Palaeoanthropological Society of Canada
Société canadienne de paléoanthropologie

PASC-SCPA2023 e-conference

The program is in *Central Standard Time* to accommodate both East and West coast participants and our presenters from abroad.

The conference begins at 10:00 AM sharp, times are given in a 24 hour clock to avoid confusion.

Program overview, abstracts are below in alphabetical order.

THURSDAY JANUARY 19

10:00 – 10:15 AM
Opening remarks

10:20 – 11:00
INVITED KEYNOTE
Tracy Kivell
Inside and outside: Evolution of hominin behaviour from the study of internal bone structure, biomechanics and living apes

11:00 – 11:20
Benjamin Collins, Amy Hatton, April Nowell, & Christopher Ames
Small Beads, Big Connections: The Ostrich Eggshell and Gastropod Shell Beads from Grassridge Rockshelter, South Africa

11:20 – 11:40
Anneliese Eber, E. Grace Veatch, E. Wahyu Saptomo, Thomas Sutikna, & Matthew W. Tocheri
2D Geometric Morphometric Analysis of Murine Mandibular Toothrows from Liang Bua (Flores, Indonesia)

11:40 – 12:00
Mary T. Silcox, Keegan R. Selig, Thomas E. Williamson, & Michael A. Schillaci
A new genus and species of notharctine (Adapoidea, Primates) from the early Eocene of the San Juan Basin, New Mexico

12:00 – 13:00 Lunch break

13:00 – 13:20
Elizabeth Grace Veatch, I Made Agus Julianto, Thomas Sutikna, & Matthew W. Tocheri
The effects of avian and human predation on small mammal taphonomy and zooarchaeology

13:20 – 13:30
Michelle Cameron
Update on investigations using spatial approaches in Holocene Southern African bioarchaeology

13:30 – 13:40
Michelle S.M. Drapeau & Sarah Borgel
The effect of mechanical loads on human bone remodeling

13:40 – 14:00
*Bacara Spruit, Jerome Reynard, Benjamin Collins, Michael Buckley, & Christopher Ames
Using fauna identified by ZooMS and stable carbon and nitrogen isotopes to infer the palaeoenvironment at Grassridge Rockshelter, Eastern Cape, South Africa during the late Pleistocene to mid-Holocene

14:00 – 14:20
Coffee Break

14:20 – 14:40
*Michael Duncan & Matthew W. Tocheri
The relatively large face of *Homo floresiensis* and its implications for hominin evolution

14:40 – 15:00
Nico Alamsyah, I Made Agus Julianto, Sam C. Lin, & Matthew W. Tocheri
Liang Panas: A new late Pleistocene archaeological site on the Indonesian island of Flores?

15:00 - 15:10
I Made Agus Julianto, Sekar Rizqy, Amalia Ramadhani, & Matthew W. Tocheri
Using taphonomic evidence to support interpretations of shellfish consumption by hominins

15:10 - 15:20
*Sarah E. Friesen, Ryan P. Knigge, & Matthew W. Tocheri
A review of the comparative locomotor behaviour of bonobos and chimpanzees

FRIDAY JANUARY 20

10:00 – 10:20 AM
Kimberly Plomp, Kanna Gnanalingham, Daniel Lewis, Laura Buck, & Mark Collard
Possible Evolutionary Origins of the Chiari Malformation

10:20 – 10:40
Sam C. Lin, E. Grace Veatch, Nico Alamsyah, I Made Agus Julianto, Thomas Sutikna, & Matthew W. Tocheri
Exploring patterns of faunal and lithic discard at Liang Bua (Flores, Indonesia)

10:40 – 11:00
Predrag Radović
Testing efficiency of different 2D geometric morphometric approaches in taxonomic identification of hominin upper first molars (M1)

11:00 – 11:20 Coffee break

11:20 – 11:40
Andrea Lukova, Christopher J. Dunmore, Tracy L. Kivell, & Matthew M. Skinner
Trabecular distribution of distal femur in extant apes

11:40 – 11:50
*Joshua Lindal, Kimberly Plomp, & Ross Barnett
Networking and Science Outreach Through Podcasting: Lessons and Experiences from *Screens of the Stone Age"*

11:50 – 12:00
` Mark Collard, Marina Elliott, Briggs Buchanan, & Jon Driver West
A systematic search for evidence of the earliest Americans in the caves of the Western Cordillera of North America

12:00 – 13:00 Lunch break

13:00 – 13:20
*Caitlin Craig, Benjamin Collins, April Nowell, & Christopher J. H. Ames
Taphonomic Considerations of Coloured Ostrich Eggshell Bead Assemblages

13:20 – 13:40
April Nowell
The Stories We Tell: Children, oral storytelling, and knowledge transmission in the European Upper Paleolithic

13:40 – 14:00

Mirjana Roksandic, Predrag Radović, & Joshua Lindal
Chibanian hominin record at the gate of Europe: When they meet they mate.

14:00 – 14:30 Posters and coffee

*Luca Del Giacco & Lauren Schroeder
Does early *Homo* dental variation follow a neutral pattern of divergence?
*Olivia Laureijs, Caley M. Orr, & Matthew W. Tocheri
A new partial trapezoid of *Homo floresiensis*
*Jessica Zachariasz, Thomas C. Prang, & Matthew W. Tocheri
Three-dimensional geometric analysis of intermediate cuneiform shape in extant humans and great apes

14:30 – 15:30

Business meeting

ABSTRACTS

Liang Panas: A new late Pleistocene archaeological site on the Indonesian island of Flores?

