

# *Bioarchaeology in Southeast Asia and the Pacific: Newsletter*

Issue No 5  
April 2009

Edited by Kate Domett  
[Kate.Domett@jcu.edu.au](mailto:Kate.Domett@jcu.edu.au)

Welcome to the fifth annual newsletter designed to update you on the latest news in the field of bioarchaeology in Southeast Asia. This year we are expanding our horizons and have included information relevant to those working in bioarchaeology around the Pacific as well – including Australia, New Zealand and the Pacific Islands and everywhere in between. I hope next year this area of our newsletter will grow in this area so please circulate to your colleagues and students. Please email me if you wish to be added to the email recipient list.

## *News*

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### TAIWAN

**From:** Professor Michael Pietrusewsky  
University of Hawai'i  
**Email:** [mikep@hawaii.edu](mailto:mikep@hawaii.edu)  
**Subject:** *Neolithic skeletons from Taiwan*

Michael Pietrusewsky and Adam Lauer, spent one month (July, 2008) recording bioarchaeological data in the Nankuanli East Neolithic (c 5000 BP) skeletons from the Tainan Science and Technology Industrial Park, Tainan, Taiwan. This is the first study of these important early Neolithic skeletal remains from Taiwan. A paper (Pietrusewsky et al., 2009) will report the preliminary results of this research at the Annual Meetings of the American Association of Physical Anthropologists in Chicago this April.

Michael Pietrusewsky has been appointed an Associate Editor to *American Journal of Physical Anthropology* for the period, May 2008- 2012.

### MYANMAR

**From:** Anne-Sophie Coupey  
**Email:** [coupeyas@yahoo.fr](mailto:coupeyas@yahoo.fr)  
**Subject:** *Excavations at Ywa Gon Gyi, Upper Burma*

Recent fieldwork by the Myanmar-French Archaeological Mission during January 2009, have been undertaken at the site of Ywa Gon Gyi (Thazi township), Upper Burma. Out of the 55 more or less intact graves excavated, 43 contained bones, the other 12 burials containing only isolated items, mostly pottery vessels (bones was not preserved or were destroyed). The forty-four deceased are represented as follows: 12 adults, 16 adolescents or adults (length of long bones only available), 11 sub-adults and 5 individuals for which the age could not have been determined. Children (from 6-18 months to 12

years +/- 30 months) seem clearly under represented if we refer to a “normal” prehistoric mortality. However, limits of the burial area are unknown; there may be some places where the deceased could have been buried together because of their age.

Usually burials are primary and single (Fig. 1); only two graves are thought to be secondary where bones are disarticulated. Graves are placed in east-west rows and all the deceased are approximately oriented with their head towards the north. All seem to have been buried in a supine position with arms and legs straight. Several adult graves show evidence of coffins (empty space during decay) with flat or curved bottom. Obviously, Iron Age people used different types of coffins: sometimes large, sometimes narrow, probably made up of wooden planks, of bamboo mats, or carved out of tree trunks. An infant burial, S29, provides evidence of a coffin. White lines which seem to be the remains of wood are on both sides of the body. The shape was an elongated trapezoid, narrow in the upper part (20 cm), larger in the lower part (30 cm) for a length of about 125 cm.



**Figure 1:** Examples of burials from Ywa Gon Gyi, Upper Burma.  
(Photos courtesy of Anne-Sophie Coupey).

The main grave goods found in the primary burials were pottery vessels, often deposited at the feet of the deceased: globular pots and shallow bowls (from one to five vases per grave). Animal bones were

scarce on the site (two graves contained a hemi mandible of pig each) and few ornaments were found (glass and carnelian beads in three graves only). Two copper wires bundles and two spindle whorls were uncovered.

Ceramic deposits are quite different from previous sites, Ywa Htin, Myo Hla, Ohh Min, Htan Ta Pin and Hton Bo, but quite similar to Nyaung Gan where cylinder pots are very scarce too.

Information obtained during this excavation season enhance our understanding of funeral practices of prehistoric populations in the Samon Basin during the end of prehistoric times. Layers excavated in Ywa Gon Gyi seem to date at least from the Iron Age (later than the 4th century BC) because of the presence of carnelian beads.

The south part of the southern pit has revealed many potsherds from the Neolithic period. This layer gave no evidence for a funeral occupation; it could have been a settlement area, in which Iron Age graves have been dug. Future comparative studies with Neolithic settlements from Thailand and from other Southeast Asian countries will be conducted.

