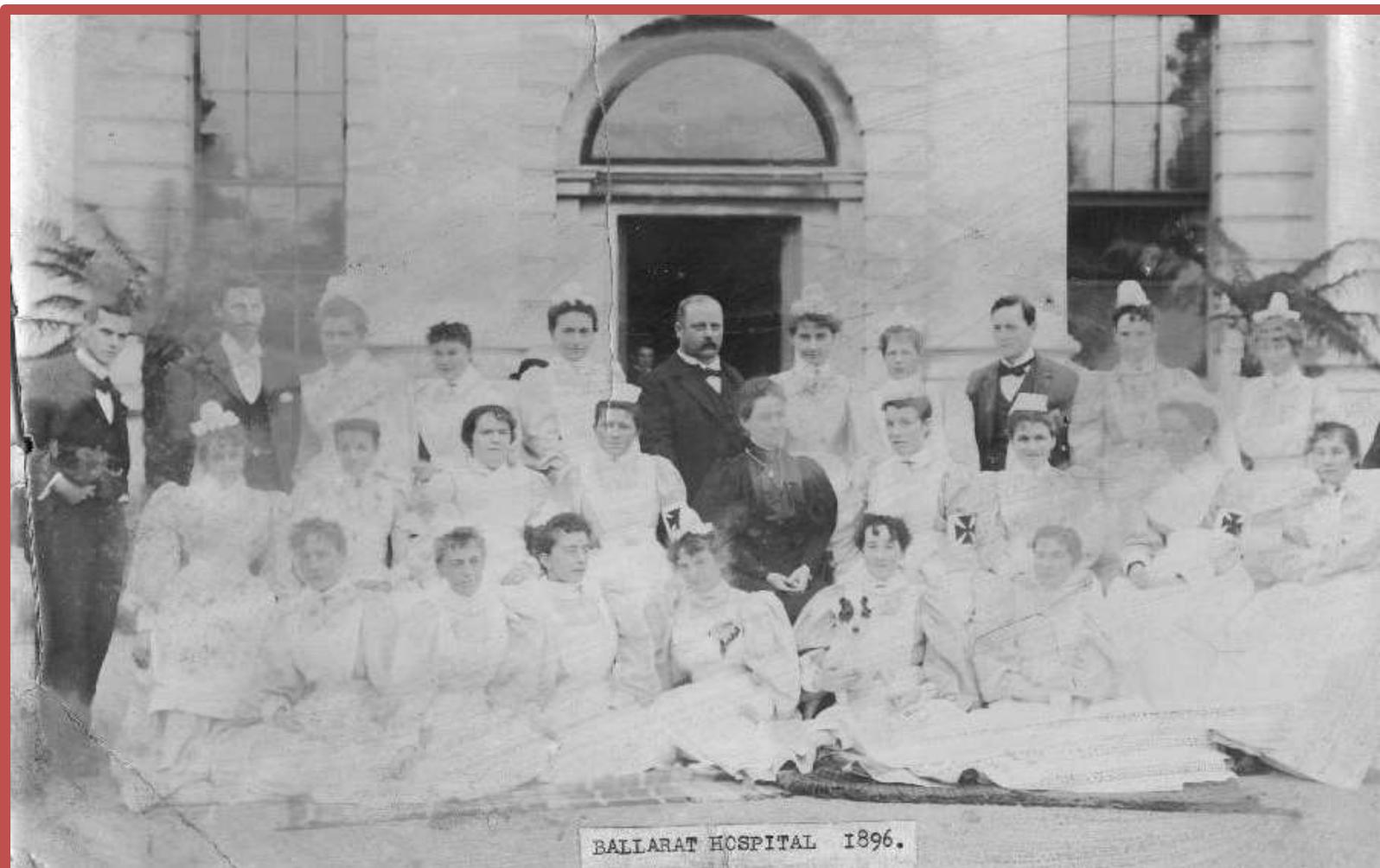




31st Annual Conference of the Australasian Society for Human Biology

3rd to 6th December 2017
Craig's Royal Hotel, Ballarat, Victoria

Multidisciplinary Health: Past, Present and Future





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Conference Welcome

It has been over a decade since the Australasian Society for Human Biology last met in Victoria. We are very excited to be hosting ASHB this year in Ballarat, traditional lands of the Wadawurrung people. The conference theme, *Multidisciplinary Health: Past, Present and Future*, draws on the long association between Ballarat and the health sciences, and we hope that this meeting will encourage the development of collaborations across disciplines. We have attempted to foster potential collaboration through this year's sessions, which move beyond the traditional themes of research fields and instead focus on the diverse strategies that we as a Society are using to answer our research questions. This approach is embodied in our keynote presentation, this year delivered by A/Prof Soren Blau.

In addition to our exciting schedule of podium and poster presentations, and of course the conference dinner, this year we are delighted to announce two additional ASHB special events. The first is a public lecture to be held on Tuesday evening with four of our delegates showcasing the range of research being undertaken by ASHB members. It is hoped that this forum will not only increase the public profile of the Society, but will facilitate the dissemination of our research to the general public, allowing local students access to researchers across the broad field of human biology. Two-thirds of our delegates for ASHB2017 are students, a figure which highlights the strength of our Society in fostering the next generation of researchers. To support the career developments of these students, on Wednesday we will be running the second of our special events - a workshop for Honours/HDR and ECR members on DECRA's and grant writing, facilitated by Dr Alison Behie (ARC DECRA Research Fellow). For our student presenters, we will also be providing them with informal written feedback on their presentations throughout the conference.

We hope that you enjoy the conference and have an opportunity to experience the historical and contemporary delights of Ballarat.

Dr Georgia Roberts
Federation University

Dr Phillip Roberts
Federation University

Samantha Rowbotham
VIFM/ Monash University

ASHB 2017 Convenors



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Conference Programme

Sunday 3rd December

9:30am – Pre-conference workshop:

3:00pm The Analysis of Human Skeletal Remains: A Quality Assurance Workshop

3:45pm Viewing of *Romancing the Skull* exhibit at the Ballarat Art Gallery. Meet in the foyer.

5:00pm – Welcome Drinks – The Bluestone Cellar, Craig's Royal Hotel Ballarat

6:00pm

Monday 4th December

Registration

8:30am Speakers for morning sessions to upload presentations on PC.

Poster presentations can be put on display in allocated space.

Welcome and notices

8:45am Welcome to Country – Wadawurrung Aboriginal Corporation

Conference opening

9:00am Keynote: Bumps, holes and lines: contributions made by bioarchaeological and forensic anthropological analyses of skeletal and dental defects

Soren Blau, Victorian Institute of Forensic Medicine

Session 1: Health and Cultural Identity

Chairs: Tanya Smith and Hyab Mehari Abraha

9:40am DISH and erosive arthropathies (gout): Exploring the origins and antiquity of non-communicable diseases in Northeast and Southeast Asian populations through pathological joint conditions

Nellissa Ling*

9:55am The Embodiment of Unequal Childhoods in Aotearoa New Zealand

Julia Spray*

10:10am A comparative study of intentional cranial modification in Georgia, Hungary and Bavaria from the European Migration period (4–7thC)

Peter Mayall*

10:25am Discussion Panel

10:45am Morning Tea

Session 2: Harm and Healing: Injury and Care

Chairs: Georgia Roberts and Caitlin Smith

11:05am	One step further: the bioarchaeology of care meets the archaeology of emotion <u>Lorna Tilley</u>
11:20am	The distribution and morphology of skeletal fractures resulting from fatal low (≤ 3 m) free falls <u>Samantha Rowbotham*</u> , Soren Blau, Jacqueline Hislop-Jambrich
11:35am	Trauma and conflict in prehistoric Southeast Asia <u>Lucille L.T. Pedersen*</u> , Kate M. Domett, Nigel J. Chang, Siân E. Halcrow, Hallie R. Buckley
11:50am	Death from or with child? Re-evaluating the probable case of euthanasia from Roonka <u>Judith H. Littleton</u> , Shirley Wallace
12:05pm	Skeletal trauma in northern Vietnam during the initiation of pastoralism (c. 6700 – 6200 BP) <u>Rachel M. Scott</u> , Hallie R. Buckley, Kate Domett, Anna Willis, Hiep Hoang Trinh, Marc Oxenham
12:20pm	Discussion Panel
12:40pm	Lunch
Session 3: Mental and Physical Stress	
Chairs: Sarah Croker and Tyla Flanagan	
1:30pm	An alternative objective microscopic method for the identification of linear enamel hypoplasia (LEH) in the absence of visible perikymata <u>Alejandra Cares Henriquez*</u> , Marc F. Oxenham
1:45pm	The effects of prenatal stress on birth outcomes in Queensland following the 2011 floods <u>Lauren McFarlane*</u> , Alison Behie
2:00pm	Poor Old Men: Unfurnished Male Burials in Early Anglo-Saxon England <u>Christine Cave</u> , Mark Oxenham
2:15pm	Systemic stress and health outcomes in Prehistoric Indonesia <u>Bronwyn Wyatt*</u> , Justyna J. Miskiewicz, Peter Bellwood
2:30pm	Useful exposures: LEH, migration, and endemic disease <u>Gina McFarlane*</u>
2:45pm	Discussion Panel
3:05pm	Afternoon Tea

Session 4: Biological Anthropology

Chairs: Justyna Mizskiewicz and Salina Hisham

3:25pm	Evaluating the taxonomy of Proconsul and Dryopithecus by randomized resampling from a large dental database of extant hominoids <u>Varsha Pilbrow</u>
3:40pm	The impact of the periodontal ligament on the mechanics of the primate jaw during post-canine chewing <u>Hyab Mehari Abraha*</u> , Jose Iriarte-Diaz, Callum F. Ross, Andrea B. Taylor, Simon Wilshin, Paul C. Dechow, O. Panagiotopoulou
3:55pm	Dental macrowear analysis of the Neanderthal mandible from Regourdou (Dordogne, Southwestern France) <u>Luca Fiorenza</u> , Stefano Benazzi, Ottmar Kullmer, Arnaud Mazurier, Roberto Macchiarelli
4:10pm	Developmental Disruptions in Non-Human Primates of Known Histories <u>Tanya M. Smith</u>
4:25pm	Healthy little hobbits –<i>Homo floresiensis</i>’ long lineage implies overall health and evolutionary fitness at a population level <u>Debbie D. Argue</u> , Colin P. Groves, Michael S. Y. Lee, William L. Jungers
4:40pm	Discussion Panel
5:00pm	AGM

Tuesday 5th December

	Registration
8:30am	Speakers for morning sessions to upload presentations on PC. Poster presentations can be put on display in allocated space.
	Session 5: Movement and Migrations: Health and Self in a Mobile World Chairs: Nicholas Malone and Charlotte Alley
9:00am	Impact of Human Interaction on Health in Prehistoric Asia <u>Melandri Vlok*</u> , Hallie Buckley
9:15am	Preliminary results of a study of cold-induced vasodilation response among mostly Asian peoples <u>Bruce A. Floyd</u>
9:30am	Radiogenic isotope ratios (⁸⁷Sr/⁸⁶Sr) do not support the presence of migrants at Samtavro cemetery, Georgia (4th – 6th centuries AD) <u>Natalie Langowski*</u> , Roland Maas, Varsha Pilbrow
9:45am	Assessment of Human Ancestry in the Australasian Region utilising the Postcranial Skeleton <u>Callan Birkmann-Little*</u> , Denise Donlon, Rebecca Griffin
10:00am	Bioarchaeological investigations of the Flinders Island Group <u>Michael Westaway</u> , Shaun Adams, Julien Louys, Brooke Hendry, Mark Collard and Clarence Flinders
10:15am	Discussion Panel
10:35am	Morning Tea (20 minutes)
	Session 6: Nutrition Chairs: Phil Roberts and Bronwyn Wyatt
11:00am	The Agricultural Transition and Health in Predynastic Egypt: Using Meta-analysis to Undertake a Regional Analysis <u>Stephanie A. Robinson*</u>
11:15am	Isotope analysis of archaeological human remains in Bahrain: Promises and pitfalls <u>Caitlin B. Smith*</u>
11:30am	Seasonal variation in wombat macronutrients and fat: implications for late Pleistocene Aboriginal hunting practices in Tasmania <u>Georgia L. Roberts</u>
11:45am	Achieved growth of immigrant and Australian-born Timorese compared to Timor-Leste residents <u>Bridget Addis*</u> , Katherine Sanders, Phoebe Spencer, Debra Judge
12:00pm	Behavioural and Seasonal Variation in Habitat Use by Cat Ba Langurs (<i>Trachypithecus poliocephalus</i>) <u>Rebecca L. Hendershott*</u> , Alison M. Behie
12:15pm	Discussion Panel