Alamsyah, Nico[1], Julianto, I Made Agus[2], Lin, Sam C.[3,4], & Tocheri, Matthew W.[2,5,4]

[1] Pusat Riset Arkeometri, Badan Riset dan Inovasi Nasional, Jakarta, Indonesia
[2] Department of Anthropology, Lakehead University, Thunder Bay, Ontario, Canada
[3] Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Wollongong, New South Wales, Australia
[4] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong, Wollongong, New South Wales, Australia
[5] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington DC, USA

Liang Bua and a recently discovered site within the So'a Basin are the only documented Late Pleistocene sites on the Indonesian island of Flores. Although there are many Holocene archaeological sites, most of these have not been excavated or investigated extensively. One of these, Liang Panas, is a rockshelter located ~40 meters above sea level in the western part of the island. It was first excavated in the 1950s by Theodore Verhoeven and later, in 2006, by a group of Indonesian archaeologists led by Wahyu Saptomo. As part of a larger strategy to re-investigate previously excavated sites on Flores, eight tooth, five shell, and seven bone samples recovered from between 0–3 meters depth in 2006 were selected for AMS dating. Seven (three pig and four porcupine) of the teeth from 35–55 cm depth yielded ages ranging between 1,158 and 1,886 radiocarbon years before present (y BP) while one pig molar from 55–65 cm was 4,800 y BP. Three of the shells were too mineralized to be dated but one each from 135–145 cm and 145–155 cm depth yielded ages of 9,214 and 9,592 y BP, respectively. Three of the bones were less than 200 y BP and three had insufficient collagen preservation (all rat). However, a partially burnt modern human manual intermediate phalanx yielded an age of 17,504 y BP. Together, these results indicate that Liang Panas unexpectedly preserves late Pleistocene deposits ~1.5 meters beneath the present ground surface.

Update on investigations using spatial approaches in Holocene Southern African bioarchaeology

Cameron, Michelle[1]

[1] Department of Anthropology; University of Toronto

This presentation will provide an update regarding a research project investigating Holocene Southern African Ancestral KhoeSan skeletal variation by integrating bioarchaeology, landscape approaches, and palaeoenvironmental research. Evolutionary anthropologists often investigate how environmental variation contributes to human diversity. Skeletal traits may be compared among groups from different regions to determine if specific environmental conditions are associated with certain skeletal properties. For example, among Holocene Southern African LSA groups, some individuals have stable light isotopic properties indicative of marine resource exploitation, and most individuals have lower limb bone biomechanical properties indicative of highly mobile lifeways. These variables relating to diet and terrestrial mobility have been compared between different Southern African regions, particularly along the southern and western Cape coasts. However, such regional analyses may mask the important influence of local factors, such as distances to key resources, like rich marine resources, or terrain complexity. This roject is using spatial analyses to assess how skeletal variation is distributed across the Southern African

Cape coast to determine the contribution of environmental variables, such as terrain or coastal access. Biomechanical variables indicative of high terrestrial mobility and stable light isotope values associated with highly marine diets are unevenly distributed across the Cape coast. These distributions are not necessarily clustered in previously analysed regions defined based on biome classifications. Current work seeks to further clarify how site-specific or local environmental factors may have affected the diets, physical behaviours, and consequently skeletal traits of these individuals.

CAVEWEST: A systematic search for evidence of the earliest Americans in the caves of the Western Cordillera of North America

Collard, Mark[1], Elliott, Marina[2], Buchanan, Briggs[3], & Driver, Jon[1]

[1] Department of Archaeology, Simon Fraser University, Canada.
[2] Department of Anthropology, Mount Royal University, Canada.
[3] Department of Anthropology, University of Tulsa, USA.

As one of the last chapters in our species' 'Out of Africa' migration, the expansion of *Homo sapiens* into the Americas is one of the most important events in prehistory. However, it remains poorly understood. The main reason for this is the paucity of well-dated stratified early sites. The most famous early North American culture, Clovis, illustrates this problem. While thousands of Clovis points have been recovered as surface finds, there are fewer than 20 well-dated Clovis sites.

The caves and rock shelters of the Western Cordillera are an obvious place to look for new evidence to shed light on the initial settlement of the Americas. But, unfortunately, the caves of the mountain chain system are not well documented. Although there are some famous sites, basic data on most other caves, as well as on the type and significance of the archaeological, paleontological, and paleoenvironmental evidence they contain, are inadequate. There is not even a rough total of how many caves have been discovered.

A US-Canadian collaboration, CAVEWEST has two main aims. The first is to create a comprehensive database of published data pertaining to caves and rock shelters in the US and Canadian sections of the Western Cordillera. The second goal of CAVEWEST is to combine the database with a recently developed predictive software program called the Locally Adaptive Model of Archaeological Potential to identify caves that have yet to be investigated in detail by archaeologists but have a high probability of containing evidence of early human occupation.

Small Beads, Big Connections: The Ostrich Eggshell and Gastropod Shell Beads from Grassridge Rockshelter, South Africa

Collins, Benjamin[1,2], Hatton, Amy[2,3], Nowell, April[4], & Amese, Christopher[4]

[1] Department of Anthropology, University of Manitoba;
[2] Human Evolution Research Institute and Department of Archaeology, University of Cape Town;
[3] Extreme Events Research Group, Max Planck Institutes for Science of Human History, Chemical Ecology and Biogeochemistry;

[4] Department of Anthropology, University of Victoria; e School of Earth, Atmospheric and Life Sciences, University of Wollongong

Ostrich eggshell (OES) and gastropod shell beads and ornaments are argued to have been used and worn by past peoples to reflect relationality, both within and between different communities. In this respect, these artefacts are argued to reflect proxies for estimating the nature and extent of social networks in southern Africa over the past 50,000 years, through both stylistic choices and demonstrable travel of these artefacts over long distance. However, the social and cultural contexts in which these items were produced have not received the same depth of consideration. Here we discuss the OES bead and gastropod shell bead and ornament assemblages from Grassridge Rockshelter, and comment on their importance for understanding the extent and nature of social networks during Marine Isotope Stage 1. Specifically, we discuss the potential of Grassridge as an OES bead production site, and more broadly the importance of OES bead production for developing and maintaining vibrant social landscapes. The modified gastropod assemblage at Grassridge provides direct evidence of interior-coastal connections, and we comment on potential pathways that past groups may have used to traverse these locales. In this respect, the OES and gastropod beads and ornaments provide complementary information and provide partial insights into the dynamic nature of social relationship in this region of southern Africa during this period.

