Palaeoanthropological Society of Canada
Société canadienne de paléoanthropologie

PASC SCPA 2nd annual meeting 2016

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Held in conjunctions with CAPA/ACAP conference

THURSDAY, OCTOBER 27/JEUDI 27 OCTOBRE

Session 4: Simposium *Palaeoanthropological Society of Canada/ Société canadienne de paléoanthropologie*

Contributions of New Scientific Methods to Paleoanthropology
Chair: Mirjana Roksandic

2:15-2:30 New scientific methods in the study of lithic residue from Palaeoanthropological sites: Olduvai Gorge.
Julio Mercader, R. Bird., M. Bundala, J. Favreau , M. Itambu, P. Lee, R. Patalano, & L. Tucker

2:30-2:45 *Homo heidelbergensis*: the view from the Eastern Mediterranean communications area (EMCA).
Mirjana Roksandic

2:45-3:00 Scientific contributions of Dr. Davidson Black to the early science of Palaeoanthropology.
JulieCormack

3:30-3:45 Where they were not: What can the Mursi Formation tell us about early hominins habitat preferences?
Michelle S.M. Drapeau, J.G. Wynn, D. Geraads, L. Dumouchel, C. J. Campisano, & R. Bobe

3:45-4:00 Investigating 3D shape change in the ilium during growth and the influence of habitual activity in Later Stone Age foragers of southern Africa.
Helen K. Kurki, and L.A. Harrington

4:00-4:15	*Homo floresiensis* and *Homo sapiens* at Liang Bua (Flores, Indonesia): The current state of the evidence. **Matthew W. Tocheri**, T. Sutikna, S. Jatmiko, & E. Wahyu Saptomo
4:15-4:30	Bipedalism evolved from knuckle-walking: Evidence from 3D geometric morphometric analyses of vertebral shape in humans, chimpanzees, and orang-utans. **Mark Collard**, K.A. Plomp, K. Dobney, U.S. Vidarsdottir, & D.A. Weston
4:30-4:45	Neanderthals from Chagyrskaya Cave, Altai, Siberia **T.B. Viola,** S.V. Markin, N. Rudaya, S. Vasiliev, & K. Kolobova
4:45-5:00	Examining sources of variation in southern African Later Stone Age lower limb cross-sectional geometric properties. ***Michelle E. Cameron** and J.T. Stock
Posters:	
	Three-dimensional geometric morphometric analysis of the trapezium in modern humans, African apes, orangutans, and fossil hominins. ***Joanna L. Dowhos,** and M.W. Tocheri
	Expression of developmental stress through regional fluctuating asymmetry in the cranium. ***Devin L. Ward,** E. Pomeroy, & J.T. Stock
5:00 – 6:30 pm	**Business Meeting**

ABSTRACTS:

1. Examining sources of variation in southern African Later Stone Age lower limb cross-sectional geometric properties

*Cameron M.E., and J.T. Stock

Phenotypic Adaptability, Variation and Evolution (PAVE) Research Group, Department of Archaeology and Anthropology, University of Cambridge

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

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

2. Bipedalism evolved from knuckle-walking: Evidence from 3D geometric morphometric analyses of vertebral shape in humans, chimpanzees, and orang-utans

Collard M.[1,2], K.A. Plomp[1], K. Dobney[3], U.S. Vidarsdottir[4], and D.A. Weston[5]

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The locomotor behaviour of the last common ancestor (LCA) of hominins and panins is a controversial topic. The most popular hypothesis contends that the LCA used knuckle-walking while on the ground, and vertical climbing and forelimb suspension while in the trees, like the African

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

3. Scientific contributions of Dr. Davidson Black to the early science of Palaeoanthropology

Cormack J.L.
Sociology & Anthropology, Mount Royal University

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

4. Three-dimensional geometric morphometric analysis of the trapezium in modern humans, African apes, orangutans, and fossil hominins