12:35pm	Extended lunch to include:
Session 7: Posters	
	Investigating the effect of bone density on osteon circularity: methodological implications for histomorphometry <u>Amy-Marie Beugelsdyk*</u> , Justyna J. Miskiewicz
	Porotic lesions on the cranial vault of Late Bronze Age to Early Middle Age populations from eastern Georgia <u>Marine Chkadia*</u> , Varsha Pilbrow
	Comparison of Linear Enamel Hypoplasia in Lapita populations from Teouma and Talasiu <u>Karen M Cooke*</u> , Alejandra Cares Henriquez, Frédérique Valentin, Marc Oxenham
	The effects of experimental burning on <i>Sus domesticus</i> dental enamel in a forensic and archaeological context Natasha Langley*, <u>Justyna J. Miskiewicz</u>
	D0-14/D: A New Palaeodemographic Ratio and Equation for Estimating Total Fertility Rates <u>Clare McFadden*</u> , Marc F Oxenham
	Decomposition of human remains deposited on the ground surface: A preliminary comparison between two Australian bushland sites <u>Jennifer K. Menzies*</u> , Sarah L. Croker, Denise Donlon
	Inferring diet in medieval England from bone histology and stable isotope data: preliminary results <u>Tahlia J. Stewart*</u> ¹ , Chris Deter ² , Geraldine E. Fahy ² , Patrick Mahony ² , Justyna J. Miskiewicz ¹
	Applying Ethnographic Practice to the Bioarchaeology of Care: A Philippines Pilot Study <u>Melandri Vlok*</u> , Trisha Palconit, Victor Paz, Marc F. Oxenham
Session 8: Social Health	
Chairs: Michael Westaway and Julie Spray	
2:00pm	Beyond Stigma: Pathways to whānau embodiment of rheumatic fever in Aotearoa/New Zealand <u>Anneka Anderson, Julie Spray*</u>
2:15pm	War and sex differences in mortality: New Zealand's polio epidemics <u>Heather T. Battles</u>
2:30pm	Investigating aetiologies of lead poisoning to infer the complex behaviour of Kabwe 1 (<i>Homo heidelbergensis</i>) <u>Madeleine Green</u> , Phillip J. Habgood, Justyna J. Miskiewicz
2:45pm	A Preliminary Study of Inverse Correlations between Female Employment and Female Pertussis Mortality in South East Australia and New Zealand, 1864 to 1925. <u>Phillip M. Roberts</u>

3:00pm	Discussion Panel
3:20pm	Afternoon Tea
Session 9: Maternal and Child Health	
Chairs: Hayley Green and Felicity Gilbert	
3:40pm	Indicators of Offspring Sex and Offspring Survival in Captive Suwalesi Black Crested Macaques (<i>Macaca nigra</i>) <u>Charlotte Alley*</u> , Vicky Melfi, Holly Farmer, Alison Behie
3:55pm	The double edged sword of grandparental investment: Health costs and benefits of grandparental caregiving <u>David A. Coall</u> , Sonja Hilbrand, Myra Taylor, Ruth Marquis, Denis Gerstorff, Ralph Hertwig
4:10pm	Reproductive Aging in Captive Chimpanzees <u>Grace Miller*</u> , Alison Behie, Vicky Melfi, Alicia Burns
4:25pm	A Palaeodemographic Measure of Maternal Mortality and Multi-Faceted Approach to Maternal Health <u>Clare McFadden*</u> , Marc F Oxenham
4:40pm	Discussion Panel
5:30pm-6:30pm	Public Lecture Evening

Wednesday 6th December

8:30am	Registration Speakers for morning sessions to upload presentations on PC.
Session 10: Teaching and Learning in Medicine Chairs: Hallie Buckley and Dominic Esterman	
9:00am	'Students-as-Partners' technology-enhanced co-creation model to improve student engagement and attitudes to anatomy learning <u>Nicole Williams*</u> , Daniel Gutschmidt, Marie Porter, Lauren Gauci, Madeline Bessen, Nicolene Lottering
9:15am	Medico-legal death investigation in Victoria – The role of the Victorian Institute of Forensic Medicine <u>Richard Bassed</u>
9:45am	Student perceptions of a creative team-based learning approach to anatomy revision <u>Sarah Croker</u> , Deborah Bryce, Annette Burgess
10:00am	Discussion Panel
10:20am	Morning Tea
Session 11: Social and Biological Understandings of Self Chairs: Richard Bassed and Kajaal Prasad	
10:40am	Understanding sex in bioarchaeology: Current limitations in "gendered" methods <u>Chelsea Morgan*</u> , Siân Halcrow, Catherine Frieman, Justyna J. Miskiewicz
10:55am	Establishment of sex and stature estimation equation protocols of the humerus for an Australian sub-population utilising post-mortem computed tomography <u>Kristy Winter*</u> , Mikaela Reynolds, Holly Peters, Laura Gregory, Donna MacGregor
11:10am	Sex Estimation of Skulls from the Indian Subcontinent Using New Morphological Quantification Techniques <u>Dominic Esterman*</u> , Denise Donlon, Sarah Croker
11:25am	Stature estimation in forensic anthropology: A scoping review <u>Kajaal Prasad*</u> , Mubarak Bidmos, Manisha Dayal
11:40am	Discussion Panel
12:00noon	Student workshop: DECRA and grant writing (to continue into lunch)
12:30pm	Lunch

Session 12: Environmental Impacts on the Body	
Chairs: Judith Littleton and Lauren McFarlane	
1:30pm	Modelling Decomposition in Aquatic Environments <u>Felicity M. Gilbert*</u>
1:45pm	Primate resilience to severe environmental change: dietary vs. social flexibility <u>Alison M. Behie</u>
2:00pm	The crimes scavengers commit: implications of scavenging on taphonomy and the post-mortem interval <u>Alyce Cameron</u> , Mark Oxenham
2:15pm	Determining conservation priorities: past susceptibilities meet present threats <u>Nicholas Malone</u>
2:30pm	New applications for the 'Rule of Nines' method in Forensic Anthropology <u>Hayley Green</u> , Stephanie Baker, Stephanie J. Marhoff-Beard
2:45pm	Discussion Panel
3:05pm	Afternoon Tea
Session 13: Recovery and Analysis of the Deceased	
Chairs: Rachel Scott and Alejandra Cares Henriquez	
3:25pm	Hip joint ankylosis and femoral bone adaptation: A histology case study from the Metal Period Philippines <u>Justyna J. Miskiewicz</u> , Claire Rider, Shimona Kealy, Marc F Oxenham
3:40pm	Age estimation of skeletal remains using the auricular surface of the Ilium: a comparison between physical examination and photographic evidence <u>Tyla Flanagan*</u> , Robert Ebeyan, Manisha Dayal
3:55pm	Life and Death in the early Colonial settlement period of South Otago, New Zealand <u>Hallie Buckley</u> , Peter Petchey, Jonny Geber, Charlotte King, Lisa Matisoo Smith, Michael Knapp, Rebecca Kinaston, and Baylee Smith
4:10pm	Visualisation and quantification of secondary dentin formation in MDCT scans: analysis of a contemporary Malaysian population <u>Salina Hisham*</u> , Ambika Flavel, Nurliza Abdullah, Mohamad Helmee Mohamad Noor, Daniel Franklin
4:25pm	Discussion Panel
4:45pm	Closing and Student Prizes



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Multidisciplinary Health: Past, Present and Future

Abstracts

The impact of the periodontal ligament on the mechanics of the primate jaw during post-canine chewing

Hyab Mehari Abraha¹, Jose Iriarte-Diaz², Callum F. Ross³, Andrea B. Taylor⁴, Simon Wilshin⁵, Paul C. Dechow⁶, Olga Panagiotopoulou¹

¹University of Queensland

²University of Illinois, USA

³University of Chicago, USA

⁴Touro University, USA

⁵The Royal Veterinary College, UK

⁶Texas A&M University, USA

Whilst the primary function of the periodontal ligament (PDL) is to attach the teeth to their socket, conflicting hypotheses exist regarding its mechanical significance during chewing. Theoretical and constitutive models have previously proposed that the PDL reduces and/or evenly distributes occlusal loads during mastication, yet finite element models are yet to fully support this hypothesis. Our poor understanding of the role of the PDL during chewing may be due to the limitations of the visualization and modelling of the PDL during the Finite Element Analysis (FEA) process. Hence, this study uses a validated FE model of a female rhesus macaque (*Macaca mulatta*) to test whether exclusion of the PDL alters strain patterns in the mandible. We test this during unilateral post-canine chewing of foods with varying hardness and toughness. Our results showed that modelling the PDL in FEA increases principal strain magnitudes and concentrations in the alveolar bone adjacent to the loaded teeth. However, we also found that mandibular locations away from the alveoli of the loaded teeth are insensitive to the PDL. Additionally, in our validation, we note that FE models that exclude the PDL report strains that are close to those recorded from homologous locations *in vivo* (all mean principal strains differ from *in vivo* results by <75 $\mu\epsilon$). These findings demonstrate that the PDL does not substantially reduce the magnitude or concentration of principal strains distributed across the mandible during unilateral post canine chewing. Hence the PDL may be safely excluded in FE studies investigating deformation in the mandible.

Achieved growth of immigrant and Australian-born Timorese compared to Timor-Leste residents

Bridget Addis^{1*}, Katherine Sanders¹, Phoebe Spencer¹, Debra Judge¹

¹The University of Western Australia

Comparative studies of migrants from an area of resource shortage to an area of resource abundance allow us to understand better the relative role of restrictive environments on genetic growth potential. Furthermore, they can identify the potential change in growth patterns that might be expected with increased resource availability in developing countries such as Timor-Leste. Timor-Leste was devastated by conflict during 24 years of Indonesian occupation and widespread violence, creating resource shortfalls and famine, particularly in rural regions. The comparison of Timor residents with Timorese who immigrated to Australia during the occupation, presents a unique opportunity for comparisons of genetically similar populations in high and low resource environments during maturation.

Eighty-three Timorese immigrant, adults (n=63) and children (n=20) currently living in Australia, were interviewed and measured for height, weight, mid-upper arm circumference and head circumference. Growth measures were then compared to previous recorded data from two rural field sites in Timor-Leste (Ossu and Natarbora), consisting of 1206 children and 487 adults.

Immature migration to Australia prior to adulthood was associated with greater height, for both males and females (both $p < 0.001$). Those born in Australia of Timorese descent or who spent their critical first two years of development in Australia had the most significant increase in growth ($p < 0.001$). Migrating during the first two years was more important to the growth of boys ($p = 0.005$) than of females ($p = 0.18$), suggesting that females have a greater capacity for catch up growth, or are less constrained by poor early conditions.

Indicators of Offspring Sex and Offspring Survival in Captive Sulawesi Black Crested Macaques (*Macaca nigra*)

Charlotte Alley^{1*}, Vicky Melfi², Holly Farmer³, Alison Behie¹

¹Australian National University

²University of Sydney

³Paignton Zoo and Wildlife Park, UK

Biological factors that influence offspring sex and survival in a species are not only reflective of aspects of their social system, but can also have important implications for conservation. This paper aims to identify predictors of offspring survival and offspring sex in a captive population of critically endangered Sulawesi black crested macaques (*Macaca nigra*). Using data from the 2005 and the 2011 European Endangered Species Program studbooks multilevel binary logistic regressions were used to determine how a number of indicators of maternal and offspring condition could predict offspring sex and survival. We found offspring survival was not predicted by any maternal characteristics, but was predicted by offspring sex with males having lower survival rates. This supports the fragile male hypothesis that proposes males are more vulnerable to stress and disease in early life than females. In terms of offspring sex, we found that mothers who were transferred in the year before giving birth were more likely to have sons. As transfers between zoos likely indicate a severe stress to the mother, this suggests that exposure to stress in the year before birth is more likely to result in the birth of a son, which goes against the predictions of the Trivers-Willard hypothesis. It may however lend support to the resource competition hypothesis that states that when females are in poor condition they should invest more into the dispersing sex as a means to limit future competition, which in this species are males.

Beyond Stigma: Pathways to whānau embodiment of rheumatic fever in Aotearoa/New Zealand

Anneka Anderson¹, Julie Spray^{1*}

¹The University of Auckland

Māori and Pasifika peoples in Aotearoa suffer disproportionately high rates of rheumatic fever (RF) compared to non-Māori or non-Pasifika, a disparity which is closely linked to overcrowding and poverty. The roots of these inequities may be found in colonial history, compounded by the persistence of material poverty and racism in the present.