Taphonomic Considerations of Coloured Ostrich Eggshell Bead Assemblages

Craig, Caitlin[1], Collins, Benjamin[2,3], Nowell, April[1], & Ames, Christopher J. H.[1,4]

[1] Department of Anthropology, University of Victoria
[2] Department of Anthropology, University of Manitoba
[3] Department of Archaeology and Human Evolution Research Institute, University of Cape Town
[4] School of Earth, Atmospheric and Life Sciences, University of Wollongong

Ostrich eggshell (OES) beads in the archaeological record often display considerable colour variation, which has been demonstrated through experimental work to result from exposure to different temperatures. However, few studies have investigated whether OES colouration was a deliberate choice made by past bead makers or a taphonomic phenomenon linked to accidental post-depositional heating. This presentation will discuss the results of two experimental studies that investigate the effects of heat-treatment on OES bead production and use. These experiments tested whether different levels of heating and therefore different colours of OES impacted the bead manufacturing process, as well as the functionality of intentionally coloured OES beads. The experiments also investigated whether the heat-treatment process affects the nature of simulated abrasive wear on finished OES beads. Results demonstrate that heat-treatment negatively affects both the bead manufacturing process and the usability of finished OES beads, and that producing a specific colour in a wood burning fire is difficult. Additionally, abrasive wear becomes noticeably darker in beads that were heat-treated after the simulated abrasion, compared to beads that were first heated and then abraded. From these observations, we suggest that colour variation in OES bead assemblages is taphonomic rather than anthropogenic, and that usewear characteristics may be a promising feature to discern whether OES beads were heated before or after being worn or used.

Does early *Homo* dental variation follow a neutral pattern of divergence?

Del Giacco, Luca[1] & Schroeder, Lauren[1,2]

[1] Department of Anthropology; University of Toronto Mississauga
[2] Human Evolution Research Institute, University of Cape Town

The fragmentary early *Homo* fossil record represents a temporally expansive and complex lineage that is morphologically and geographically diverse. This large amount of variation, which also captures the transition period from *Australopithecus* to *Homo*, has been the focus of a number of studies that have attempted to tease apart taxonomic relationships among specimens, however, results have been ambiguous. More recently, several craniomandibular studies have focused instead on reconstructing the evolutionary processes that produced this diversity, showing that much of it is consistent with non-adaptive evolutionary processes, providing an added level of complexity to how our lineage evolved and diversified. Here, we add to this body of work by applying methods developed from evolutionary quantitative genetics to assess whether genetic drift or natural selection was responsible for the observed diversification in early *Homo* dental remains. Utilizing previously published standard dental measurements of *Homo* fossil specimens dated between 2.8 and 1.5 million years (Ma), we found that mandibular dental variation does not deviate from a model of genetic drift across regions (southern Africa, southeast Africa, east Africa, northeast Africa, Dmanisi), or across time periods (2.8-2.3 Ma, 2.29-1.8 Ma, 1.79-1.5 Ma). In contrast, the null hypothesis of genetic drift was rejected for maxillary dental remains, specifically between some of the earliest *Homo* specimens and later *Homo*, and comparisons involving the Dmanisi hominins. The latter illustrates that adaptation, probably dietary, was an important factor in the earliest migrations of *Homo* out of Africa, and the former indicates an interesting pattern of selection between time periods in early *Homo*, possibly representative of different species. Finally, the contrasting pattern seen between mandibular and maxillary remains is consistent with studies indicating that morphological integration is stronger in mandibular dentition, and thus a potential constraint on the effect of diversifying selection.

The effect of mechanical loads on human bone remodeling

Drapeau, Michelle S.M.[1] & Borgel, Sarah[1]

[1] Laboratoire de paléoanthropologie, Département d'anthropologie, Université de Montréal

Bone Haversian remodeling (HR) has been used to compare life history parameters in various extant and fossil taxa. Because it has been shown to respond to load by targeting areas that incur microdamage, it has also been explored as a mean to infer variation in mobility or activity levels in animals, but more rarely in humans. Robling and Stout (2003) observed that there is greater remodeling in bones that have larger than expected cross-sectional parameters, thus concluding that HR and modeling are positively correlated with activity levels.

Surprisingly, no other studies have pursued exploration of HR as a mean to infer variation in activity and mobility in human populations, likely because of the difficulty of controlling for all the confounding factors that are known to affect HR (e.g., hormonal level, sex, metabolic rate, age). To that end, we decided to test for the correlation of bone modeling and HR by comparing the right and left metacarpal of two different archaeological populations. Since humans tend to use their upper limbs asymmetrically, we

hypothesized that right-left asymmetry of cross-sectional parameters would be positively correlated with asymmetry of HR.

Against expectations, we found that modeling asymmetry was negatively correlated with HR, with the smaller side showing more remodeling events. These results raise questions about the relationship between modeling and remodeling and underscore that too little is known about how HR responds to loads, particularly in non-loading bones, to use it to infer activity in the hominin past.