**From:** Dr Bob Hudson

University of Sydney

**Email:** [bob.hudson@usyd.edu.au](mailto:bob.hudson@usyd.edu.au)

**Subject:** *Recent excavations, conservation and presentation of inhumation burials at Halin, Myanmar (Burma)*

Halin was known from the early 20<sup>th</sup> century as an early urban site, surrounded by a brick wall several metres thick, with the corridor gates characteristic of First Millennium AD sites in Burma extending up to 50 metres inward (Hudson 2004). When formal excavations began in the late 1960s, inhumation burials were discovered under the south wall (Myint Aung 1970). Over the past 15 years or so, treasure hunting by the locals, who search for stone beads and whatever else is saleable, made it apparent that the southern part of the city, both inside and outside the wall, contained a wealth of antiquities. The Archaeology Department has now excavated three burial sites. In March 2009, two of these, HL 25&26, had become permanent site museums, lockable brick buildings with iron roofs. The most recent, and most extensive, excavation, HL 28, was covered by a temporary building (Fig. 2). Reports on these excavations have not so far been published.

All the burial sites are in an area of saltfields and hot springs south of the city. The salt is still commercially exploited by the local villagers. I have previously suggested (Hudson 2004, 2005) that salt was probably the key economic resource which enabled and attracted long-term settlement.

**HL 25** was excavated in 2005 (Fig. 3). Of the half dozen skeletons left exposed, two are aligned to the north (pictured) and two to the northwest. No metal or stone tools were found, nor beads, nor even stone bracelets, according to local information. The site has suffered from water damage post-excavation, and a pump has been installed to cope with the annual rise of the water table.

Figure 2 (over page): Map of Halin indicating recent areas of excavation.

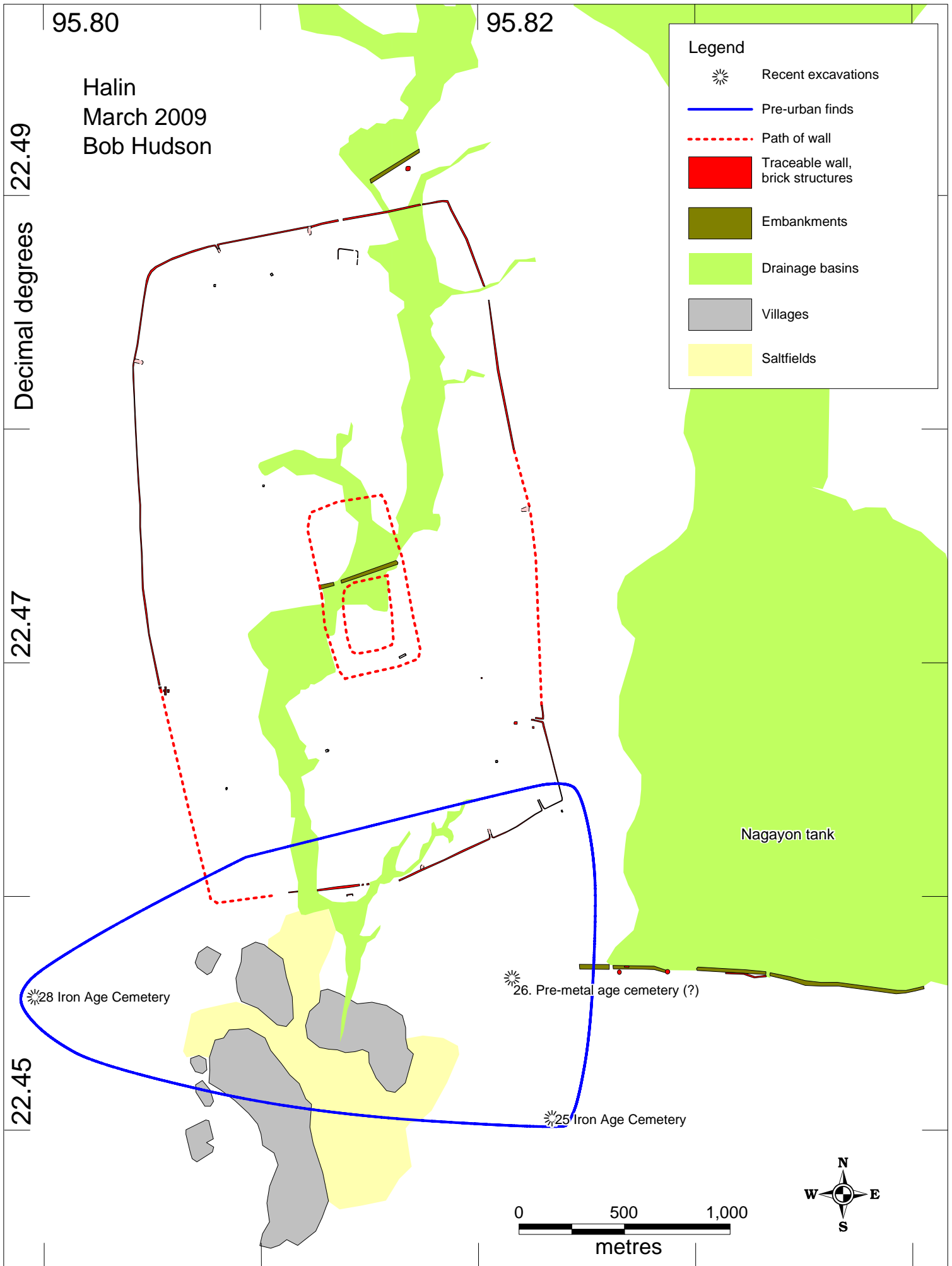




Figure 3: HL 25 burials  
(Photo courtesy of Bob Hudson)

**HL26** has burial layers that go down 4.5 metres. Again, only half a dozen skeletons can be seen. Their heads are oriented northward, and they are accompanied by substantial numbers of pots (Fig. 4). There are pieces of rusted iron associated with some of the burials.