However, health policy remains focussed on isolating diseases within 'at-risk' bodies, in the case of RF, through targeted media campaigns and throat swabbing programmes. Medical anthropology has long focussed on the way such interventions create social stigma, and how this stigma in turn can be embodied by targeted groups, a form of social suffering.

However, our research suggests that the embodied effects of these interventions can be traced to mechanisms beyond stigma alone. This research is based on three ethnographic studies of community experiences of recent RF interventions within seven District Health Board areas of Aotearoa and within a South Auckland school. We point to several other mechanisms, including burden of responsibility and habituated attention to sore throats, which result in various embodiments of RF by the wider Māori and Pasifika communities. Although this intervention has seen moderate success in lowering rates of RF, these pathways create new forms of inequitable social suffering.

We argue that broadening the lens of enquiry beyond stigma demonstrates a bodily impact of disease that extends beyond those usually considered in health policy and allows us to better theorise the way that neoliberal state interventions enact structural violence upon Māori and Pasifika communities.

Healthy Little Hobbits. *Homo floresiensis*' long lineage implies overall health and evolutionary fitness at a population level

Debbie D. Argue¹, Colin P. Groves¹, Michael S. Y. Lee², William L. Jungers³

¹Australian National University

²South Australian Museum / Flinders University

³Stony Brook University / Association Vahatra, Madagascar

Although *Homo floresiensis* has been known for 13 years, its phylogenetic status remains highly contentious. Bones that have been placed in the *Homo floresiensis* hypodigm have been interpreted in three ways: that the species is descended from an early hominin lineage; that it is a dwarfed descendant of *Homo erectus*; that the remains are those of anatomically modern humans that had genetic or metabolic disorders.

Here we present the results of parsimony and Bayesian phylogenetic analyses of an expanded morphological dataset comprising a comprehensive range of specimens for *Australopithecus* and *Homo*: *Australopithecus afarensis*, *Australopithecus africanus*, *Australopithecus sediba*, *Homo habilis*, *Homo georgicus*, *Homo naledi*, *Homo ergaster*, *Homo erectus* (Sangiran and Trinil), and *Homo sapiens*. We broaden the range of traits previously applied to the *H. floresiensis* question by including characters from the crania, mandibles, dentition and postcrania. This has not been attempted before and provides an unparalleled database to apply to the problem of the phylogenetic position of this species.

The new data and analyses support the hypothesis that *H. floresiensis* is an early *Homo* lineage and suggest that *H. floresiensis* is a long-surviving relict of an early (>1.7Ma) hominin. These results indicate a hitherto unknown long-lived hominin lineage, suggesting overall health and evolutionary fitness at a population level.

This project was funded by The Australian Research Council Discovery Project Scheme (DP1096870).

Medico-legal death investigation in Victoria – the role of the Victorian Institute of Forensic Medicine.

Richard Bassed^{1,2}

¹Victorian Institute of Forensic Medicine

²Monash University

The Victorian Institute of Forensic Medicine (VIFM) is a statutory authority that is responsible for the medico-legal investigation of all deaths reported to the Victorian State Coroner. The Institute also works closely with Victoria Police to provide clinical forensic medical expertise in the examination of living victims of assault and family violence. The VIFM is home to the Donor Tissue Bank of Victoria where they receive, process and distribute tissues for life-saving surgery. Under the auspices of the Monash University Department of Forensic Medicine, the Institute also hosts a large and active teaching and research program focused on death and injury prevention, and forensic medical education. Over the 30 years of the VIFM's existence, the Institute has grown to an organisation of some 250 people who provide a comprehensive range of forensic medical and scientific specialties necessary for the detailed investigation of deaths and assaults. This presentation will provide an overview of the operations of the VIFM, its structure, its functions, the daily workload, and how the VIFM works collaboratively with the State Coroner in order to arrive at robust medico-legal conclusions concerning the deaths of Victorians who are admitted into our care. The presentation will also highlight current research activities, including new advances in post-mortem computed tomography imaging, and how this is strengthening the evidence base of the VIFMs work.

War and sex differences in mortality: New Zealand's polio epidemics

Heather T. Battles¹

¹University of Auckland

Poliomyelitis emerged as an epidemic disease in New Zealand and many other countries in the late 19th and early 20th centuries, presumably from a prior state of endemicity in sufficiently large populations with low levels of sanitation and hygiene. Its emergence and mortality patterns have primarily been studied using data from Northern Europe and North America. Epidemics in Australia and New Zealand, and the connections between them, have received comparatively little attention. New Zealand polio mortality data for 415 individuals was collected from the non-Maori death registrations for the epidemic periods of 1916, 1924-25, 1936-37 and 1947-49. Analysis shows the sex ratio of deaths fluctuating over time with an overall excess of male deaths, and an abruptly increasing age at death in the later epidemics due largely to a lack of deaths in young children rather than to an increasing number of deaths in adults. I consider the factors shaping such patterns in the New Zealand context, including the viral traffic across the Tasman, particularly for the epidemic of 1916. Investigation revealed 125 deaths attributed to polio in that year. The sex ratio of deaths was high at 1.7 (79 males: 46 females), and contrary to contemporary patterns elsewhere, the majority of deaths (60.8%) occurred in ages 5 years and up (max = 49 years). Males 15-24 years had a particularly high polio mortality rate, suggesting a potential role of the war in shaping exposure and resistance to the virus.

Primate resilience to severe environmental change: dietary vs. social flexibility

Alison M. Behie¹

¹Australian National University

Species that regularly exhibit marked differences in diet, grouping patterns and activity levels are predicted to also exhibit variation in their ability to cope with large scale habitat disturbances. Within the Atelidae, howler monkeys (*Alouatta* spp.) and spider monkeys (*Ateles* spp.) typically display divergent feeding ecologies and social organizations, wherein the former rely more heavily on leaves and live in small, cohesive social groups while the latter specialize in fruit and live in larger, dispersed, fission-fusion communities. As frugivory may place tighter constraints on optimal energy budgets, spider monkeys are typically regarded as more sensitive to disturbance than howlers. In order to investigate this, I compared the response of a black howler monkey (*Alouatta pigra*) and a Yucatan spider monkey population (*Ateles geoffroyi yucatanensis*) to two separate hurricane events at two different sites (Monkey River in 2001 and Runaway Creek Nature Reserve in 2010). Given the more specialized nature of the spider monkey diet I expected them to suffer more severe population losses, however they lost no individual animals, while the howler monkey population declined by 78% before recovering. As both species showed some degree of flexibility in activity and diet budgets, spider monkeys also exhibited a high degree of flexibility in social grouping significantly increasing fission-fusion rates. These results suggest that although considered more vulnerable to disturbance, spider monkeys may be able to survive following habitat disturbance by using flexibility in social patterns as a mechanism to deal with a reduced food supply.

Investigating the effect of bone density on osteon circularity: methodological implications for histomorphometry

Amy-Marie Beugelsdyk^{1*}, Justyna J. Miskiewicz¹

¹Australian National University

The present study investigates the effect of secondary bone density on the circularity of transverse surfaces of osteons. Firstly, we hypothesized that bone remodeling related increase in the density of osteons, or their “clustering”, will affect the regularity and shape of osteon cement lines. Secondly, we investigated a technical question as to whether circularity and roundness data represent the same or comparable values. Using ImageJ, histology images representing human midshaft femora from a British medieval sample were evaluated for osteon circularity and roundness. Data were recorded in 18 samples which represented five adult individuals. In total, 591 osteons were examined. Statistical analysis revealed no significant relationship between osteon density and means osteon circularity. However, we have identified substantial statistically significant differences between osteon circularity and roundness data. Even though both variables quantify how close a 2D object is to a perfect circle, roundness data calculations account for osteon surface shape variation in the major axis, whereas circularity is based on perimeter measures. Our results indicate that assessing the circularity of osteon surfaces remains an informative component in bone histology studies. Future histomorphometric research should report both circularity and roundness data to understand cement line shape (ir) irregularity more accurately.

Assessment of Human Ancestry in the Australasian Region utilising the Postcranial Skeleton

Callan Birkmann-Little^{1*}, Denise Donlon¹, Rebecca Griffin¹

¹University of Sydney

The assessment of ancestry is one of the crucial but more difficult tasks in forensic anthropology and is vital for the management of skeletal remains. Skeletal remains are sometimes found with severely damaged or missing cranial bones creating problems as cranial bones are the bones of choice for assessment of ancestry. It is therefore advantageous to probe the postcranial skeleton for any evidence of ancestral differentiation in size and/or morphology. This study will expand on my previous preliminary research into the postcranial skeleton and the ancestral markers found in the measurements of the long bones. This study will investigate the possible differences in size of bones of the postcranial skeleton of various ancestral groups living in the Australasian region including; American Caucasoid, African American, Australian Caucasoid (CT scans only), Australian Aboriginal, Polynesian, South East Asian and Indian. A comparison between the two Caucasoid groups will allow for an assessment on the reliability of using American Caucasoid collections in the Australian environment. Univariate and multivariate analyses (Discriminant Function Analysis and Random Forest) will be utilised to assess whether it is possible to correctly allocate remains into ancestral groups. Multivariate methods have been shown to be useful for classification analyses and provide insight into what aspects of the postcranial skeleton provide the greatest differences between groups. This study aims to provide a new tool for Australasian forensic anthropology and will assist with our overall understanding of the factors controlling variation in the human postcranial skeleton.

Bumps, holes and lines: contributions made by bioarchaeological and forensic anthropological analyses of skeletal and dental defects

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While debates continue about the intention and value of the recovery, collection and analysis of archaeological human skeletal remains, there is no doubt that the study of skeletal and dental pathology has contributed to understanding the epidemiology of archaeological populations and the natural history of different diseases. In contemporary contexts, the documentation of bone and /or dental pathology may be useful when attempting to identify unknown human remains. From the descriptive case study of a specific disease to the identification of an individual recovered from a mass grave, this presentation considers the conceptual and practical evolution of bioarchaeological and forensic anthropological analysis of bone and dental defects and examines the range of contributions in different contexts.

Life and Death in the early Colonial settlement period of South Otago, New Zealand

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Two events are often linked to the early European settlement of Otago: the arrival of the first immigrant ships the Philip Laing and the John Wickliffe in 1848; and the series of Central Otago gold rushes in 1861-1862 that powered a commercial boom in Dunedin and a population explosion in the wider province. However, the establishment of farming was essential for the long term viability of the settlement, as the growing city of Dunedin needed a productive hinterland to provide food, and the easily won gold soon ran out leaving the miners the option of either moving on or settling down. The first settlers on the Tokomairiro Plain in South Otago arrived in 1850 to establish the town of Milton. Settlement in New Zealand was portrayed as offering opportunities for a healthier and more prosperous future compared to life in Britain. A recent excavation at the St John's Anglican burial ground in Milton has provided a unique opportunity to examine directly the health of early European settlers in the region. The preliminary multi-disciplinary results from historical records, osteology and chemical and molecular analyses will be presented and interpreted in the wider context of 19th century life in New Zealand.

The crimes scavengers commit: implications of scavenging on taphonomy and the post-mortem interval

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The aim of this paper is to present a section of data from Doctoral research into the post-mortem interval (PMI) of skeletonised remains, specifically the taphonomic implications of local scavengers. The materials include 12 *Sus scrofa* (white hybrid pig) and 12 *Macropus giganteus* (eastern grey kangaroo) carcasses which were part of a controlled animal model research experiment conducted between May 2012 and April 2014 in the Canberra region, Australia. The methodological approach involved assessing the impact local scavengers had on the carcasses which had been decomposing outside on the ground surface. The results of the research indicate that the behaviour of local scavengers is affected by seasonal changes in the environment, and as such, scavenging sequences cannot be used without further research to estimate the PMI of skeletonised remains.

Poor Old Men: Unfurnished Male Burials in Early Anglo-Saxon England

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Research has shown that in general old men in Early Anglo-Saxon burials are treated well in death; however, this is not universal. Of 367 burials in the three Early Anglo-Saxon cemeteries of Great Chesterford Essex, Mill Hill Deal Kent and Worthy Park Kingsworthy Hampshire, 13 (3.5%) were unfurnished male burials. Of these, eight were aged at greater than 45 years, four younger than 45, and five were unable to be aged. Recent studies have found that in general, men maintain or gain status in old age whereas women tend to lose it. This paper examines these men to determine possible reasons for their 'poor' status in death. We find that these men had hard lives, with more evidence for pathology than was found the general population; they tended to be buried in smaller graves, even though there was no difference in their stature relative to the rest of the male population. Our conclusions support the idea that these men may have been slaves or low-ranked servants, but there is no evidence to suggest that they may have been native British men.