The relatively large face of *Homo floresiensis* and its implications for hominin evolution

Duncan, Michael[1] & Tocheri, Michael[1,2,3]

[1] Department of Anthropology, Lakehead University
[2] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution
[3] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong

The face of *Homo floresiensis* has been repeatedly described as substantially reduced and comparable to the condition observed in modern humans (*Homo sapiens*) and/or *Homo erectus*. It has even been claimed that LB1's relative facial measurements are broadly similar to hominin crania that are well known for their extremely small faces in relation to their cranial vaults. The idea that LB1 had a proportionately small face like other derived species in the genus *Homo* is a key component of the hypothesis that *Homo floresiensis* is an island-dwarfed descendant of Asian *Homo erectus*. Here we show that, when properly scaled against other measures of cranial size, the face of LB1 is actually extremely large and comparable to that seen in various australopiths and other early *Homo* specimens. Although reduced facial size in hominins is typically considered to be the result of decreased masticatory stresses, it has also been linked to the evolution of running, wherein a smaller face makes it energetically easier for the head to remain stabilized during movements at faster speeds. The combination of a relatively large face, short legs, and long feet suggests that *Homo floresiensis* evolved from an early *Homo* ancestry that does not include Asian *Homo erectus* and had yet to accrue any morphological adaptations for bipedal running. Moreover, facial reduction in the genus *Homo* may be the result of a two-stage process: 1) reduced tooth and jaw size due to changes in diet, followed by 2) reduced facial size due to changes in locomotion.

2D Geometric Morphometric Analysis of Murine Mandibular Toothrows from Liang Bua (Flores, Indonesia)

Eber, Anneliese[1], Veatch, E. Grace[2], Saptomo, E. Wahyu[3,4], Sutikna, Thomas[3,5], & Tocheri, Matthew W.[1,2,3]

[1] Department of Anthropology, Lakehead University, Thunder Bay, Ontario, Canada
[2] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington DC, USA
[3] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong, Wollongong, New South Wales, Australia
[4] Pusat Penelitian Arkeologi Nasional, Jakarta, Indonesia

[5] Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Wollongong, New South Wales, Australia

Liang Bua, the type site of *Homo floresiensis*, preserves a rich faunal assemblage, ~78% of which is comprised of remains of eight species of murine rodents (*Papagomys armandvillei, Papagomys theodorverhoeveni, Komodomys rintjanus, Hooijeromys* cf. *nusatenggara, Rattus hainaldi, Rattus exulans, Paulamys naso,* and *Spelaeomys florensis*). Accurately identifying murine dental remains to species level is thus integral to a robust understanding of the paleoecology of the Indonesian island of Flores. This study uses, and evaluates the efficacy of, two-dimensional geometric morphometrics (2DGM) to quantitatively characterize the size and shape of murine rodent mandibular molar rows from Liang Bua such that they can be accurately identified to species level. The effects of image angle and tooth wear stage on the analyses are also investigated. Results show that 2DGM captures important details about mandibular toothrow size and shape that can be used in conjunction with qualitative and other quantitative data for murine species identification at Liang Bua and other archaeological sites on Flores. Image angle and tooth wear did influence some aspects of the 2DGM analyses and we provide several recommendations for how to mitigate these potential issues in future work. Since the Liang Bua murine remains represent multiple species of varying body sizes and habitat preferences, quantitative variation and descriptions of previously uncharacterized inter- and intra-species variation described in this study will help to facilitate ongoing paleoecological reconstructions of the cave's history.

A review of the comparative locomotor behaviour of bonobos and chimpanzees

Friesen, Sarah E.[1,2], Knigge, Ryan P.[3], & Tocheri, Matthew W.[2,4,5]

[1] Department of Anthropology, University of Toronto Mississauga, Mississauga, ON, Canada
[2] Department of Anthropology, Lakehead University, Thunder Bay, Ontario, Canada
[3] Department of Integrative Biology and Physiology, University of Minnesota Medical School, Minneapolis, Minnesota, USA
[4] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington, District of Columbia, USA
[5] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong, Wollongong, New South Wales, Australia

Until recently bonobos were typically thought to be more arboreal than chimpanzees, a misconception largely based on studies of unhabituated populations of bonobos. Habituated bonobos in the wild are more terrestrial than previously thought and their locomotor behaviour is similar to that of chimpanzees. Locomotor studies of chimpanzees and bonobos are limited to three populations of habituated chimpanzees and two populations of bonobos, only one of which was fully habituated. We review and discuss these studies and highlight the lesser-appreciated subtleties of bonobo and chimpanzee comparative locomotor behaviour. Currently available data indicate that bonobos are no more arboreal or terrestrial than are chimpanzees. Each spends roughly half their time during the day on the ground. Western and eastern chimpanzee males generally spend more than half of their time on the ground whereas females spend comparatively more time in the trees. Bonobos and western chimpanzee males also climb vertically and move bipedally in the trees more frequently compared to western chimpanzee females and all eastern chimpanzees. Additionally, western chimpanzees appear to prefer larger diameter substrates when climbing, like tree trunks, while bonobos prefer thinner substrates, like vines. These data provide a basis for testable predictions of functional anatomy. For example, a recent study found that differences between the climbing styles of western chimpanzees and bonobos are reflected in their tarsal anatomy.

The existing literature on locomotor behaviour is limited, but it is a valuable resource that can provide insight into the functional anatomy of bonobos and chimpanzees.