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Hominids include living and fossil humans and great apes and these taxa are known to vary in terms of trapezium morphology. As the wrist bone with the only articulation with the pollical metacarpal, the trapezium and its morphological characteristics play an important role in interpreting the evolution of manual dexterity and tool use in hominins, but its usefulness for evaluating hominid phylogenetic relationships is less clear. Using three-dimensional (3D) geometric morphometrics, we explored variation in trapezial shape in a 3D-laser-scanned sample of extant hominids including modern humans, chimpanzees, bonobos, eastern gorillas, western gorillas, orangutans, as well as fossil hominin samples. A series of 640 landmarks and semi-landmarks were applied to the articular surfaces of each 3D model to capture key features of trapezium shape and these were subsequently superimposed by generalized Procrustes analysis. Multivariate statistical analyses of the resulting shape data, including principal components analysis (PCA), between-group PCA, and canonical variates analysis, result in clear separation between all extant taxa. Interestingly, modern human trapezia are most similar to those of chimpanzees and bonobos, suggesting that these taxa share subtle but derived shape features relative to other hominids. Moreover, all fossil hominin trapezia examined here fall within or between the clusters of Homo and Pan, again suggesting that trapezium morphology retains important phylogenetic information.

5. Where they were not: What can the Mursi Formation tell us about early hominins habitat preferences?

Drapeau, M.S.M.1, J.G. Wynn2, D. Geraads3, L. Dumouchel4, C.J. Campisano5, and R. Bobe6
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At more than 4 Ma, the Mursi Formation is among the oldest sediments of the Omo Group of the Omo-Turkana Basin. Despite an age that corresponds to the *Ardipithecus-Australopithecus* transition, it has been only occasionally explored since its discovery in 1967. The existing faunal collection included fewer than 250 specimens and notably lacked hominins.
Renewed fieldwork in the formation allowed us to triple the faunal collection to more than 900 specimens and to better understand the depositional context of the fossils. The increased sample confirms the previously observed abundance of suids relative to bovids (3:1), and the relative abundance of hippos, elephants, deinotheres, crocodiles, and *Euthecodon*. The larger sample now

includes a primate and perhaps a tragulid, but still no hominins. Stable carbon isotopic composition of calcitic rhizoliths and organic matter from paleosols are extremely ^{13}C-depleted. These values indicate very closed, wooded vegetation dominated by C_3 plants and little or no C_4 understory, with a proxy-based estimate of woody cover greater than 80%. The paleosol carbon isotopic values from the Mursi Formation are extremely different from those at the 4.4 Ma *Ardipithecus ramidus* locality of Aramis, the latter of which indicates average woody cover of less than 25%. The paleosol carbon isotope values from Mursi are also very different from the penecontemporaneous *Australopithecus anamensis* locality of Kanapoi, with an estimated woody cover of ~ 50%. The closed, likely mesic habitat inferred from the fauna and paleosols of the Mursi Formation might represent an environment that was unfavorable for hominins.

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

Kurki H.K.[1] and L.A. Harrington[2]

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High levels of within-population size and shape variation in the human adult pelvis suggest that this structure is more biologically plastic than previously thought. The adult pelvis is the product of the skeletal growth process, and as such, use of the lower limb in locomotion during the growth period may influence the shape of the developing pelvis. Variation among individuals in the levels of mobility may contribute to pelvic variation. This study examines the pattern of shape change in the ilium in a sample of juveniles (N=54) from the Later Stone Age foragers of southern Africa (mid-Holocene) using three-dimensional geometric morphometrics, and assesses the relationship of ilium shape change through ontogeny with femoral midshaft robusticity (J) as an indicator of mobility. Principal components analysis of twelve 3D landmarks of the ilium summarized shape variation in the sample. Four of the first five PCs (PCs 1, 2, 4 and 5) show significant relationships with estimated age at death, capturing shape change through ontogeny. Age-adjusted values of PCs 1-5 were regressed on size-standardized femoral midshaft J values.

None of these relationships were significant, suggesting that activity levels do not significantly influence overall shape variation in the ilium through ontogeny. It is possible that robusticity variation is too low in this highly active forager population to produce detectable variation in ilium shape, or that biomechanical influences on ilium shape during growth are too subtle to be detected in an analysis of whole-ilium shape.

7. New scientific methods in the study of lithic residue from palaeoanthropological sites: Olduvai Gorge

Mercader J.1, R. Bird1, M. Bundala2, J. Favreau1, M. Itambu1,2, P. Lee1, R. Patalano1, L. Tucker1