An alternative objective microscopic method for the identification of linear enamel hypoplasia (LEH) in the absence of visible perikymata

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We propose a simple alternative objective microscopic method for the identification of systemic linear enamel hypoplasia (LEH). This method is specifically intended for archaeological dental assemblages that cannot otherwise be analysed with existing microscopic methods due to the absence of visible or continuous perikymata. Three sets (three individuals) of human dental remains from Metal Period Nui Nap and pre-Neolithic Con Co Ngua, Vietnam, were examined. LEH defects were objectively identified using the new Micro Polynomial quantitative method proposed in this study, which relies on enamel surface depth profiles. A second microscopic method (the Micro Metric method), which relies on perikymata spacing profiles, was used to verify the results of the new proposed method. The results were also compared to the standard macroscopic Field method. The Micro Polynomial method was successful in identifying 11 of the 13 LEH defects identified by the Micro Metric method. This result also compared favourably against the standard macroscopic Field method, which only identified a total of three LEH defects (a single defect on each set of dental remains examined in this study). Preliminary results suggest that the use of enamel surface depth profiles may be a viable alternative for objectively identifying LEH defects in dental assemblages when perikymata are difficult to observe, discontinuous, or missing altogether.

Porotic lesions on the cranial vault of Late Bronze Age to Early Middle Age populations from eastern Georgia

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Cranial porous lesions are the most common pathological conditions observed in archaeological populations. The lesions are a compensatory reaction to stress on the diploë, caused by changes in bone marrow cell size and/or function and are linked to dietary disorders and anaemia. The aim of this research is to compare the degree of healing in porous lesions of the cranial vaults of past populations from eastern Georgia from three consecutive epochs: Late Bronze Age (LBA), Hellenistic/Roman (H/R) period, and the Early Middle Ages (EMA). These epochs span the time-period between 1500 BC and 600 AD, when there was a change in lifestyle from mobile hunter-gatherers to sedentary agriculturalists and then to urban settlers.

The degree of healing was studied on 105 adults: 29 from LBA, 39 from H/R, and 37 from EMA. We observed an increase in the proportion of individuals with porous lesions through time (LBA 59%, H/R 67%, EMA 73%) and significant difference in the number of healed lesions across the time periods, chi-square = 6.99, (df = 2,) p<0.05. In the LBA no healed lesions were observed, whereas the number of healed lesions increased to 8% in the H/R period and 19% by the EMA.

The results suggest that a settled lifestyle increased the risk of anaemia in eastern Georgia. However, the health burden relating to porotic hyperostosis was greater in the LBA, possibly leading to death; hence no healed lesions. Increased prevalence of healed lesions in later periods indicates a greater ability to cope with anaemia.

The double edged sword of grandparental investment: Health costs and benefits of grandparental caregiving

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Across human cultures, grandparents make a valued contribution to the health of their families and communities. Moreover, evidence is gathering that grandparents have a positive impact on the development of grandchildren in contemporary industrialized societies. There is little understanding, however, of the health implications for the grandparents who are providing the childcare. Recent theoretical analyses propose a curvilinear relationship between grandparental childcare and health such that no contact or custodial childcare are detrimental for grandparental health and moderate levels of care may provide the optimal health benefits. The potential health benefits have not been considered. This paper uses data from Germany and Australia to examine the potential cost and benefits of providing childcare for grandparents' health. Using data from the longitudinal Berlin Ageing Study, survival analyses show that help provided by grandparents, in the form of babysitting without the parents present, is associated with increased longevity. Grandparents who provided childcare showed a significantly higher probability of surviving compared to grandparents who did not provide help and to non-grandparents. At the other end of the care spectrum, data from a Western Australian study of grandparents who are raising their own grandchildren shows negative health consequences of custodial grandcare. Qualitative and quantitative data will be presented that illustrate the negative health impact of fulltime care responsibilities for grandparents. This presentation will conclude with a discussion of the potential health promoting and limiting causal pathways that may be involved.

Comparison of Linear Enamel Hypoplasia in Lapita populations from Teouma and Talasiu

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Linear enamel hypoplasia (LEH) is caused by periods of systemic stress during the formation of enamel, and is often used in the reconstruction and comparison of population health in ancient and modern societies. This study assessed the prevalence of LEH in permanent dentition from two Lapita populations; Teouma, Vanuatu (n=5), which dates to early Lapita (c. ~3000BP) and Talasiu, Tonga (n=10), a later Lapita site (c. ~2500BP), as a means for comparing population health.

Microscopic examination was used to create surface profiles of each tooth being assessed. The defects were then identified using the newly developed 'Polynomial Method'. The frequency, duration, and chronology of defects were compared between the samples, as well as by biological sex.

No significant results were found using any of the statistical tests undertaken to compare the two sites, indicating that there were possibly similar causes of (or responses to) environmental and physiological strain at both sites. Some of the possible causes investigated in this study include malnutrition and pathology which would be consistent with scurvy, previously identified in pathological analysis of the sites, and chronic infection, as well as systemic stress caused by the developmental period around weaning. Furthermore, when male susceptibility is taken into account, the similarities between the sexes potentially indicate some preference for males and male children within the two populations, as has also been indicated historically and isotopically.

Student perceptions of a creative team-based learning approach to anatomy revision

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A revision session just before students' exams can be a high pressure environment, with tense students trying to maximize study time. Unable to use our anatomy labs in the session before our first year medical students' exam, we devised a theory revision session presented in a games format. Firstly, a word game required the verbal description of anatomical features to teammates. Secondly, team-based learning principles were employed as individual students answered a set of multiple choice questions, followed by the same test taken as a team with discussion. This format was intended to enhance student engagement in the process of identifying gaps in their knowledge, but we were aware some students might not perceive it as a valuable use of time. We therefore sought feedback from all students with a validated survey, asking three Likert-type questions and three open-ended questions. Surveys were returned by 266/ 287 students (92.7%). Most (78.5%) agreed or strongly agreed that the word game identified knowledge gaps, though there were several comments (16) that it was too fast for this purpose, but was certainly fun (49 comments). Almost all students (96.9%) agreed or strongly agreed that the multiple choice questions identified knowledge gaps. A similar number (93.0%) agreed or strongly agreed that working as a team was beneficial. Qualitative data from the open-ended questions reinforced these findings. The format was therefore received well and appreciated by almost all students.

Sex Estimation of Skulls from the Indian Subcontinent Using New Morphological Quantification Techniques

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Anatomical teaching collections typically contain isolated skulls usually of Indian origin. If their biological profiles existed, such skulls would be better utilised in physical anthropological research and education. Estimating sex is crucial for developing biological profiles. Indian populations have reduced sexual dimorphism and inaccurate sexing techniques. The browridges, mastoid processes and zygomatic arches lack objective quantification methods. This is concerning as they cannot contribute to statistically objective sexing methods. This study therefore developed several new techniques. The mastoid process and browridge volumes, the temporal bone's zygomatic process area and the zygomatic arch to infratemporal fossa distance were used alongside traditional craniometric measurements to create new discriminant functions. Skulls of 19th-20th century adult Indian articulated and half-skeletons from universities and museums in NSW and the ACT were measured (46 male, 15 female). Sex was determined from the pelvis and articular surfaces were matched to ensure bones were from one individual. The best function from stepwise analysis of all variables had a cross-validated accuracy of 95.7% in males and 93.3% in females. When tested on 7 skeletons withheld from original analysis, all skeletons were sexed correctly. Principal components analysis confirmed previous assumptions that size and robustness of features differentiate male and female skulls. However, intra-observer analysis revealed that these new techniques require improvement for consistency. These results are promising but require replication on a larger sample with more females. These functions can sex anatomical teaching skulls but caution must be used when applied to modern forensic cases involving Indian remains.

Dental macrowear analysis of the Neanderthal mandible from Regourdou (Dordogne, Southwestern France)

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Tooth wear is one of the most studied features in archaeology and anthropology for reconstructing diet, food processing and cultural habits of ancient populations and extinct human fossils. In particular, attritional areas (visible to the naked eye, and characterised by polished surfaces with well-delineated borders) are created by the contact of opposing dental arches during mastication, and they can be extremely useful to detect information about diet and non-masticatory behaviours. The aims of this study is analyse the occlusal wear pattern of the complete Neanderthal mandible of Regourdou 1 (Dordogne, Southern France), using a sophisticated and well-established method known as Occlusal Fingerprint Analysis. This new approach is based on the use of three-dimensional digital models of teeth to quantify structural parameters of wear facets, such as facet area, inclination and orientation. The frontal teeth of Regourdou 1 show a more advanced degree of wear than the postcanine dentition, with large dentine exposure and rounded labial wear, a typical pattern found in many Neanderthal specimens. The posterior dentition is characterised by an asymmetric wear pattern, with the right side significantly more worn the left half. In contrast, the left lower P₃ shows a more advanced degree of wear than the right premolar, with a mesio-distally elongated dentine exposure and semicircular enamel facets. The analysis of this unique pattern excludes the possibility that this type of wear is created by a normal chewing behaviour, but it rather indicates tooth-tool uses for daily task activities for food processing and/or manufacturing of objects.

Age estimation of skeletal remains using the auricular surface of the Ilium: a comparison between physical examination and photographic evidence

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The estimation of age at death is an essential aspect of identifying skeletal remains in forensic anthropology. Forensic anthropologists usually estimate age directly from physical remains, but in certain circumstances it may be pertinent to base estimations off photographic images. The validity and accuracy of currently established age estimation methodologies using photographic evidence has not been extensively examined. Professional forensic anthropologists frequently utilise age estimation methodologies based off the pubic symphysis and the auricular surface of the ilium. This project aims to address the literature gap, focussing specifically on the auricular surface of the ilium. The project will to test and validate the original auricular surface age estimation methodology by Lovejoy et al. (1985) through the comparison of physical examination and photographic evidence age estimates. Additionally, a comparison between the photographic age estimations formed using the Lovejoy et al. (1985), Buckberry & Chamberlain (2002) and Osborne, Simmons & Nawrocki (2004) methodologies will assess the applicability of auricular surface methods on photographic evidence. The proposed approach ultimately aims to test the validity of physical age estimation methodologies on photographic evidence, and consequently enable forensic anthropologists to estimate the age of skeletal remains from photographic evidence for academic and medico-legal purposes. Observations of images examined, shows that the physical examination age estimation methods are a valid approach to the examination of photographic evidence.

Preliminary results of a study of cold-induced vasodilation response among mostly Asian peoples

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The conference presentation represents preliminary results from the beginnings of a larger study aimed at evaluating how well the geographic origins of Asian peoples help predict the strength of their cold-induced-vasodilation (CIVD) response. Participants have been recruited so far through advertisements posted with Asian student groups at the University of Auckland and by word of mouth. Following submersion of their right hand to wrist level in 8°C water, the capacity to rewarm fingers in response to moderate cooling by periodically increasing peripheral blood flow was assessed with the average temperature from the first minimum to the end of 30 minutes used as the primary criterion. Additionally, so far 43 of the 65 persons reported on here have been tested twice with a separate evaluation of intra-individual response consistency. While sub-sample sizes are too small to draw conclusions, central tendencies in participants' CIVD responses accord with expectations based upon geographic origins. Among Austronesian speaking peoples in Island Southeast Asia (n = 23), the average temperature above water is relatively low (2.6 degrees), but the range of response variation is greater than anticipated (0.6 to 6.4). Moreover, participants from Near Oceania and Polynesia (n = 8) have average temperatures that are intermediate (2.9 degrees) between those of participants from Island Southeast Asia and those from Northern Europe (3.2) or Northern China (3.4). This study, when completed, will permit tests of existing as well as new hypotheses. Results will be integrated with other research to better understand how Remote Oceania was settled.

Modelling Decomposition in Aquatic Environments

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Research into decomposition in aquatic environments has gained some momentum over the past few decades. However, very few actualistic taphonomic experiments on aquatic decomposition have been attempted and a large percentage of research has been based on anecdotal data. This is essentially due to the multitude of variables that can affect the process, and in the case of experimentation, the logistics of recreating or controlling an aquatic environment.

The aim of this paper is to present the details of research conducted into developing a quantitative model of decomposition within aquatic environments. Three animal model experiments were conducted in different seasons (winter and summer), water types (fresh and salt water) and environment conditions (pond and harbour). *Sus scrofa* (white hybrid pigs) n=24, were used in the experiments.