Using taphonomic evidence to support interpretations of shellfish consumption by hominins

Julianto, I Made Agus[1], Ramadhani, Sekar Rizqy Amalia[2], & Tocheri, Matthew W.[1,3,4]

[1] Department of Anthropology, Lakehead University
[2] Museum Song Terus, Direktorat Jenderal Perlindungan Kebudayaan, Kementerian Pendidikan, Kebudayaan, Riset, dan Teknologi
[3] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution
[4] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong

Shellfish, which include crustaceans and mollusks, provide substantial nutritional benefits as a dietary resource that can often be predictably accessed. Shellfish exploitation is usually associated with foraging populations with greater social complexity and reduced mobility.

Shell middens are typically interpreted as refuse of hominin subsistence practices if other evidence of hominin activities (e.g., stone artifacts) is found in association. However, determining whether hominins were in fact responsible for accumulating all or part of a shellfish assemblage is an important question that should require taphonomic evidence. Here we document how people living today in Indonesia and elsewhere in Southeast Asia process mollusks that have long but relatively narrow conical shapes (i.e., small diameters), making it challenging to extract the shell meat using any kind of implement, for consumption. These mollusks are typically processed by cutting the apices prior to boiling the shells in water, which makes it easier to extract the meat by sucking it out from the aperture. A shell midden at Liang Bua (Flores, Indonesia) was deposited between ~4.4 and 3.3 thousand years (ka) ago. Interestingly, 63.1% of *Tarebia granifera* (n = 2,656) and 66.7% of *Melanoides tuberculata* (n = 486) showed signs that they were deliberately cut at their apices. Thus, the taphonomic evidence indicates that during this time modern humans processed these freshwater mollusks for food at the site, a behavior not yet documented either in *Homo floresiensis* or in modern human populations on Flores prior to ~4.4 ka ago.

Inside and outside: Evolution of hominin behaviour from the study of internal bone structure, biomechanics and living apes

Kivell, Tracy[1, 2]

[1] University of Kent, School of Anthropology and Conservation
[2] Department of Human Origins, MPI-EVA

Hominin fossils are rare and thus we need to extract as much information as possible from them. Functional information we can derive from the internal bone structure (inside) and test using biomechanical experiments and studies of living apes (outside) can help us address longstanding questions about the evolution of hominin locomotion and tool use. In this talk, I will focus on *Australopithecus* fossils and what their internal bone structure may reveal about the importance of climbing and manipulation around 2 million years ago, including how experimental studies of bonobos and humans add

to this functional interpretation. I will also present recent research on the study of wild chimpanzee locomotor behaviour and how this informs our understanding of the emergence of hominin bipedalism.

A new partial trapezoid of *Homo floresiensis*

Laureijs, Olivia[1], Orr, Caley M.[2,3], & Tocheri, Matthew W.[1,4,5]

[1] Department of Anthropology, Lakehead University
[2] Department of Cell and Developmental Biology, University of Colorado School of Medicine
[3] Department of Anthropology, University of Colorado Denver
[4] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution
[5] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong

The trapezoid, a carpal that articulates with the base of the index finger, shows clear differences in shape between extant humans and great apes. These shape differences likely reflect the evolutionary shift from using the hand during locomotion (e.g., quadrupedalism) to gripping and manipulating objects (e.g., tool use). The characteristic boot shape of the modern human trapezoid is shared with Neandertals and *Homo naledi* but not with the *Homo floresiensis* holotype specimen (LB1), which has a trapezoid remarkably similar to that of extant great apes. Another *Homo floresiensis* trapezoid from Liang Bua (Flores, Indonesia) has been identified that articulates with the LB20 capitate. Unfortunately, a large portion of the dorsoradial aspect of the bone is broken off such that parts of the dorsal nonarticular surface and the facets for the second metacarpal, capitate, and scaphoid are missing, making quantitative comparisons of its morphology more challenging. There is also an idiosyncratic tubercle palmarly that articulates with the capitate directly anterior and slightly proximal to the second metacarpal facet. This tubercle may be a variant of the praetrapezium, which is an ossified mass that sometimes occurs on or near to the palmar tubercle of the trapezium. Here we explore using three-dimensional geometric morphometric analyses to quantitatively compare the shapes of the preserved portions of the articular facets of this new *Homo floresiensis* trapezoid to a sample of extant and extinct hominid trapezoids. We discuss the results of these comparative analyses for understanding how trapezoid shape changed during hominin evolution.

Exploring patterns of faunal and lithic discard at Liang Bua (Flores, Indonesia)

Lin, Sam C.[1,2], Veatch, E. Grace[3], Alamsyah, Nico[4], Julianto, I Made Agus[5], Sutikna, Thomas[1,2], & Tocheri, Matthew W.[5,3,2]

[1] Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Wollongong, New South Wales, Australia
[2] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong, Wollongong, New South Wales, Australia
[3] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington DC, USA
[4] Pusat Riset Arkeometri, Badan Riset dan Inovasi Nasional, Jakarta, Indonesia
[5] Department of Anthropology, Lakehead University, Thunder Bay, Ontario, Canada

At Liang Bua, the hominin turnover from *Homo floresiensis* to *Homo sapiens* ~50–46 thousand years (ka) ago is accompanied by marked shifts in the archaeological record. Prior to 50 ka, stone artefacts are

consistently dominated by an iron-rich variety of nodular chert that is still abundant in the nearby river today. In contrast, post-46 ka there is an increased usage of silica-dominated nodular chert that was derived from localised, inland sources. Without major differences in quality and availability between the two stone types, the raw material pattern at Liang Bua may reflect changes in hominin foraging activities and/or environmental conditions. Indeed, the faunal sequence at the site ~60–50 shows an abrupt decline in medium-sized murines and the disappearance of several large-bodied taxa, including Komodo dragons and dwarf proboscideans, suggesting a sudden localised shift from more open to more closed habitats at this time. In this study, we use a simple agent-based model to explore the possible roles that hominin behaviour and/or environmental conditions may play in the formation of the lithic and faunal record at Liang Bua. The model results show that the interaction between human foraging practices and habitat variation can have varying effects on the proportion and distribution of lithic and faunal discards on an archaeological landscape. We discuss the implications of our results on the interpretation of hominin behaviour at Liang Bua.