Figure 4: An example of the large number of pots associated with burials at site HL26.  
(Photo courtesy of Bob Hudson)

**HL 28** was, in March 2009, a living reminder that the Mortimer Wheeler pit-and-baulk method of excavation has not been forgotten. Eleven pits reveal rows of skeletons, more than 20 reasonably complete specimens, their heads aligned neatly eastward, clusters of pots at their feet (Fig. 5). The visible burials occupy one level, about 1.2 metres below the present surface.

Some of the skeletons are associated with iron spearheads. The presence of small drinking vessels (Fig. 6) might support suggestions that this society was a user of alcohol (Win Maung (Tanpawady) 2003).



Figure 5: Burials from the site of HL28.  
(Photo courtesy of Bob Hudson)



Figure 6: Site HL 28. Note the “goglets”, as Burmese archaeologists call them, by the right arm of the lower skeleton. (Photo courtesy of Bob Hudson)

The aim of this brief note has been to present a snapshot of the burial sites, rather than to attempt much analysis. Archaeologists working in the same field, in particular J.P Pautreau, Anne-Sophie Coupey and others excavating in Upper Burma, will no doubt spot familiar material here. It is interesting that

the city wall seems to have been built some time in the first millennium CE with no concern for, or perhaps no memory of, the burials (Myint Aung's sites 8 & 17; Myint Aung 1970) that it was overlaying. The attached Halin map shows the known extent of the informal finds, as well as the official excavations. Essentially, burials and other pre-urban finds have been on slightly elevated ground within a few hundred metres of the saltfields.

Many objects from these burials, such as beads, tools or weapons, may have already fled the scene. A woman who has lived all her life in the family farmhouse which sits on top of the south wall remembered as a young girl seeing gold beads, a "king's skeleton", and a "king's sword" dug up. She later identified a picture of an iron spear-head as resembling the "sword". Her parents had sold all they found. More of Halin is probably sitting unidentified in antique and souvenir shops, or melted down for the metal, that can be seen on the ground. The most recent excavations are for now, at least, still there. The Archaeology Department has, on the strength of the site museums, made Halin subject to a US\$5 admission fee. I am the proud holder of Halin Archaeological Zone ticket #1.

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THAILAND
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**From:** Drs Nancy Tayles and Siân Halcrow

Department of Anatomy and Structural Biology, University of Otago, New Zealand

**Email:** [sian.halcrow@anatomy.otago.ac.nz](mailto:sian.halcrow@anatomy.otago.ac.nz), [nancy.tayles@anatomy.otago.ac.nz](mailto:nancy.tayles@anatomy.otago.ac.nz)

**Subject:** *Report from the Ban Non Wat, Thailand, project: post-excavation analysis*

Since completion in December 2007 of the final 'Origins of Angkor' excavation at the site of Ban Non Wat, Nakhon Ratchasima Province, Northeast Thailand under the directorship of Professor Charles Higham, Dr Rachanie Thosarat and Dr Amphan Kijngam, time spent in the field by our team has been concentrated on post-excavation work on the skeletal remains from 637 burials.

A team visited for the month of January 2008 and again for three months over the period November 2008-January 2009. In the interim, Dr Rachanie Thosarat and Chanakarn Hongtong, completed a significant amount of the cleaning of the adult skeletons, which has been a much-appreciated contribution to the progress of the skeletal analysis.

The periods spent on laboratory work by Nancy Tayles, assisted in January 2008 by Chris Smith, Angela Clark, Lynley Wallis, Jaime McHugh and in January 2009 by Nathan Harris, Angela Clark, Natthamon Pureepatpong, Bhadravarna Bongsasilp (Kwan) and Lia Betti have resulted in the completion of detailed cataloguing and age and sex estimates for 40% (173/429, to be exact!) of the adult burials, although as these represent the earlier and better preserved burials, this actually represents far more than 40% of the work involved in this initial phase of the project. The remaining proportion is numerically larger but the quality and quantity of skeletal material from the later periods of the

cemetery means it should be considerably less time-consuming to complete. The data collection from the sample of the almost 250 infant and child burials has in the meantime been completed by Sian Halcrow.