Results indicate substantial seasonal variation in the progression of decomposition within aquatic environments, but with only minor differences between water treatments (salt vs fresh water). Further differences in the decomposition process were also observed in the later stages, particularly in relation to submerged and floating portions of the carcasses and manifestations of preservation. These results, the implications for estimating time since death (TSD) in aquatic environments, and potential application to a medico legal setting, will be discussed.

New applications for the 'Rule of Nines' method in Forensic Anthropology

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The 'Rule of Nines' is commonly used as a method of describing and calculating the total surface area of a body affected by severe soft tissue burns. Each region of the body (head, limbs and trunk) is allocated a percentage value that represents the contribution that the body region contributes to overall body surface area. Studies have found that the method is 'quick' and 'easy' and provides a reasonable assessment for initial management of burn patients.

The present study investigated the use of this 'quick and easy' Rule of Nines method as a means of quantifying the surface area of a body that has undergone decomposition for the purpose of determining the postmortem interval (PMI). It was hypothesised that the method would reduce subjectivity in comparison to commonly used anthropological PMI methods, as it assesses the amount of soft tissue that is present/absent at the time of 'discovery', as opposed to the 'stage' of decomposition. Three researchers with varying levels of experience scored ten pig carcasses using the 'Rule of Nines' method from digital photographs. Results demonstrate relative agreement in decomposition score between all three researchers when known PMI was within the first 7 days. This presentation will discuss the results of the interobserver agreement in detail, as well as issues arising when applying the score to known PMI equations. Suggestions for improving the method for use in PMI determination will be introduced.

Investigating aetiologies of lead poisoning to infer the complex behaviour of Kabwe 1 (*Homo heidelbergensis*)

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In recent years, there has been an increase in interest within the literature regarding the behaviour of the species *Homo heidelbergensis*. Past studies have relied heavily on stone tools for making inferences into the behavioural repertoire and flexibility of the species as evidence of symbolic behaviour has not been as prevalent. Here, the link between histopathological data and behavioural aetiologies for disease in the context of the species' behaviour is explored for the first time. Using the Kabwe 1 specimen as an example, and the previously established condition of lead poisoning as underlying the specimen's extensive pathology, this research discerns aetiologies for lead poisoning that are indicative of complex behavioural processes – namely geophagia and dermal exposure. The results are based on cross comparative analyses performed against past and present cases where geophagia and dermal exposure result in lead poisoning in various species and time periods. New insights into the symbolic and utilitarian behaviour of Kabwe 1, and the *Homo heidelbergensis* species as a whole, are presented.

Behavioural and Seasonal Variation in Habitat Use by Cat Ba Langurs (*Trachypithecus poliocephalus*)

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How primates use their available habitat is affected by, among other things, resource distribution and thermoregulation, both of which may change seasonally. This study assesses how two groups of an under-researched and Critically Endangered limestone langur species (the Cat Ba langur; *Trachypithecus poliocephalus*) use their petrous karst habitat with the goal of contributing to conservation management. Eleven months (180 days) of behavioural data were collected and used to calculate activity budgets. Habitat variables were also collected and included substrates (rocks/trees), vegetation coverages (sparse/dense) and hill types (steep cliff, valley, exposed slope, summits, and ground level) used by the monkeys. We predicted that the langurs would vary their behaviours across habitat variables (with foraging concentrated on food-plentiful slopes), and their habitat use across seasons. We found that langurs spend most of their time on rocks, in sparsely vegetated areas, and on exposed slopes and steep cliffs. All behaviours were more likely to occur on rocks and sparsely vegetated areas except foraging, which was concentrated in trees and densely covered areas. Densely canopied areas and valleys were used significantly more often in the dry season, possibly as a reflection of the need to increase foraging in food-rich, plant-diverse areas. Summits are also used more often in the dry season, possibly to thermoregulate via sunbathing when temperatures are cold. Overall, all habitat areas need protection against further degradation, although particular emphasis should be given to areas that harbour more food options for the langurs.

Visualisation and quantification of secondary dentin formation in MDCT scans: analysis of a contemporary Malaysian population

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Age is a crucial key indicator towards developing a biological profile for forensic purposes. Methods based on the analysis of the pulp chamber are recommended for age estimation in adults, with the Kvaal et al. approach frequently applied in different populations. The aim of the present study was to apply the Kvaal method in the analysis of 250 anonymised MDCT scans of Malaysian individuals, aged between 11 to 77 years. As per the directives of the method, length and width measurements of the tooth and pulp chamber were acquired in maxillary central and lateral incisors, second premolars, mandibular lateral incisors, canines, and first premolars. These measurements were then used to calculate a series of ratios that are subsequently used to formulate linear regression models. The multiple regression models were also generated separately for males, females and pooled sex. Intra-observer error was determined to be within acceptable standards for all measurements (TEM<1.0, rTEM<5%, R>0.75). Differences for the calculated pulp/tooth width ratios from measurements acquired from sagittal and coronal view were evaluated and no significant differences were observed, $p \geq 0.019$. The most accurate model was for maxillary lateral incisor in males (SEE ± 11.257); this is the only model that fit the acceptable range for forensic application (SEE ± 5 to 12 years) (others with SEE ± 12.783 to 15.588). Regression models based on the measurements of multiple teeth did not improve the age prediction accuracy. Therefore, this method is deemed not reliable for forensic age estimation from MDCT images in a Malaysian population.

The effects of experimental burning on *Sus domesticus* dental enamel in a forensic and archaeological context

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Understanding the effects of burning on teeth is central to forensic and archaeological research and professional contexts. However, our current knowledge in relation to specific burning temperatures and the associated effects on tooth enamel is based on a small number of studies with wide-ranging experimental designs. Here, we seek to determine a temperature point at which tooth enamel no longer displays perikymata, and whether a controlled increase in burning temperature has an associated inverse effect on the weight of teeth.

Eighteen molars from archaeological *Sus scrofa* (domestic pig) were burnt in a furnace at 20°C increments, starting at 410°C and ending at 750°C. The morphological colour changes observed demonstrated a progression from light to dark brown, through black, light grey and blue to white. Enamel fracturing and disintegration increased with the rising temperature until 610°C, when enamel began to shatter. Perikymata were no longer visible at 710°C. There was a statistically significant difference before and after burning loss in the weight of all samples, with all teeth losing an average of 30% of their original weight.

The results provide a preliminary model for further research which should utilise human teeth. We propose that burnt dental tissues begin structural disintegration from within at approximately 600°C, but retain lateral structure until 710°C. We conclude that future analyses of burnt human dental remains should incorporate a combined examination of qualitative and quantitative approaches from which it may be possible to infer the burning circumstances for remains from archaeological or forensic contexts.

Radiogenic isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) do not support the presence of migrants at Samtavro cemetery, Georgia (4th - 6th centuries AD)

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Situated in Mtskheta, Georgia, Samtavro cemetery provides evidence of interaction between local human populations and Greek, Roman, and Sassanid civilisations. A notable cultural transition dating to the 4th-6th centuries AD is indicated by declining tile-lined burials containing single articulated interments, and proliferation of stone-cist tombs containing multiple disarticulated skeletons and individuals with intentionally modified crania. The modified crania belong almost exclusively to adult females, with no juveniles represented, suggesting a novel cultural influence introduced via an influx of migrants. This study uses radiogenic strontium isotope ratios ($^{87}\text{Sr}/^{86}\text{Sr}$) to test for the presence of migrants to the region, and offers a reanalysis of human strontium data using new environmental values from the landscape surrounding Mtskheta. $^{87}\text{Sr}/^{86}\text{Sr}$ was measured in tooth enamel of 11 humans, including individuals from stone cists (n = 8, three with modified crania), and tile-lined burials (n = 3). The local bioavailable strontium range was estimated via measurement of $^{87}\text{Sr}/^{86}\text{Sr}$ in vegetation samples (n = 6) and snail shells (n = 5) from six localities near Samtavro with differing geological substrates, and faunal tooth enamel from Samtavro cemetery (n = 14). $^{87}\text{Sr}/^{86}\text{Sr}$ of all faunal and environmental samples ranged between 0.7067 and 0.7083 (median = 0.7078 ± 0.0004, 1). Human $^{87}\text{Sr}/^{86}\text{Sr}$ values exhibited little variability, ranging between 0.7074 and 0.7083 (median = 0.70785 ± 0.00025, 1), falling within range of local faunal and environmental values. Based on $^{87}\text{Sr}/^{86}\text{Sr}$ data, we find no support for the hypothesis that non-local individuals were interred at the Samtavro cemetery.

DISH and erosive arthropathies (gout): Exploring the origins and antiquity of noncommunicable diseases in Northeast and Southeast Asian populations through pathological joint conditions

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This proposed project seeks to contribute to the knowledge of non-communicable diseases (NCDs) (i.e. metabolic syndrome, cardiovascular diseases, renal diseases) by assessing skeletal evidence of diffuse idiopathic skeletal hyperostosis (DISH) and erosive arthropathies (gout) in the archaeological record. NCDs are global health problems and the leading cause of population mortality today. DISH and gout appear to be comorbid, and are commonly linked to rich dietary intake in European populations. However, genetic predisposition is also considered an underlying mechanism in the manifestation of these pathological joint conditions.

This research will assess DISH and gout in skeletal assemblages from archaeological sites in Northeast and Southeast Asia to inform on the origins and antiquity of NCDs. Populations groups such as those from Northeast Asia, Southeast Asia, and the Pacific Islands demonstrate high rates of metabolic health problems, and their close ancestral link to each other suggests a hereditary aspect behind the prevalence of NCDs specific to this region. The research will explore the relationship of DISH and gout to body size as measured by long bone dimensions (e.g. diaphyseal length and breadth, and articular surface dimensions) as a proxy for physiological stress (e.g. food shortage, dietary pattern). Current health literature and the archaeological record will be drawn on to illustrate how socio-cultural and environmental stresses may have imposed directly, or indirectly, to DISH and gout pathogenesis.

Death from or with child? Re-evaluating the probable case of euthanasia from Roonka

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There are surprisingly few palaeopathological records of death in childbirth but one of the more spectacular is the case of Burial 110 from Roonka. In 1983, Pounder et al. described the burial of this woman and foetus as a probable case of mercy killing as a result of dystocia of the foetus. This case is widely cited but while undertaking an inventory of the remains and going back through the burial field notes and photography, we began to be less certain of this diagnosis. Partially this uncertainty was fuelled by the discomfort in thinking about someone being killed by being struck across the forehead when in extremis. Such a blow would be an uncertain cause of death, the woman would be facing her assailant, and would such desperate measures really be necessary?

In this paper, therefore, we reanalyse Burial 110 paying attention to four different issues:

- Taphonomic: which fractures are perimortem?
- Archaeoethanatology: what was the position of the body and the child?
- Historical: was euthanasia likely or necessary?
- Ethnographic: is the evidence consistent with Aboriginal practices.

On the basis of the answers to these questions, we argue that it is unlikely that the woman was in childbirth and that the injuries are more consistent with domestic violence than a mercy killing. However, consistent with the argument for mercy killing, this is not an uncomplicated story. This woman was certainly killed but what the burial itself shows is how multifaceted violence and care can be.

Determining conservation priorities: past susceptibilities meet present threats

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We are currently facing an impending extinction crisis of the world's nonhuman primate species. While the underlying threats are widespread, namely a suite of unsustainable human activities, species loss should generally follow patterns of relative susceptibility to extinction processes. As the setting of regional and taxon-specific priorities remains a vital component of conservation strategy, I propose the development of a conceptual model whereby human attitudes and actions are integrated with existing, biological susceptibilities to extinction processes. In this model, an unweighted system of scoring the presence or absence of specific characteristics (e.g., being a prey species for local hunters; presence or absence of taboos prohibiting meat consumption, etc) will produce an index of human impact. In turn, this index can be used with other measures of susceptibility (e.g., low population density; maximum latitudinal range) to determine particularly susceptible species based on an integration of cultural and biological data. The proposed framework will increase conservation efficacy for endangered primates through not only the identification of highly vulnerable taxa, but also by engaging with the social and cultural landscapes wherein conservation tactics are to be deployed.