Networking and Science Outreach Through Podcasting: Lessons and Experiences from *Screens of the Stone Age*

Lindal, Joshua[1], Plomp, Kimberly[2], & Barnett, Ross

[1] Department of Anthropology, University of Manitoba, Canada
[2] School of Archaeology, University of the Philippines Diliman, Quezon City, Philippines

One of the main goals of the Palaeoanthropological Society of Canada is to promote awareness and understanding of human evolution to students, researchers, and the general public. As such, PASC supports a podcast: *Screens of the Stone Age*, “the podcast where scientists review movies about prehistoric people". We started this podcast as a pandemic project to encourage networking and practice science outreach.

Three hosts, each with their own area of expertise within archaeology, palaeogenomics and palaeoanthropology, discuss the scientific merits and misunderstandings presented in each movie, while also getting caught on some meandering tangents. Here, we provide an overview of our experience after a year and a half of podcasting, including analytics, listener feedback, and a breakdown of the podcasting process, from recording and editing to hosting and distribution, with the ulterior motive of winning over PASC members as listeners.

Trabecular distribution of distal femur in extant apes

Lukova, Andrea[1], Dunmore, Christopher J.[1], Kivell1,Tracy L.[2], & Skinner, Matthew M.[1,2]

[1] Skeletal Biology Research Centre, School of Anthropology and Conservation, University of Kent, Canterbury, UK
[2] Centre for the Exploration of the Deep Human Journey, University of the Witwatersrand, Johannesburg, South Africa

Extant great apes are often used to model aspects of fossil hominin locomotor behaviours. Comparative investigation of trabecular bone, which (re-)models to reflect loads incurred during life, can provide novel insights into the locomotor reconstruction of fossil taxa. Here we analyze the distal femoral epiphysis of

Homo sapiens (N = 26), *Gorilla gorilla* (N = 14), *Pan troglodytes verus* (N=15), and *Pongo* sp. (N = 9) to determine how variation in trabecular structure reflects differences in locomotor behaviours. Canonical holistic morphometric analysis (cHMA) of relative bone volume fraction (rBV/TV) and degree of anisotropy (DA) is used to infer patterns of joint loading in extant taxa. A principal component analysis of rBV/TV and DA distributions show clear separation between taxa. Trabecular distribution in humans is consistent with medial (due to the ground reaction forces) and lateral (due to the resistance of the knee adduction moment provided by the quadriceps and gastrocnemius muscles and lateral collateral ligament) loading. Distribution in non-human apes is consistent with primarily medial loading due to the higher knee adduction moment,varus angle and ground reaction forces. Signals of a more extended knee in female gorillas compared to males (or chimpanzees) may reflect a more extended knee position during vertical climbing and higher arboreality in females. Orangutans showed the most homogenous distribution of trabecular structure across both condyles, consistent with more variable knee joint postures. These results provide the comparative context to interpret knee posture and, in turn, locomotor behaviours in fossil hominins.

The Stories We Tell: Children, oral storytelling, and knowledge transmission in the European Upper Paleolithic

Nowell, April[1]

[1] Department of Anthropology, University of Victoria, Canada

Storytelling, whether around a campfire, in a café or a sold out theater, is ubiquitous in human culture. Globally, storytelling through film, television, books, videogames and other media represents a $300 billion industry. The universality of storytelling suggests that this behavior has deep roots. It also begs the questions of why we as humans find stories so compelling and what the evolutionary context for this behavior might be. The ways in which children learn in foraging societies differ from the classroom-based style of learning and teaching typical of industrialized societies in the West. This difference, however, has often been mischaracterized by anthropologists as an absence or rarity of direct teaching in foraging societies. In this talk, following the work of Scalise Sugiyama, I argue that oral storytelling is a form of pedagogy in foraging societies that shares many of the features of direct teaching. Building on ethnographic data, I explore the evolutionary context, adaptive features and cognitive underpinnings of storytelling. I then present archaeological evidence for storytelling and narrative in the Upper Paleolithic. Finally, arguing that storytelling is a vehicle for cumulative culture, I consider the implications of this form of teaching for skill acquisition and knowledge transmission among Upper Paleolithic children and adolescents and for their role as drivers of human cultural evolution.

Possible Evolutionary Origins of the Chiari Malformation

Plomp, Kimberly[1], Gnanalingham, Kanna[2], Lewis, Kanna[2], Buck, Laura, & Collard, Mark[4]

[1] School of Archaeology, University of the Philippines Diliman, Quezon City, Philippines
[2] School of Health Sciences, University of Manchester, Manchester, UK
[3] Department of Archaeology, Liverpool John Moores University, Liverpool, UK
[4] Department of Archaeology, Simon Fraser University, Burnaby, Canada

Chiari malformation (CM) is a condition in which brain tissue herniates into the spinal canal. It is well accepted that it is related to the shape of the occipital and occurs as a result of an underdeveloped occipital bone. However, the causes of the underdeveloped occipital remain unclear. One hypothesis suggests that interbreeding between Pleistocene hominin species and the remaining Pleistocene genomes present in modern humans may play an important role in the phyletic brain-braincase mismatch that leads to CM.

We initiated a study to test this hypothesis using shape analyses of modern human and fossil hominin crania. We used 3D geometric morphometrics to investigate the shape of modern human crania of living people both with and without CM through CT scans and compare them with those of fossil hominins. Our results indicate that modern humans with CM do tend to share shape traits with the fossil taxa that differentiate them from healthy humans, including the relative width and height of the occipital bone, and the shape of the neurocranium.