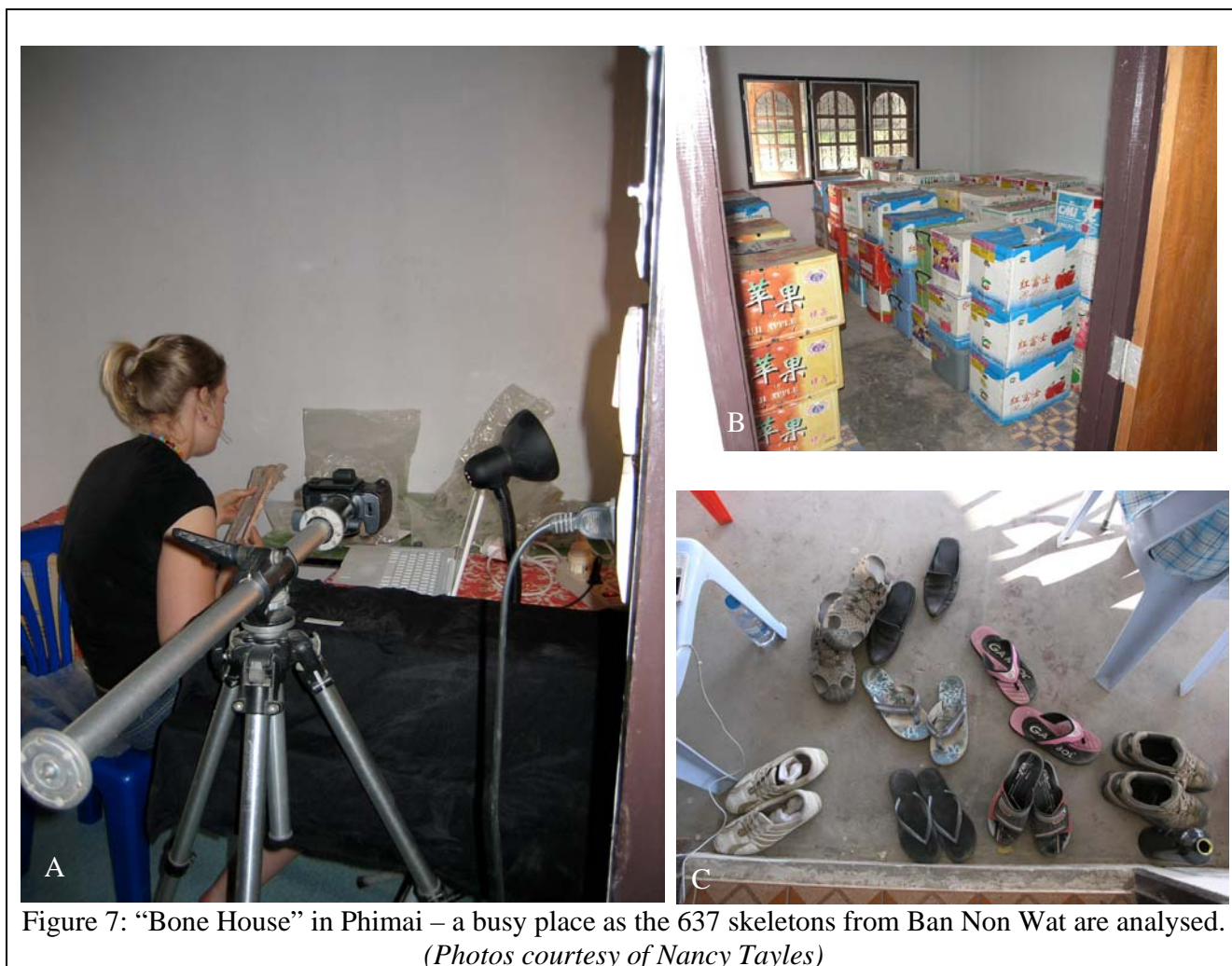


Figure 7: “Bone House” in Phimai – a busy place as the 637 skeletons from Ban Non Wat are analysed.  
(Photos courtesy of Nancy Tayles)

A publication by Sian and Nancy on the demography of the site is in preparation, almost ready for publication, and a publication on the Neolithic skeletons is in the early stages of writing.

Sian is employed as a Postdoctoral fellow at the University of Otago and during the year attended the Ancient DNA and Associated Biomolecules conference at Pompeii, Italy and visited a DNA specialist Maru Mormina at the University of Cambridge. In early January 2009 she attended the Dynamics of Human Diversity in Mainland Southeast Asia Workshop in Siem Reap, Cambodia, lead by Nick Enfield of the Max Planck Institute for Psycholinguistics, Nijmegen, Holland, and Joyce White of the University Museum, Pennsylvania as the bioarchaeological representative. (A report on this meeting is detailed below under the Conference section.)