A comparative study of intentional cranial modification in Georgia, Hungary and Bavaria from the European Migration period (4th – 7thC)

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The practice of intentional cranial modification proliferated in Europe following the arrival of the Huns into Hungary in the 5th century. Crania were modified by binding the head of infants soon after birth producing a permanent and conspicuous alteration in shape. My hypothesis is that the Huns used cranial modification as a deliberate strategy at this time to identify those people affiliated with them. Contemporary records confirm the powerful and prolonged influence of the Huns in Europe however their approach to cranial modification was not documented. To investigate this, I scanned modified cranium from Georgia, Hungary and Bavaria for a comparative analysis. In Georgia, cranial modification was common involving 24% of individuals, mostly females and rarely juveniles. In Bavaria, it was rare and almost entirely involved females. By contrast in Hungary males, females and juveniles are involved affecting up to 50% of the population. This indicates that in Georgia and Bavaria cranial modification was associated with female migration whereas in Hungary it was actively practiced. A quantitative analysis of the cranial morphology, using geometric morphometric techniques, revealed Hungarian crania to be of a specific shape, with little variation, formed by the application of two bindings whereas by contrast Georgian modified crania showed much greater variation and most appeared to have been formed by a single binding. This was similar in Bavaria. These findings support the hypothesis that intentional cranial modification was advanced in Hungary while under Hunnic control as a specific means of discriminating their affiliated population.

A Palaeodemographic Measure of Maternal Mortality and Multi-Faceted Approach to Maternal Health

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The objectives of this study were to develop a way to estimate the maternal mortality rate (women per 100,000 who die during pregnancy, childbirth or within 42 days) of ancient populations and describe the potential practical applications of such a measure. Using age-at-death data and maternal mortality rates for 76 countries from the United Nations database for the years 1990-1995, we examined the correlation between female to male deaths ratios for the core childbearing ages and the maternal mortality rate. We utilised linear regression to determine an equation for calculating total maternal mortality from the ratio. We achieved a correlation of 0.840 between our dF20-24/dM20-24 ratio and actual maternal mortality rates. The maternal mortality rate can be compared to those of other ancient populations to identify relative differences in intra- and inter-population maternal mortality. In the context of broader bioarchaeological information, such as indicators of care, nutritional deficiency, disease and socio-economic status, the maternal mortality rate may offer exciting new insights into the causes of maternal mortality, sophistication of maternal care, and female experience of pregnancy and childbirth in past populations.

D0-14/D: A New Palaeodemographic Ratio and Equation for Estimating Total Fertility Rates

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Palaeodemography is the study of the demographic dynamics of past populations. Such attributes can provide significant and valuable insight into the ability of past humans to adapt in response to environmental events, such as climate change, and societal change, for instance migration and social complexity. Several key issues underpin palaeodemography, with the predominant concerns at present being the inaccuracy of age-at-death estimation techniques, non-stationarity of populations, and underenumeration of infants. In order to address the underrepresentation of infants, palaeodemographers have tended to exclude the youngest age group from analyses and utilise remaining age categories to estimate demographic parameters. Whilst this may be suitable for those samples where differential preservation and recovery or cultural practices have led to an apparent underrepresentation of infants, infants can be well represented in some skeletal assemblages. We propose the D0-14/D Ratio as an alternative palaeodemographic tool for application to sites where infant representation is good. We achieved a correlation of 0.848 between our D0-14/D Ratio and actual fertility rates. This correlation was significantly higher ($p < 0.05$) than the other ratios examined, including the d5-14/d20+ by Bocquet-Appel and Masset and the 15P5 index by Bocquet-Appel. Using linear regression we have calculated an equation by which total fertility rate can be estimated and ultimately compared with other total fertility rates regardless of temporal or geographic origin. In addition to providing a tool to estimate total fertility rate, we believe we have made progress in addressing some of the key issues in palaeodemography, specifically age-at-death estimate error and non-stationarity.

Useful exposures: LEH, migration, and endemic disease

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Stressors during childhood are often detrimental to later health outcomes, with stress indicators, such as linear enamel hypoplasia (LEH), frequently associated with decreased longevity even in adulthood. However, in some situations it may be a lack of childhood disease exposures that is more injurious to long term survival. This research considers survival risks associated with LEH in skeletal remains of adults ($n=195$) living in London during the industrial revolution (1760 to 1840). Results suggest that high frequencies of LEH were no barrier to reaching older adult ages but furthermore it was adults with fewer defects who were most likely to die before 35 years of age (risk ratio = 0.53, 95% CI = 0.29-0.97). In addition, this younger group of individuals had significantly longer femurs (mean difference: Z score=0.55, S.E.=0.26, $t= 2.08$, $df=88$, $p=0.040$), marking them as likely having experienced less stressful developmental environments compared to others in the sample. Skeletal data is supplemented by St. Bride's parish burial records ($n = 8179$) to identify trends in the main mortality drivers, revealing a relative increase in smallpox burials for this age group. I suggest the positive relationship between the number of LEH and longevity is most likely explained by migrants moving to London from rural regions where certain diseases, such as smallpox, were not yet endemic.

The effects of prenatal stress on birth outcomes in Queensland following the 2011 floods

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Exposure to environmental disasters, such as floods, can be a traumatic experience, and exposure to this stress during pregnancy can have significant impacts on foetal development. Previous studies have found that exposure to environmental disasters during pregnancy can result in adverse outcomes such as pre-term birth, low birth weight, an increased risk of spontaneous abortion and fewer male births. We examined changes to birth outcomes following the 2010-2011 Queensland floods using a population cohort method. Chi-square tests for independence compared birth outcomes between different flood-affected areas of Queensland. Following this, birth outcomes were compared across five years within each of these different areas. This study principally found significant reductions to both birth weight ($p < 0.0001$) and gestational age ($p < 0.0001$) in babies born to mothers in moderately flood-affected areas exposed in the second trimester. This significance remained when examined across years within the area, and significant reductions to birth weight were also found for babies exposed in the third trimester ($p = 0.046$). A range of demographic factors were also analysed, suggesting that several pre-existing factors may have influenced the experience of stress for these mothers. Due to the increasing frequency of extreme flood events and the adverse effects of these events on birth outcomes, these results will help expand our understanding of the relationship between environmental disasters and birth outcomes to improve public health policy and disaster management. Results will also shed light on how the experience of stress may vary between women and how this will impact vulnerability to future disaster events.

Decomposition of human remains deposited on the ground surface: A preliminary comparison between two Australian bushland sites

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When estimating time since death for human remains, factors affecting the rate of soft tissue decomposition include the intactness of the body and the local environmental conditions.

This current study examined some specific soft tissue changes in partial remains and one whole cadaver. Significant differences were found between fleshed, severed limbs placed on the ground surface at a facility near Belanglo State Forest, NSW, Australia and an intact cadaver 100 km away at AFTER in Yarramundi, NSW. Ant activity in the early stages of decomposition was found to be similar. Maggots, on the other hand, differed in the time taken to reach their maximum levels of activity. Maggots on the severed limbs reached their maximum activity level at around 6 days whereas maggots associated with the complete cadaver were most active at around one month from deposition.

Moulds, similar in appearance, appeared at both sites, but were present earlier at the Belanglo site. The timing of grease and fluids emanating from the remains also differed between sites. Greasy 'haloes' impregnated surrounding soil weeks earlier around the severed limbs than around the complete cadaver.

Considering the possible reasons for the differences observed, it has been demonstrated previously that trauma accelerates decomposition processes. The earlier changes recorded for the severed limbs are therefore not unexpected. Despite the distance between the sites being relatively small it is likely that differing temperatures and humidity have also contributed to the results observed. This demonstrates the importance of site-specific research in time since death studies.

Reproductive Aging in Captive Chimpanzees

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As more than half of all primate species are threatened with extinction, studies in evolutionary sciences, captive management and conservation are vital, and reproductive ageing is a key issue in these fields. This study explores reproductive ageing in female captive chimpanzees (*Pan troglodytes*) by using an international, zoological database provided by Taronga Zoo, Australia. Using birth history, pedigree, and zoo relocation records, the sample of individuals (N=102), their mothers (N=94), and their offspring (N=360) were analysed to explore potential impacts on reproductive ageing. An element of reproductive aging, post reproductive lifespan (PRL) was used. Multiple Regression Models were used to study the linear relationship between individual's PRL and reproductive traits. The results show that female captive born chimpanzees have a longer PRL, as predicted by Age at first birth ($p=0.038$) and Total number of births ($p<0.001$). This indicates that, in this sample, individuals that reproduced later, had a longer PRL. This is supported by a similar relationship between lifespan and Age at first birth, where a linear relationship was also found ($p<0.001$). Therefore, there appears to be a trade-off between reproduction and lifespan. Investigating the factors surrounding chimpanzee reproductive aging and lifespan is not only relevant to conservation, but also any humans that reproduce later in life, as chimpanzees may be used as model for human aging. Findings such as these can be used to improve research into primate health and reproduction.

Hip joint ankylosis and femoral bone adaptation: A histology case study from the Metal Period Philippines

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It is now well established that changes in mechanical load can affect limb bone macro- and microscopic bone adaptation. However, limited research has been undertaken investigating the biomechanical effects of one-sided hip joint pathology on lower limb bone structure. This study examines skeletal traits of the left and right leg in an archaeological individual who presented with ankylosed left hip joint, and would have experienced difficulty with mobility in the years prior to his death.

A macroscopic examination, utilising entheses assessment and morphometric measurements, of right and left femur was undertaken on the remains representing a middle-aged male from the Metal Period site of Nagsabaran, Philippines. Histological sections were then produced for the femora to examine vascular canal density, to gain insights into cortical bone metabolism and remodeling.

Midshaft entheses of the ankylosed femur were poorly expressed and of smooth topography, and its cortical width was thinner. Higher density of cortical pores examined using static histomorphometry was observed. Geographic information system (GIS) software was used to map cortical pore density in the endosteal and periosteal bone, revealing a statistically significant ($p. 000$) reduction in its average pore-to-pore distance in the ankylosed sample. Results indicate that reduced mechanical load of the lower limb has negative effects on skeletal adaptation resulting in bone "wasting".

Understanding sex in bioarchaeology: Current limitations in “gendered” methods

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Current methods of estimating biological sex from human skeletal remains are generally focused upon size and indicators of bone morphology related to functional adaptations. Traditionally, most confidence in estimation accuracy and reliability has been placed on the shape and features in innominate bones, followed by cranial and other post-cranial skeletal elements. However, as there is such significant inter-individual and inter-population variability in human skeletal size and shape visible in cranial and non-cranial bones, current qualitative and quantitative methods are prone to either misidentification, or an estimation of sex as indeterminate. This is likely due to the issue that current methods rely upon ideas of what is considered ‘male’ or ‘female’ features. For example, relatively larger samples are often implied to be male, creating an immediate bias in methodological approaches implemented by osteologists. Ultimately, it can be argued that this has created structured methodological standards entrenched in gendered biases. This study briefly presents the problems associated with our current abilities to estimate sex due to gendered biases, and discusses potential future research avenues to address these limitations. Specifically, insights from experimental skeletal biological research utilising histological methods will be used to illustrate how to further our understanding of the multi-faceted sex-specific bone growth in humans.

Trauma and conflict in prehistoric Southeast Asia

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Here we present the first large-scale temporal and geographical comparison of trauma that has been compiled for prehistoric mainland Southeast Asia (Thailand, Cambodia, Vietnam and Myanmar) as opposed to narrow localised studies. This will serve to identify cultural and environmental stressors that lead to trauma in earlier societies. An increase in the prevalence of individual trauma (fractures, sharp force and blunt force lesions) was observed from the Neolithic (7.8%), to the Bronze Age (11.8%), and to the Iron Age (12.6%). The increase in risk of injury in this sample is suggested to be related to increasing socio-political and technological complexity, burgeoning population density and environmental constraints. Local variability is observed in the type and prevalence of trauma, with most skeletal assemblages reflecting an accidental injury pattern (Colles’ fractures, trauma to the small bones of the hands and feet, vertebrae, pelvis and clavicles). However, a number of sites exhibit evidence of trauma associated with interpersonal violence (craniofacial injuries, distal ulna fractures and perimortem sharp force trauma). Several Iron Age sites in northeast Thailand and northwest Cambodia experienced serious physical conflict compared to other regions. This coincides with intensified agriculture in northeast Thailand and greater influence from external sources including China and India. In northwest Cambodia there was contextual evidence of significant social tension prior to the formation of centralised polities such as Angkor in Cambodia. We argue that while there is a general increase in the amount of trauma over time, the causes may be multifactorial and represent a range of local and regional variation that requires further research.