Testing efficiency of different 2D geometric morphometric approaches in taxonomic identification of hominin upper first molars (M1)

Radović, Predrag[1,2]

[1] Department of Archaeology, Faculty of Philosophy, University of Belgrade, Belgrade, Serbia
[2] National Museum Kraljevo, Kraljevo, Serbia

The efficiency of 16 different 2D geometric morphometric approaches (geometric models) to the classification of Neanderthal (*Homo neanderthalensis*) and anatomically modern human (*Homo sapiens*) M1s was examined. The models were tested on two sets of occlusal projections of crowns (n = 34 and n = 64) obtained by orienting digital 3D models in a virtual environment or by photographing similarly oriented physical specimens of teeth. Classifications based on linear discriminant analysis (LDA) with cross-validation (jackknifing) were applied, where sets of principal components (PCs) were used as variables, cumulatively describing ≥ 90% of the total variance. The models were tested both in shape space and form space and were compared in terms of the highest correct classification rates. The study confirms that occlusal projections of M1 in two hominin species indeed differ and may be used for taxonomic identification of both complete and damaged crowns. Most models show high classification rates (over 90%), with some providing correct classifications of all the teeth in the dataset.

Chibanian hominin record at the gate of Europe: When they meet they mate

Roksandic, Mirjana[1,2,3], Radović, Predrag[1,4,5], & Lindal, Joshua[1,2]

[1] Department of Anthropology, University of Winnipeg, Canada
[2] Department of Anthropology, University of Manitoba, Canada
[3] Fellow, DFG Center for Advanced Studies 'Words, Bones, Genes, Tools', University of Tübingen, Germany
[4] Department of Archaeology, Faculty of Philosophy, University of Belgrade, Serbia.
[5] National Museum Kraljevo, Serbia

The Chibanian age (formerly the Middle Pleistocene) holds a special place in human evolution as the time which evidenced most of the morphological developments associated with the direct ancestors of modern humans. With the timing of the split between the ancestors of modern humans and Neanderthals being

pushed to the Calabrain (Early Pleistocene), and the evidence for an *in situ* evolution of Neanderthals in Western Europe during the Chibanian, understanding the hominin populations and interactions in the Balkans in this critical period becomes paramount. The Balkan Peninsula occupies an important crossroads between Europe and Western Asia. Because of its geographic position, it holds the key to resolving several major questions about the evolution and migrations of ancient humans. In addition to being a potential route of population movement between the Levant, Anatolia and Western Europe, the Balkans are a hotspot of biodiversity which served as a biotic refugium during cold glacial periods. Throughout the Pleistocene, the Balkans provided ideal conditions for human settlement, at the contact of the Continental and the Mediterranean climate zones. This allowed human groups to establish themselves in the mountainous regions along the corridors, presenting opportunities for interaction with incoming migrating groups. Hominin fossil evidence from the Balkan Peninsula viewed in its regional context is starting to build a complex picture of human evolution in the region, which includes the simultaneous presence, and likely interaction, of multiple hominin groups.

A new genus and species of notharctine (Adapoidea, Primates) from the early Eocene of the San Juan Basin, New Mexico

Silcox, Mary T.[1], Selig, Keegan R.[2], Williamson, Thomas E.[3], & Schillaci, Michael A.[1]

[1] University of Toronto Scarborough, Dept. of Anthropology
[2] Duke University, Dept. of Evolutionary Anthropology
[3] New Mexico Museum of Natural History and Science

Adapoidea is one of the first groups of likely crown primates to appear in the fossil record, emerging ~56 million years ago at the beginning of the Eocene, and known from across Laurasia. Most workers consider adapoids to be stem strepsirrhines. Although there are literally thousands of fossils of adapoids known from early Eocene deposits in North America, the record from the San Juan Basin of New Mexico is notable for documenting a broad diversity of different adapoid species from a relatively narrow time window (Wasatchian North American Land Mammal Age 6). The current study documents an additional genus and species known from a complete lower dental series, including well preserved spatulate incisors and a diminutive vestige of p1. A phylogenetic analysis indicates that the new taxon represents a distinct lineage from other San Juan Basin adapoids, reflecting its mixture of primitive (e.g., unbasined p4 talonid), derived (e.g., reduced p1, expanded m2 paracristid) and unique (e.g., very small m3 relative to m2) features. Dental topographic analysis indicates that the new species was a dedicated frugivore. This new taxon underscores the importance of the San Juan Basin to our understanding of the early phases of euprimate evolution, and of the diversification of Primates in North America.

Using fauna identified by ZooMS and stable carbon and nitrogen isotopes to infer the palaeoenvironment at Grassridge Rockshelter, Eastern Cape, South Africa during the late Pleistocene to mid-Holocene

Spruit, Bacara[1], Reynard, Jerome[1], Collins, Benjamin[2,3], Buckley, Michael[4,5], & Ames, Michael[6,7]

[1] School of Geography, Archaeology and Environmental Sciences, University of the Witwatersrand, Private Bag 3, WITS 2050, South Africa

[2] Department of Anthropology, University of Manitoba, Winnipeg, Manitoba, R3T 2N2, Canada
[3] Human Evolution Research Institute, Department of Archaeology, University of Cape Town, Cape Town, Western Cape, 7701, South Africa
[4] Interdisciplinary Centre for Ancient Life, School of Natural Sciences, University of Manchester, Manchester, United Kingdom
[5] Manchester Institute of Biotechnology, University of Manchester, Manchester, United Kingdom
[6] Centre for Archaeological Science, University of Wollongong, Wollongong, New South Wales, 2522, Australia
[7] Department of Anthropology, University of Victoria, Victoria, British Columbia, V8W 2Y2, Canada

Zooarchaeology by Mass Spectrometry (ZooMS) has the potential to revolutionize zooarchaeological studies, especially when combined with stable isotopes. In particular, ZooMS allows unidentifiable or morphologically ambiguous faunal remains to be definitively identified, offering an alternative to traditional osteomorphological or ancient DNA analysis. While stable carbon and nitrogen isotopes provide insight into dietary preference with variations indicating behavioural, environmental, and/or physiological change.