**From:** Dr Kate Domett  
James Cook University  
**Email:** [kate.domett@jcu.edu.au](mailto:kate.domett@jcu.edu.au)  
**Subject:** *Ban Non Wat 2008/9 Excavation*

During November 2008 through to February 2009 excavations were undertaken again at Ban Non Wat, a continuation of our new project “Resilience and Opportunity in ancient Thailand” begun last year. A further 13 burials were uncovered this season bringing the total to 42 individuals (46 burials). We have continued the numbering system started by the University of Otago team bringing the overall total to 681. We continue to work closely with the Otago biological anthropologists and Nancy Tayles led two of her students, Aimee Glover and Nathan Harris, in the recovery of some of the burials until I could arrive in January. Working on the bones on site with me were my new Hons student, Alana Colbert, a volunteer Canadian biological anthropologist and archaeologist, Jen Newton, and Jodie Mitchell, a volunteer archaeologist from Australia.

We continued to excavate areas partially excavated last year and as we got deeper and deeper we had real problems with the high water table this year (Fig. 8) – an investment in two water pumps certainly paid off.



**Figure 8:** Burial 679 highlighting water table issues at Ban Non Wat this year.  
(*Photo courtesy of Peter Petchey*).

During our fieldseason this year we also organized, in collaboration with the National Research Council of Thailand, to run 2 days of seminars and workshops for local community leaders (from university to village level). This was a giant event with up to 100 people attending. Day 1 consisted of a series of seminars held in Khorat, presented by a range of Thai and Australian people involved in the project including myself providing a summary of the skeletal remains. Day 2 involved attendees participating in four workshops at the village of Ban Non Wat where they learnt about our methodologies including the assessment of age at death and sex estimation in skeletal remains.

CAMBODIA
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**From:** Nancy Beavan Athfield, Louise Shewan, Dougald O'Reilly

**Email:** [N.Beavan@gns.cri.nz](mailto:N.Beavan@gns.cri.nz)

**Subject:** *University of Sydney wins a 2009 Australian Research Council grant for three-year project in Cambodia*

The Australian Research Council has awarded a AUD\$154,000 grant in its 2008 funding round to the University of Sydney for a project entitled "*History in their bones: A diachronic, bioarchaeological study of diet, mobility and social organisation from Cambodian skeletal assemblages.*"

An international team led by Dr Dougald O'Reilly will conduct a three year study of diet, mobility and social organization from Cambodian skeletal assemblages c.2500 BCE to 17<sup>th</sup> CE. The project team includes Dr Louise Shewan (University of Sydney), Dr. Nancy Beavan Athfield (GNS Science, New Zealand), Prof Rethy Chhem (Professor of Anthropology and Chair of Radiology at the University of Western Ontario), Dr Kate Domett (James Cook University), Prof Charles Higham ( James Cook Fellow, Otago University, New Zealand) Dr Richard Armstrong (Fellow, Australian National University), and Dr Christophe Pottier (Director, Ecole Française d'Extrême Orient {EFEO}). The multidisciplinary collaborations aim to enhance traditional archaeological techniques with isotopic analysis to tackle a complex research question.

Health, human mobility and social differentiation are fundamental to the three core archaeological issues of mainland Southeast Asia - the nature of early agrarian rice growing communities, the impact of 'Indianisation' on the formation of the state, and the development and demise of empires. Accompanying these cultural transformations which span several millennia is changing accessibility, distribution and use of resources, often linked to population movement. By employing an integrated bioarchaeological analysis of human skeletal remains - the physical attributes and evidence of disease combined with the isotopic evidence for variability of diet and migration, gauged with a reliable chronology – we can enhance our understanding of the temporal changes in the residential behaviour, ritual traditions, health and mobility of agricultural communities in the formative stages of state development through to post-imperial contexts during the rise and decline of Southeast Asia's most powerful state, centered on Angkor.

The project will examine both the consistent features and the physical and isotopic variability in skeletal remains over time throughout Cambodia. The extensive and wide-ranging characterisation will allow us to investigate specific research questions: (i) What were farmers eating; did farming populations also exploit different local food resources; were they moving around the landscape (ii) Did people migrate as rulers of states shifted to new territory and (iii) Can we discern changes in health and longevity as economies expanded or changed.

To examine residential mobility and environmental variability, we will use state of the art analytical equipment and sampling procedures pioneered at the Australian National University for laser-ablation ICP-MS and SHRIMP (Sensitive High Resolution Ion MicroProbe) for in-situ strontium and oxygen isotope analysis. Both techniques require only extremely small sample sizes and permit the isotopic mapping of skeletal material at unprecedented spatial resolution, providing highly detailed records of environmental change and migration. The isotopic analysis of skeletal remains also compliments and expands the work previously conducted in SE Asia, allowing us to examine if particular mobility patterns identified in prehistoric Thailand (Bentley *et al.* 2005, 2007) are discernable in Cambodian contexts. For the first time in Cambodian archaeological research, we will also develop a unique baseline “isotopic map” of regional isotopic values providing present and future researchers with an important reference database.