Evaluating the taxonomy of *Proconsul* and *Dryopithecus* by randomised resampling from a large dental database of extant hominoids

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The Miocene fossil hominoids, *Proconsul* and *Dryopithecus* occupy key stem positions in the human evolutionary tree. With typically limited sample sizes, however, it is difficult to understand their patterns of variation and determine their alpha taxonomy and phylogeny. Extant hominoids, *Pan*, *Gorilla*, *Pongo* and *Hylobates* make good comparative models because of close phylogenetic links, well-known taxonomy and large sample sizes. The purpose of this study is to evaluate the taxonomy of *Proconsul* and *Dryopithecus* by randomized re-sampling from a large dental database of extant hominoids. Focusing on the lower second molar, samples of 26 for *Dryopithecus* and 33 for *Proconsul* were randomly redrawn 1000 times from samples of 283 *Pan*, 270 *Gorilla*, 155 *Pongo* and 301 *Hylobates*. This exercise tests the null hypothesis that the variation in the fossil species is equivalent to that in closely related extant species. The coefficient of variation (CV) for mesiodistal and buccolingual dental dimensions was used to compare the fossil and extant hominoid dental variation. The CV for dental dimensions are high in *Proconsul* and *Dryopithecus* compared with the extant hominoids. There is less than 0.05% probability of encountering a CV as high as *D. carinhiacus* and *P. major* in species of extant hominoids, suggesting that more than one species is currently collapsed in the fossil taxa. The extant hominoids differ in fundamental ways in their degree and patterns of dental variation and provide variable interpretations for fossil hominoid taxonomy, making this a rigorous analysis for understanding fossil hominoid dental variation.

Stature estimation in forensic anthropology: A scoping review

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Stature is one of four biological traits used in forensic anthropology to identify individuals. One of the more reliable methods used to estimate stature is the mathematical methods which uses mathematical equations, but is also population specific. Currently no equations exist that can be applied to the Australian population, which is very diverse. Hence, the aim of this project is to conduct a scoping review to comprehensively review and identify stature estimation equations for diverse populations developed in the last ten years. A scoping review aims to rapidly gather literature and key concepts to map accumulated evidence surrounding a research area. Inclusion criteria for this study consisted of studies incorporating skeletal elements, mathematical methods, individuals above 18 years of age and studies conducted in the last 10 years. Studies using body elements other than skeletal material, stature of children, individuals with skeletal deformities or pathologies, studies not written in English and those that had less than 10 subjects in the study were excluded. The search strategy for this scoping review included a three step search. Firstly, reviews were conducted by two independent researchers in Scopus and Web of Science databases. Search terms included “stature estimation” AND “forensic” AND “anthropology”. Articles were then selected in a systematic process by excluding irrelevant articles. The selected articles were eventually reviewed and relevant information extracted on mathematical equations for stature estimation. Data collected from this scoping review has now facilitated information for a systematic review in which the gathered equations can be tested.

Seasonal Variation in Wombat Macronutrients: Implications for late Pleistocene Aboriginal Hunting Practices in Tasmania

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Ethnographic accounts from around Australia demonstrate the importance of fat within hunter-gatherer diets. This is particularly true of communities with diets high in lean protein living within regions with high calorific demands. One such region is southwest Tasmania, occupied throughout the late Pleistocene between c.40,000 calBP to 16,500 calBP. The exceptionally well preserved faunal assemblages recovered from sites within the southwest demonstrate that two species dominated the diets of Pleistocene Aboriginal Tasmanians: the Bennett's wallaby, and the Tasmanian Common wombat.

Isotopic analyses of archaeological wombat teeth have demonstrated that hunting of this species was focussed during a narrow seasonal range – late winter to mid-summer – a time of year associated with the best grass growth. Further, this pattern is replicated throughout each of the three sites which were assessed (Kutikina Cave 25m a.s.l.; Warreen Cave 215m a.s.l.; Bone Cave 400m a.s.l.), regardless of age or altitude. This pattern contrasts to the assessments of seasonal hunting of the wallabies, shown to have been focussed over summer in the higher altitude sites and over autumn and winter in the lower sites. Of importance in the interpretation of these patterns are the differences in the distribution and treatment of skeletal elements for each species. Wallaby long bones were repeatedly cracked open to access the marrow within. Wombat elements however are dominated by elements found in association with surface pockets of fat, located between the upper limbs and the torso and the crania and neck. I argue that these patterns, in association with environmental variables, represent a systematic strategy focussed on the recovery of the best energy yield from the environment – a focus on fat. To test this model, longitudinal data have been collected on the variation in macronutrients found in a variety of wombat tissues – brain, muscle, marrow and fat – from the Cradle Mountain region of highland Tasmania. These results suggest that macronutrients do indeed vary on a seasonal basis. Here I will explore the implications for Aboriginal wombat hunting during the late Pleistocene in southwest Tasmania.

A Preliminary Study of Inverse Correlations between Female Employment and Female Pertussis Mortality in South East Australia and New Zealand, 1864 to 1925.

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This paper compares female employment rates to ratios of female pertussis mortality (reported as 'whooping cough') in late colonial and early commonwealth populations in south-east Australasia from 1864 to 1925. In this study area, during this time, women progressively made up a larger percentage of the work force and there are notable land mark decisions on women's suffrage. This makes the area well suited to studying the selective mortality process of pertussis in relation to the social development of female autonomy. The study has found that as the study period progressed there was the expected overall decrease in 'whooping cough' specific mortality rates. The reduction in female mortality categorised as 'whooping cough', however, decreased to a much larger extent than male mortality from the same cause. There were good negative correlations ($r=-0.649$) between female percentage of the work force and the share of 'whooping cough' deaths that were female. A lagging analysis was also conducted which showed an improvement in the correlation when comparing the census data for year x against the share of 'whooping cough' deaths that were female for years Y_{x+1} ($r= -0.737$), while showing little correlation against Y_{x-2} , Y_{x-1} , Y_{x+2} and Y_{x+3} . The lagging analysis shows that changes in female employment precede changes in female 'whooping cough' mortality by 0 to 1 years.

The Agricultural Transition and Health in Predynastic Egypt: Using Meta-analysis to undertake a Regional Analysis

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The agricultural transition is seen by many as one of the major defining points in human history. While the transition resulted in many cultural changes, including permanent settlements and craft specialisation, the transition would have also had an impact on human biology and health. The agricultural transition has been traditionally associated with universal declines in health, however recently there has been a shift towards a more regionally specific and diverse relationship between health and the agricultural transition. This study contributes to the growing collection of regional health studies, investigating the effects of agricultural transition and subsequent urbanisation in predynastic Egypt upon human biological adaptation. Using a meta-analysis approach, previous studies on enamel hypoplasia, porotic hyperostosis and cribra orbitalia were collated to produce a large data set. Temporal changes in the frequency of these skeletal markers were then investigated. Two temporal trends were identified. The first temporal trend sees a marked decline in the frequency of all three stress markers across the transition to agriculture and beginnings of intensification. The second temporal trend identifies a subsequent increase in the frequency of stress markers, associated with the move to urban settlements and increasing intensification. This suggests that in the Egyptian region, large urban settlements associated with state formation and the dynastic period, placed greater health pressure on the population in comparison to the agricultural transition itself.

The distribution and morphology of skeletal fractures resulting from fatal low (≤ 3 m) free falls

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Fatal low (≤ 3 m) free falls often result in blunt force trauma to the skeleton. How this skeletal trauma manifests in the skeleton however, is currently poorly researched and understood by forensic practitioners. Subsequently, this study aimed to identify the types of skeletal fracture patterns and morphologies that result from a fatal low free fall. Skeletal trauma was analysed using the full-body post mortem computed tomography scans of 145 individuals who were known to have died from a low free fall. This trauma was then examined in the context of variables that are known to influence how an individual falls using multiple logistic regression. Analysis showed the axial skeleton was more likely to fracture as the fall height increased (1.5 - 3 m), whilst the appendicular skeleton (primarily lower extremities) was more likely to fracture as the fall height decreased (< 1.5 m). Upper extremity fracturing was more likely to occur if the fall was intentional and the individual had no pre-existing medical conditions. Post-cranial bilateral fracturing was more likely to occur as the fall height increased, whilst unilateral fracturing was more likely to occur in older individuals. An examination of fracture morphologies identified 108 different types. Six of those (skull, rib and femur fractures) were significantly associated with the height fallen. This study has identified that there are fracture patterns and morphologies characteristic of fatal low free falls. These findings will further inform anthropological interpretations of trauma in cases where a fall may be considered the possible mechanism.

Skeletal trauma in northern Vietnam during the initiation of pastoralism (c. 6700 – 6200 BP)

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Trauma within a population can highlight the potential social and physical risks faced by that population over broad periods of time. At an individual level these provide a snapshot into one person's life, physical challenges, and possible adversity following injury. Prior to rice cultivation, northern Vietnam was occupied by hunter-gather groups co-existing with an array of animals including some large and dangerous (for example tigers, crocodiles, buffalo). Injuries sustained interacting with wild and domestic animals, including bovines, can be severe. Adult individuals (n = 110) from the pre-agricultural site of Con Co Ngua (CCN) (c. 6700 – 6200 cal BP) in northern Vietnam were analysed for sharp and blunt force skeletal trauma. It is hypothesised that the types and pattern of injuries will include trauma sustained during close contact with buffalo given the large number of their remains found at the site. Crude trauma prevalence (n = 14/110, 12.7%) was not significantly different between males (n = 8/52) and females (n = 5/37) (p = 0.714). Nor were there significant differences in the prevalence of fractured limb elements. However, the pattern of trauma between the sexes differed with half of injured males suffering vertebral fractures. These injuries are consistent with high-energy trauma sustained during bovine attacks and falls from a height. The prevalence and pattern of fractured limb bones at CCN when compared with other Southeast and East Asian sites is most similar to the agropastoral site of Lamadong, China. The potential for skeletal trauma to assess animal trapping and herding practices in the past is discussed.

Isotope analysis of archaeological human remains in Bahrain: Promises and pitfalls

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Dietary and subsistence shifts in ancient Bahrain (2500BCE-1250CE) have been used to explain a pattern of changing disease ecology that occurred on the island. However, the current dietary evidence does not provide enough information to support this hypothesis. A detailed characterisation of diet at both an individual and cemetery scale and through time is needed to further an understanding of the relationship between subsistence practices, diet, and disease. As part of my PhD research, I am currently analysing bone and tooth isotope chemistry of human and faunal remains to reconstruct local isotope ecologies through time on Bahrain. In this paper, I will outline what information isotopic analysis of people from Bahrain can tell us about their behaviour and how that has changed (or not) through time.

However, the alkaline soil of Bahrain presents a unique challenge to developing a detailed characterisation of diet using stable isotope analysis. The alkaline nature of the soil leads to poor bone collagen preservation. As a result, only a relatively recent cemetery in this collection, Qal'at al-Bahrain, which was in use during the Middle Islamic period (ca. 1250CE), has yielded sufficient collagen samples for carbon and nitrogen isotope analysis. This limitation is due to the poor preservation of bone collagen from early cemeteries and has prevented a diachronic assessment of dietary behaviour. I will discuss and report preliminary results for new approaches to this challenge, including a gentler, slower preparation method of bone collagen extraction and the sampling of dentine in addition to bone collagen.

Developmental Disruptions in Non-Human Primates of Known Histories

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Developmental defects on the outer and inner aspects of tooth crowns and roots are known as hypoplasias and accentuated lines, respectively. These features are frequently examined for insights into human and non-human primate childhood disease, nutrition, environmental variation, early mortality, and weaning. While precise records of developmental defects may provide key insights into human evolution, very few studies have examined the teeth of individuals of known histories. I determined the timing of developmental defects on casts and in histological sections of captive juvenile rhesus macaques (*Macaca mulatta*), captive juvenile pig-tailed macaques (*Macaca nemestrina*), and wild juvenile chimpanzees (*Pan troglodytes verus*), which were compared to medical and/or behavioural records of potential developmental stressors. I found that hypoplasias are uncommon on the permanent molar crowns of these individuals, but I frequently observed accentuated lines in postnatal enamel and dentine. Teeth are particularly sensitive recorders of diarrheal illnesses, as well as medical procedures. It does not appear that the normative cessation of nursing (weaning) leaves a consistent or marked developmental defect in captive or wild primate molar crowns. Finally, I show that a ten-year record of developmental defects in the Taï Forest wild chimpanzees does not correspond to local patterns of rainfall, fruit availability, or epidemic illnesses observed in this community. While human and non-human primate teeth may show events such as birth, severe illnesses, and poor nutrition under certain conditions, conclusive identification of weaning, malnutrition, disease, and/or environmental variation from hypoplasias or accentuated lines requires additional evidence.