Fauna identified by ZooMS and stable carbon and nitrogen isotopes were used to infer the palaeoenvironmental conditions at Grassridge Rockshelter (GRS) during the late Pleistocene (LP; c. 43–28ka), terminal Pleistocene (TP; c. 13.5–11.6ka), and mid-Holocene (MH; c. 7.3–6.8ka). Using ZooMS, 85% (n=85) of GRS fauna were successfully identified to at least the tribe. Notably, the success of ZooMS increased through time but not significantly, suggesting that it could be used on southern African LP faunal assemblages. Shifts in fauna and stable isotope ratios parallel changing vegetation and palaeoenvironmental conditions through time. The LP was characterised by cool and dry conditions with open-habitat grazers dominating the faunal assemblage, while the MH was characterised by warmer, mesic conditions with browsers dominating the faunal assemblage.

The misidentification of a suni (*Neotragus moschatus*) and some broad taxonomic identifications in the GRS fauna highlights the need to expand the collagen marker reference database, develop novel ZooMS peptide markers, and encourages the use of multiple palaeoenvironmental proxies. Furthermore, some unexpected fauna were identified at GRS, namely, a blue duiker (*Philantomba monticola*) and ostrich (*Struthio camelus*), highlighting the potential of ZooMS to identify rare, exotic, or unexpected taxa.

The effects of avian and human predation on small mammal taphonomy and zooarchaeology

Veatch, Elizabeth Grace[1], Julianto, I Made Agus[2], Sutikna, Thomas[3,4], & Tocheri, Matthew W.[2,1,3]

[1] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution, Washington DC, USA
[2] Department of Anthropology, Lakehead University, Thunder Bay, Ontario, Canada
[3] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong, Wollongong, New South Wales, Australia
[4] Centre for Archaeological Science, School of Earth and Environmental Sciences, University of Wollongong, Wollongong, New South Wales, Australia

Identifying the causal mechanisms that contribute towards an assemblages' taphonomic signature has been a critical component of neotaphonomic research. Identifying the agent responsible for the accumulation of bone assemblages, for example, provides important ecological information about the relationship between predator and prey. As such, actualistic experiments are often the primary approach to understanding this relationship, particularly when specific variables and conditions are of interest. For

example, small animals are subject to diverse predators but relatively few actualistic and observational studies have explored how small animal body size affects the taphonomic signature(s) of human and avian predation. To address this issue, this study compares the resulting taphonomic patterns of small animal predation by humans and raptors using data collected during an ethnoarchaeological study and a controlled feeding experiment, respectively. We explored how humans butcher small animals of various taxa and body sizes by analyzing anthropogenic modifications (i.e., cutmarks, tooth marks, burning). For avian predators, we fed laboratory rats (*Rattus norvegicus domestica*) of different body sizes to two Milky Eagle Owls (*Bubo lacteus*), one King vulture (*Sarcoramphus papa*), and two Lappet-faced vultures (*Torgos tracheliotos*). Both resulting small animal assemblages were analyzed post-consumption for skeletal element representation, fragmentation and breakage patterns, and bone surface modifications. Results show that small animal body size significantly contributes to pre-depositional taphonomic processes in terms of skeletal part profiles, butchering intensities, and cutmark frequencies.

Three-dimensional geometric analysis of intermediate cuneiform shape in extant humans and great apes

Zachariasz, Jessica[1], Prang, Thomas C.[2], & Tocheri, Thomas C.[1,3,4]

[1] Department of Anthropology, Lakehead University
[2] Department of Anthropology, Washington University of St. Louis
[3] Human Origins Program, Department of Anthropology, National Museum of Natural History, Smithsonian Institution
[4] Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage, University of Wollongong

Among the tarsal bones of extant and extinct hominids, the intermediate cuneiform is arguably the least studied. Here we use three-dimensional geometric morphometrics (3DGM) to explore intermediate cuneiform shape variation in extant humans and great apes in relation to the locomotor repertoires of these taxa. The sample consists of 251 intermediate cuneiforms representing *Homo sapiens, Pan troglodytes, Pan paniscus, Gorilla beringei, Gorilla gorilla, Pongo pygmaeus,* and *Pongo abelii*. Using Stratovan Checkpoint software, two semi-landmark patches were placed on the navicular and second metatarsal facets and exported to R studio for 3DGM analysis. Principal component analysis resulted in gorillas clustering positively along PC1, orangutans and humans clustering negatively, with chimpanzees and bonobos clustering in between. The separation along PC1 is driven by the width and height of the navicular and second metatarsal facets; gorillas have a relatively wide and short cuneiform, whereas in comparison the orangutan and human cuneiform is elongated and narrower. Along PC2, humans cluster positively, separating them from the orangutans who cluster negatively. The separation along PC2 is driven by the fact that, in humans, the navicular and second metatarsal facets are oriented relatively parallel to each other whereas in orangutans the second metatarsal is oriented more obliquely. Overall, these results indicate clear differences in intermediate cuneiform shape among extant hominid taxa that may prove useful for future research on fossil hominid intermediate cuneiforms.