Regional and temporal changes in documented mortuary practices are another aspect of our research, but we also have the exciting opportunity to investigate a heretofore unknown burial practices. Since 2003 Dr Beavan-Athfield has studied the enigmatic jar burial sites in the Cardamom Mountains of southern Cambodia, and further research on the sites is incorporated into our current project. In the Cardamom’s we find a culturally unique custom of secondary internment of multiple skeletons in large pottery jars, which were then placed in natural rock ledges at remote locations through-out the Cardamom massif. Preliminary analysis from the first of these sites to be analysed indicates its use from 1440 CE to perhaps as late as 1630 CE. Questions about who created these sites and how long the practice lasted will be addressed by radiocarbon dating and isotopic analysis of skeletal material for clues about residency and diet.

This integration of advanced isotopic analytical techniques with classical archaeological methods for physical skeletal analysis will significantly enhance our understanding of temporal changes in population, health, diet, and patterns of mobility of the agrarian communities of the 2<sup>nd</sup> and 1<sup>st</sup> millennia BCE, through to the formative stages of state development, and into the late- and post-Angkorian world after the 15<sup>th</sup> C CE.

LAOS
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**From: Drs Nancy Tayles and Siân Halcrow**

Department of Anatomy and Structural Biology, University of Otago, New Zealand

**Email:** [sian.halcrow@anatomy.otago.ac.nz](mailto:sian.halcrow@anatomy.otago.ac.nz), [nancy.tayles@anatomy.otago.ac.nz](mailto:nancy.tayles@anatomy.otago.ac.nz)

**Subject:** *Report on visits to Laos National Museum, November 2008 - January 2009.*

From the 26th - 27th November 2008 Nancy Tayles visited the Laos National Museum, Vientiane, at the invitation of Thongsa Sayavongkhamdy of the Department of National Heritage to undertake a preliminary examination of three skeletons held at the museum: one excavated from Tong Hai Hin, on the Plain of Jars, in 1996 by Thongsa. This was partly loose fragments and partly encased in blocks of soil. The other two skeletons, one from Nam Thong Song on the Nakai Plateau, and a more recent partial skeleton from Vientiane, are both encased in plaster. These were also excavated in the 1990’s.

After viewing the two plaster-encased skeletons, and in consultation with Marion Ravenscroft, museum conservator, we decided to leave these until a future visit and much of my time during the two days at the Museum, along with a further three days, together with Siân Halcrow, in January 2009 was spent cleaning the remains from the Plain of Jars.

Once the bones were completely cleaned, we determined that they were clearly disarticulated, so they either represent secondary burials or were significantly disturbed postmortem. It is possible that these were secondary burials distributed around a primary cremation burial in a stone jar. We also established that they represent three individuals, an infant aged about nine months and two small adults, probably females. This is the first skeletal analysis from the Plain of Jars and we are in the process of publication of a paper detailing our findings.

VIETNAM
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**From:** Anna Willis

Australian National University

**Email:** [anna.willis@anu.edu.au](mailto:anna.willis@anu.edu.au)

**Subject:** *Current News from Vietnam*

We are currently four weeks into an excavation of the Neolithic site of An Son in Long An Province, Southern Vietnam. The project is a joint collaboration between Vietnam and Australia and includes staff and students from the Australian National University, the Centre for Archaeological Research, Ho Chi Minh City, the Long An Museum, the Institute for Archaeological Research, Hanoi and members of the An Son village community. The site has been excavated several times previously: 1978, 1997, 2004 and 2007, resulting in an understanding of the stratigraphy of the site, the temporal sequence from reliable radiocarbon dates and the discovery of 26 skeletons in total. The main objective of this season is to increase the sample size of human burials and associated skeletal and dental remains from this site.

The first four weeks, beginning on April 1<sup>st</sup> have been spent excavating three squares, H1, H2 and H3. The basic stratigraphy of the site includes three distinctive albeit heterogenous and complex layers, with the lowest, essentially river alluvium, containing the bulk of the burials. Material culture from the site includes pottery sherds (as well as near complete broken vessels in some instances), small clay pellets, the remains of apparently in situ cooking stoves (carangs), stone adzes and axes, large amounts of gastropods and smaller numbers of bivalves, an enormous quantity of animal and fish bones including sus, bovid, turtle and freshwater crocodile.

To date we have excavated 2 primary, supine subadult skeletons (a neonate and another several month old infant) from H2 and an isolated cranium in H1. On the 27<sup>th</sup> April two further burials were discovered, another individual in H1 and a very distinctive grave cut in H2, both of which are in the early stages of being exposed. The majority of the burials in previous seasons have been found in the basal layer (otherwise sterile river alluvium) of the site having been originally dug into this layer from the overlying palaeosoil. It is anticipated that further skeletons will be found at this same level, which we are only just beginning to reach now. The excavation is scheduled to continue for another three weeks.