The Embodiment of Unequal Childhoods in Aotearoa New Zealand

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Over the last few decades anthropologists have played an important role in showing how inequality gets under the skin. In the literature, the embodiment of inequality is usually discussed in terms of biological measures such as biomarkers, health measures and epidemiological data, recognising that patterns across populations and subgroups do not reflect inherent biological differences, but the embodiment of common, sometimes unequal environments.

This doctoral research offers another mechanism for the embodiment of unequal environments, this time in the way that children learn to 'be' in their bodies differently in different contexts. My research centres around the case study of rheumatic fever, which, almost exclusively affecting Māori and Pasifika children, represents a marker of social inequity in New Zealand. Based on fieldwork with 82 children aged 8 to 12 living in an impoverished community in South Auckland, I consider the inadvertent impact of a school-based 'sore throat' swabbing clinic and targeted media campaign for the production of unequal experiences of the body. I use Bourdieu's *habitus* and the phenomenological concept of *intentionality* as a theoretical framework to trace how children's bodies are coproduced through their own agentic practices, in relationship with peers and family, shaped by local cultural understandings, and structured by resource distribution, institutions and policy.

Inferring diet in medieval England from bone histology and stable isotope data: preliminary results

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Inferring diet is important in bioarchaeology and skeletal biology, but traditional waste refuse analyses are limited. Instead, isotopic studies are frequently used to investigate diet, and diet variation between high and low status individuals. Recent studies have used histological techniques to assess osteon population density (OPD) in ancient humans, differentiating upper from lower status individuals, likely due to nutrition and lifestyle factors. For the first time, we combine bone histology and isotope data to investigate dietary variation and its effects on bone microstructure in medieval Canterbury, England. Miskiewicz and Mahoney (*Anat Rec* 2016:50) identified significant differences in OPD between monastic (upper) ($M=20.5/\text{mm}^2$, $SD=3.9$) and lower status ($M=18.6/\text{mm}^2$, $SD=3.2$) individuals ($P=0.003$). Historical records imply monastic diets of this period (11th-16th century), were almost three times the contemporary recommended daily caloric intake that included the consumption of meat, dairy, and fresh fish, while the common diet was restricted to being largely grain-based with minimal meat or fish. Using these published bone histology data and new nitrogen isotope data, we compare bone samples from monastic ($n=22$) and low social status ($n=9$) burials from medieval Canterbury, England.

In this preliminary study, monastic individuals have a significantly higher average $\delta^{15}\text{N}$ ($M=12.8\text{‰}$, $SD=0.8$) than lower status individuals ($M=11.7\text{‰}$, $SD=0.93$) ($P=0.002$). Differences in mean $\delta^{15}\text{N}$ are consistent with dietary inferences gained from OPD analyses in this population. These preliminary data suggest we can infer aspects of diet using a combination of histological and isotopic data. Further investigation into the relationship between diet variation and bone microstructure is warranted.

One step further: the bioarchaeology of care meets the archaeology of emotion

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The bioarchaeology of care is a systematic, contextualised approach for studying care provision in the past. Triggered by evidence in human remains indicating survival with potentially limiting disability, it assesses likely need for, and delivery of, health-related care; models possible features of this care; then seeks to interpret the implications of care practices and outcomes for a deeper understanding of both the care-recipient and their community. Each stage of this process contributes to an osteobiography of the subject, framed within their lifecourse and lifeways, which is used reflexively throughout analysis. So far, however, this osteobiography has failed to explicitly acknowledge the importance of emotions in shaping the behaviours associated with the experience of disease.

Over the last decade there has been growing acceptance of 'emotion' as a legitimate topic for archaeology, although oddly enough, given the subject matter, work produced on this topic has been largely impersonal - concentrated either on generalised reactions to significant events (such as ritual sacrifice, violence) or landscapes, or on the 'emotional identity' invested in particular artefacts. In contrast, the impacts of severe pathology - frightening, limiting, demanding, unpredictable - elicit often strong, and always *personal*, emotional responses from sufferers and caregivers alike, suggesting that a focus on emotion in relation to past disability and care may be particularly rewarding. Using case study examples, this presentation considers what emerges when the bioarchaeology of care addresses the issue of emotion.

Impact of Human Interaction on Health in Prehistoric Asia

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In a globalising world, human dispersal and population displacement have been demonstrated to influence the health of both migratory and interacting local populations. Similarly, human interaction in the form of trade, migration and conflict were driving factors in the spread of infectious diseases such as the bubonic plague. The impacts of past diseases often provide the benchmark for epidemiological models guiding management of future outbreaks. However, it is argued here that a medical evolutionary approach to the issue is beneficial in understanding the impact of human interaction on the overall health of populations. This paper outlines proposed PhD research into the impact that human interaction has had on past interacting populations in Asia. Human populations in the region of Asia have experienced complex systems of human interaction both within and between population groups since the intensification of agriculture onwards. Population increase, technological and social change, and environmental factors encouraged human movement efforts, placing different populations within varying realms of interaction. Skeletal collections from Mongolia, Vietnam, and Japan are proposed to be analysed for cranial and post cranial palaeopathological lesions relating to infectious and nutritious disorders in order to assess the levels of health of interacting populations. These will be discussed in the unique biocultural context of each case. It is hypothesised that with increasing contact of human groups, the spread of infectious diseases were promoted, and the competition for resources within a region were amplified, impacting the health of interacting populations negatively.

Applying Ethnographic Practice to the Bioarchaeology of Care: A Philippines Pilot Study

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This poster presents ethnographic information collected to supplement an analysis using the bioarchaeology of care approach developed by Tilley and Oxenham (2011). It is argued that performing local ethnobioarchaeological research relevant to the case of disability in the past is useful in countering western assumptions of care and compassion. Clinical studies of injury and disease provide the main source of information on the biological restrictions of disability. However, the ability to employ such research in prehistoric contexts is restricted by the discussion of their applications within modern clinical contexts. This ethnographic approach to care was valuable in the case of B243 (see Vlok et al. 2017) in providing a lens through which to observe a community restricted in their access to modern medicine and partially reliant on treatments available from the resources in their physical surrounds. The primary focus of this research was to address aspects of healthcare practice invisible in the archaeological record, through the study of a community which shared similar physical environmental constraints to the community in which B243 once lived. 10 adult individuals from the Tuhian community in Catanauan, Philippines were interviewed over a 2-week period. Risk to injury in the physical surrounds, roles of care giving and the use of natural resources in healthcare practice were the focus of the interview. It was demonstrated that ethnobioarchaeological approaches to disability in the past, though restricted in their application in relation to comparing societies, can be useful in supplementing interpretation of the final stages of the bioarchaeology of care technique.

Bioarchaeological investigations of the Flinders Island Group

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Archaeological research conducted by Beaton in Princess Charlotte Bay and the Flinders Island Group in the late 1970s played a key role in the debate around Aboriginal demographic shifts, the colonisation of offshore islands and the development of intensified economic systems in Aboriginal Australia. More recent research has hinted at the possibility of Austronesian contact on the east coast of Cape York. The bioarchaeological record from the Flinders Island group provides an important means of testing these ideas. Over the past three years we have undertaken new investigations of the island group excavating/examining several Aboriginal burials in partnership with the Traditional Owners to investigate questions relating to mortuary practices, mobility between the mainland, and possible contact with Austronesian speaking people (as suggested through historic linguistics and some elements of material culture). I will present our craniometric and isotopic results and discuss our future research direction in this fascinating landscape.

‘Students-as-Partners’ Technology-Enhanced Co-creation Model to improve Student Engagement and Attitudes to Anatomy Learning

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Based on 2016 Student Evaluation of Learning and Teaching data for Functional Human Anatomy at the University of Adelaide, students found the threshold-learning concept associated with anatomy difficult to master; specifically, content was challenging due to an increase in volume, and the requisite to learn new vocabulary and study skills. A group of high achieving students were selected to augment formal teaching and to combat these issues by supporting students to develop efficient learning strategies, organizational skills, and foster a sense of belonging within the university. To supplement course delivery, ‘Peer2Peer’ leaders partnered to create a selection of digital learning technologies to address the spectrum of student learning styles, including: “MSK Snapchat” for kinaesthetic learners; “Student’s Guide to Anatomy” Podcast for aural; and “Prezi” case studies for visual. Co-creators aimed to promote the notion of a learning environment outside the classroom - colloquially advertised as “Study without Studying”. The aim was to implement digital tools to enhance learning outcomes, with the objective of improving academic performance in the course. Resultant analytics gathered demonstrated a high engagement rate across all technologies, with >130 students actively engaging with these tools between April-July 2017; while 80% of survey responses (n=132) believed these tools aided and/or enhanced performance. Course grade distributions, fail rate and satisfaction scores verify the efficacy of this digital strategy to engage students with different learning preferences. The Peer2Peer pilot program has helped improve academic and social outcomes within anatomy and creates the foundations for application into other University medical courses.

Establishment of sex and stature estimation equation protocols of the humerus for an Australian sub-population utilising post-mortem computed tomography

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Formations of a biological profile (estimation of ancestry, sex, age and stature) and subsequent population specific estimation equations standards are becoming increasingly relevant in the changing global environment. Despite the prominent use of the humerus for sex estimation in forensic anthropology, limited research focuses on the estimation of sex and/or stature for an Australian (sub) population. Additionally, the utilization of post-mortem computed tomography (PMCT) post-cranial sample data to form three-dimensional (3D) models and measurements as an alternative to dry bone osteometric measurements. This research study aims to provide a 3D model methodology for the development of sex and stature estimation equations of the humerus for an Australian sub-population utilizing computed tomography, including proof of concept. Samples consist of humeral PMCT Digital Imaging and Communications in Medicine (DICOM) datasets from a contemporary Caucasian Australian adult sub-population, aged between 18-75 years, obtained in 2017. Threshold based segmentation was conducted in Amira® (v6.0, FEI, Oregon, USA) for 3D model formation, then transferred to reverse engineering program, Geomagic Design X® (v5.6.6, Geomagic inc., North Carolina, USA) for performing anthropometric measurements of the 3D model humerus by plane to plane measurements. Five common measurements of the humerus and an additional measurement were incorporated; maximum humeral length, vertical diameter of the humeral head, maximum diameter of the humeral head, epicondyle breadth, maximum and minimum mid-shaft diameter. Our protocol demonstrates high reliability with intra- observer and reliable inter-observer error rates at present.

Systemic stress and health outcomes in Prehistoric Indonesia

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Prehistoric populations of the Northern Moluccas Islands (Indonesia) offer a unique opportunity to investigate health and disease status in challenging island environments. This research seeks to understand how skeletal markers of systemic stress, especially those indicating childhood exposure to external or internal non-specific physiological disruptions, may influence longer term health impacts on growth and mortality.

A sample of individuals (minimum n = 31) dated from the first millennium BCE to 1000 CE, were examined for two traditional skeletal markers of physiological disruption - linear enamel hypoplasia and porotic hyperostosis. The two stress marker variables were then analysed in relation to estimated stature and age-at-death.

Most individuals displayed skeletal stress markers, but no associated reduction in stature was observed in adult individuals. The largest proportion of individuals with linear enamel hypoplasia were adolescents, with decreasing proportions in older age-at-death groups. However, porotic hyperostosis was almost consistently present in all age-at-death categories. Finally, linear enamel hypoplasia, but not porotic hyperostosis data differed between island sites represented by the sample. The presence and distribution of the studied skeletal markers, and their longer term health impacts, may reflect variation in resource availability, infectious disease exposure, or environmental influences throughout the lives of these individuals, and across this ISEA region.

Seminar BINGO!

To play, simply print out this bingo sheet and attend a departmental seminar.

Mark over each square that occurs throughout the course of the lecture.

The first one to form a straight line (or all four corners) must yell out to win!



SEMINAR B I N G O

Speaker bashes previous work	Repeated use of "um..."	Speaker sucks up to host professor	Host Professor falls asleep	Speaker wastes 5 minutes explaining outline
Laptop malfunction	Work ties in to Cancer/HIV or War on Terror	"... et al."	You're the only one in your lab that bothered to show up	Blatant typo
Entire slide filled with equations	"The data <i>clearly</i> shows..."	FREE Speaker runs out of time	Use of Powerpoint template with blue background	References Advisor (past or present)
There's a Grad Student wearing same clothes as yesterday	Bitter Post-doc asks question	"That's an interesting question"	"Beyond the scope of this work"	Master's student bobs head fighting sleep
Speaker forgets to thank collaborators	Cell phone goes off	You've no idea what's going on	"Future work will..."	Results conveniently show improvement

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