1100-1470). The individual was excavated in 2015 from Pachacamac, Peru, which was a major ceremonial center and pilgrimage destination for Andean cultures. The individual in this case study is a middle adult male dated to cal. AD 1433(+/- 15). X-ray, CT scans, and radiocarbon dates of this individual were taken as a part of the Mummies as Microcosms project, which I am using for my M.A. thesis research into bioarchaeology of care analyses. The bioarchaeology of care framework combines paleopathological analysis, biomedical research, archaeological context, and understanding of the traditional lifeways to fully understand the lived experience of this individual. The assessment of the CT scan revealed indicators of functional disability, such as numerous vertebral compression fractures and the near complete fusion of three continuous vertebrae, alongside a healed compression fracture of the left humerus and multiple lesions at sites of joint articulation. This case study will create a narrative of care for the individual with physical disability in relation to the differential diagnoses and how they impacted the individual (e.g. symptoms, skeletal manifestations, functional limitations). Ultimately, this research will contribute to a more holistic, biocultural understanding of life along the central coast of Peru during the Late Intermediate Period.

Young J  
Canadian Museum of History

### **Forensic Anthropology and the Arctic: Unique Challenges and Approaches**

Human remains found in the Territory of Nunavut pose unique problems for analysis and reporting. Isolated location of finds, abundant archaeological burial sites, dated biological standards, limited contextual information, and undocumented taphonomic processes and variables all contribute to challenging interpretive scenarios. Developing innovative ways to approach each case has proven useful but there is still a long way to go. This paper will discuss forensic anthropology in Nunavut, the challenges and possible innovative ways to improve interpretive outcomes and positive contributions.