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Several compendia have illustrated the reach of conventional approaches to exploring the evolutionary origin of omnivorous diets. Included are the cost of developing unusually large brains and bodies, tooth size, shape, enamel thickness, mechanics and wear, and the chemical signal (e.g. isotopes) from diet left on bones and teeth. Over the last decade, a new interpretation of human origins has proposed a long history of dependence on fire, suggesting that humans are biologically adapted to cooked foods. However, both the conventional and more recent approaches have not provided direct indication of plant utilization as a key dietary component, nor have they revealed which tools were used to process different types of food. Lithic residue is a triple proxy at the interface of tool use, paleoenvironment, and diet. The number of stone tool assemblages yielding Plio-Pleistocene microremains such as starch granules is very limited, and authenticity has not been rigorously established in many cases. What taphonomic lines of evidence must we unlock to address current preservation/authenticity controversy in molecular paleontology? Contamination is one of the key issues. Strict controls are rarely followed in practice. Many researchers still ignore stringent criteria possibly because they believe they are not really necessary but give no indication as to why the criteria ignored are not relevant. In this presentation we describe anticontamination measures deployed at Olduvai Gorge and the University of Calgary to increase the reliability of the recovered signals from lithic residue both in the field and laboratory.

8. *Homo heidelbergensis*: the view from the Eastern Mediterranean Communications Area (EMCA)

Roksandic M.
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The hominin mandible BH-1 from the Middle Pleistocene cave of Mala Balanica suggested a possibility that human populations in this part of the continent were not subject to the process of Neanderthalization observed in the west. Current hominin fossil record of the early Middle Pleistocene of the Central Balkans suggests that Europe was inhabited by two different populations, a population in the west of the continent with developed derived Neanderthal morphology, and a more variable population in the east characterized by a combination of plesiomorphous and synapomorphous traits. Together with the Southwest Asia the Balkans form the "Eastern Mediterranean" geographic entity, a region at the crossroads of the continents that should be conceptualized as the fertilization zone between different populations and their technological traditions. Building on the scant – but growing – fossil human record contextualized by more abundant archaeological data, we examine the evidence for this larger Eastern Mediterranean Communications Area in the Middle and Upper Pleistocene record. In the context of the Eastern Mediterranean, the presence of two populations suggests that, in order to continue using the

nomenclature of *Homo heidelbergensis*, the current hypodigm needs to be revised to include only the specimens from the latter group.

9. *Homo floresiensis* and *Homo sapiens* at Liang Bua (Flores, Indonesia): The current state of the evidence

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

10. Neanderthals from Chagyrskaya Cave, Altai, Siberia

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The presence of Neanderthals in the Altai mountains of Siberia has been suggested since the 1980s, following the discovery of human remains associated with Middle Palaeolithic industries at Okladnikov and Denisova caves. These remains had few morphologically diagnostic traits, but analyses of mitochondrial and nuclear DNA supported the assignment of some of these fossils to Neanderthals, whereas others belong to another group, the Denisovans. Since 2008, our team has been excavating Chagyrskaya cave, about 100 km west of Denisova. The Pleistocene deposits of the site date to the transition between OIS 4 and 3 based on 14C dates and environmental data. The excavations have yielded more than 100,000 lithics and about 150,000 animal bones, as well as 75 hominin fragments coming from at least five individuals. The majority of the material comprise isolated teeth and phalanges, but we have also recovered large parts of a right arm and shoulder

girdle and a left foot. The Chagyrskaya assemblage preserves a large number of Neanderthal traits in the dentition such as midtrigonid crests on the lower molars and strongly shoveled upper incisors with a convex labial surface. The postcranial material also shows several features seen in Neanderthals, like the presence of a dorsal sulcus on the axillary border of the scapula, large and rounded apical tufts on the phalanges and robust first metacarpals with large M. opponens pollicis crest. We will discuss the morphology of these specimens in a comparative context and their implications for our understanding of Neanderthal geographic variability.

11. Expression of developmental stress through regional fluctuating asymmetry in the cranium

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

To evaluate this hypothesis we use two populations from the Ancient Nile Valley, the el-Badari (n=32) and Kerma (n=27). Previous research suggests that these samples have very disparate health, and therefore should have different FA levels. 36 bilateral, linear dimensions were recorded on the bony labyrinth, base, vault, and face. Each measurement was scaled and tested for skew and normality before FA evaluation. As expected, FA scores were lowest in the bony labyrinth, suggesting the structure is functionally constrained and genetically canalized. However, other regions did not follow the expected pattern: FA peaked in the cranial base and then decreased through the face and vault, with variable significance. This result may demonstrate that cranial base morphology is relatively more susceptible to physiological stress or that stress is higher during cranial base development. FA did not differ significantly between samples, but el-Badari coefficients of variance for FA were higher in every region, suggesting the samples may have had different health profiles than previously thought.