This site is an integral component of Anna Willis' PhD research which will include the mortuary archaeology of the site and the palaeohealth of the individuals. Although the sample size at this stage is still small, it is anticipated that An Son will provide a good temporally similar comparative site for the Northern Vietnamese site of Man Bac, among other assemblages.

INDIA

**From:** Gwen Robbins

Appalachian State University

**Email:** [grobbs321@yahoo.com](mailto:grobbs321@yahoo.com)

**Subject:** *Earliest evidence for leprosy in the world identified in India.*

Dr. Gwen Robbins (Appalachian State University) and colleagues from Deccan College Post-Graduate research institute (Pune, India) recently wrote an article reporting on the most ancient evidence for leprosy in the world. Leprosy is a debilitating but treatable disease caused by infection with *Mycobacterium leprae*. Although popular conceptions of leprosy are focused primarily on images from Biblical or Medieval times, one quarter of a million people worldwide were still suffering from the disease in 2007—primarily in rural areas of Bangladesh, Brazil, China, Democratic Republic of Congo, Cote D'Ivoire, Ethiopia, India, Indonesia, Mozambique, Myanmar, Nepal, Nigeria, Philippines and Sudan. The history of leprosy is interwoven with civilization itself and an understanding of the origin and transmission routes of this disease could potentially lead to new insights about the evolution of infectious diseases and eradication efforts. However, the disease is difficult to culture *in vitro* and much about leprosy is still poorly understood, including the origin, initial transmission routes, and timing for the spread of the disease in the Old World.

The earliest textual references to leprosy are found in proto-historic texts, including the Egyptian Ebers papyrus dated to 1550 B.C. It has been suggested that there are references to the disease in Sanskrit hymns of the *Atharva Veda* composed before the first millennium B.C., and the Old and New Testaments of the Bible. However, this evidence is controversial and the earliest widely accepted references to the disease are from much later sources: South Asian texts *Sushruta Samhita* and Kautilya's *Arthashastra* dated to the 6<sup>th</sup> century B.C., 4<sup>th</sup> century accounts of the Greek author Nanzianos, a 3<sup>rd</sup> century Chinese text *Shuihudi Qin Jia*, and 1st century A.D. Roman accounts of Celsus and Pliny the Elder. Historians of the disease have maintained that leprosy originated in the Indian subcontinent and spread to Europe after the fourth century B.C. but the disease did not become a serious public health problem in Europe until the Middle Ages. Asylums were established by the 7<sup>th</sup> century in France and skeletal evidence for the disease is well documented for Medieval European skeletal collections from the United Kingdom, Denmark, Italy, Czech Republic, and Hungary.

Although urbanization has traditionally been considered requisite for the spread of the disease in the Old World, genomics research has indicated a Late Pleistocene model for origin and transmission out of Africa. Archaeological evidence for the disease in Africa and Asia in prehistory has also provided indications that the disease has ancient roots. Skeletal evidence of leprosy has been documented in the 2<sup>nd</sup> century B.C. in Roman period Egypt, the 1<sup>st</sup> millennium B.C. in Uzbekistan, Nubia in the 5<sup>th</sup> century B.C., and Thailand *circa* 300 B.C.. The earliest documented cases in West Asia (Israel) are from the 1<sup>st</sup> century A.D.. Previously there was no skeletal evidence for the disease in South Asia.

Dr. Robbins and colleagues report on skeletal evidence for leprosy from 2000 B.C. at the site of Balathal (24°43' N 73°59' E), located 40 km northeast of Udaipur in the contemporary state of Rajasthan, India. There are two phases of occupation represented at Balathal, a small occupation in the Early Historic period (cal. B.C. 760 - A.D. 380) and a large Chalcolithic settlement (cal. B.C. 3700-1820). This earlier deposit is contemporaneous with and demonstrates influences from the Indus, or Harappan civilization, in ceramic styles and construction methods. The Chalcolithic people of Balathal lived in stone or mud-brick houses, made wheel thrown pottery, copper implements, and practiced dry field agriculture focused on barley and wheat. Burial was uncommon all over South Asia toward the

end of the second millennium B.C. Only 5 burials were recovered from this site. One of them, individual 1997-1, was buried inside of a large stone enclosure (500 m<sup>2</sup>) that was filled with 9 layers of stratified ash from burned cow dung. The enclosure was sealed by a sterile layer of 20-30 cm of white ash that separated the Chalcolithic layers from later Early Historic deposits. Two radiocarbon dates from the layer where this Middle Aged man was interred indicate he was buried around 4000 years ago. The skeleton demonstrates changes to his facial skeleton that are consistent with the most severe form of leprosy (lepromatous leprosy).

The distribution of skeletal pathologies is key to a diagnosis of leprosy. We expect leprosy to include changes to the skull and the postcranial skeleton—particularly cortical inflammatory changes of the palatine process of the maxilla, diaphyseal cortical surface, and intra-articular cortical surface. The principle change that indicates a diagnosis of leprosy is rhinomaxillary syndrome, which involves loss of bone around the pyriform aperture, destruction of the nasal spine, and loss of bone at the anterior alveolar process. Leprosy is also associated with pathological remodeling of the facial skeleton at the nasal conchae, infraorbital, and palatal regions, including pitting of the cortical surface indicating increased osteoclast activity and/or bone necrosis. In the Balathal skeleton, we have clear evidence of rhinomaxillary syndrome: erosion/remodeling of the lateral and inferior margins of the nasal aperture, complete atrophy of the anterior nasal spine, bilateral osteolytic lesions at the infraorbital region of the maxilla, evidence for infection in macroporosity of the supraorbital region at glabella, and resorption of the anterior alveolar region of the maxilla. The palatine process of the maxilla also demonstrates pathological changes including pitting near the midline and in the alveolar region indicating superficial inflammation affected regions that had not already resorbed. This individual had lost most of his teeth many years before death.

Postcranial manifestations of leprosy take two forms: direct bacterial invasion by contact with infected elements and injury to appendages related to leprous autonomic neuropathy. The former can be manifest in non-specific inflammatory changes at multiple sites while the latter is manifest in evidence for traumatic injury in wrist, hand, ankle, and foot bones. Injuries to extremities are not direct evidence for leprosy but they do corroborate the other evidence as they can be associated with the neuropathy accompany infection with leprosy. For this individual from Balathal, postcranial pathological conditions include degenerative changes in the spine and diarthrodial joints, infectious involvement of the lower leg, and evidence for traumatic injury to the left wrist (a fractured pisiform). Evidence of direct involvement of the hand and foot bones is unavailable although absence of many hand and foot bones could be explained by bone absorption, which would leave the bones more fragile and likely to degrade after burial.

While it has long been thought that leprosy originated in the Old World, less is known about the origin and prehistoric transmission routes for leprosy than other related infectious diseases. The evidence from Balathal supports Sanskrit translations of the *Atharva Veda* that reference leprosy and supports the suggestion that this ancient text is the earliest historical reference to the disease, its pathogenesis and treatment.

“Born by night art thou, O plant, dark, black, sable. Do thou, that art rich in colour, stain this leprosy, and the grey spots! ... The leprosy which has originated in the bones, and that which has originated in the body and upon the skin, the white mark begotten of corruption, I have destroyed with my charm.”

As the Sanskrit word *kushtha* referred to a plant used to treat leprosy and tuberculosis (*rajayakṣma*), the *Atharva Veda* is also the earliest text to infer a connection between the two conditions, at least in terms of treatment. It is not common to find adult burials after 2000 B.C. In contrast, infants and children under 5 years of age are common in peninsular sites. These features of

second millennium burial practice are suggestive of Vedic tradition. Given this, it is interesting to note that it is customary in Vedic tradition in parts of India to bury lepers alive rather than cremate their bodies, which as diseased, are not considered an appropriate sacrifice to Hindu Gods. The biological evidence presented here indicates that similar mortuary behavior for people with leprosy was present at a rural Chalcolithic village in northwest India by the beginning of the second millennium B.C.

Evidence for leprosy in India at 2000 B.C. can be used to address hypotheses about prehistoric transmission models for the disease. Analysis of rare single nucleotide polymorphisms in contemporary samples of *M. leprae* from worldwide geographic regions identified two strains of leprosy segregating in Asia (predominantly Type I) and east Africa (Type II). Because of the low frequency of the Type II strain in Asia, and its high frequency in East Africa, one scenario for leprosy's origin is that Type II evolved first in East Africa (before 40,000 B.C.) and was later transmitted to Asia (evolving into Type I) and Europe (evolving into Type III), which is also common in West Africa and the Americas.

Alternatively, the Type II strain may have evolved from the Type I strain in Asia much more recently and was then transmitted out of Asia, into Africa and Europe. Small sample sizes and potentially biased demographic sampling of *M. leprae* from contemporary populations in the comparative genomics study could explain the absence of the Type II strain in South Asia (n = 4). Sampling issues or fixation of the Type II strain in East Africa (n = 2), combined with contemporary eradication efforts in India may have lead to an underestimate of the putative ancestral Type II strain's historical prevalence in India, and the derived Type I strain's historical prevalence in East Africa.

The Late Holocene transmission scenario is more compatible with the natural history of *M. leprae*, which thrives on human contact and may have spread to East Africa during the development of urban life and large inter-continental trade networks during the height of the Indus civilization and the "Middle Asian Interaction Sphere". The "Middle Asian Interaction Sphere" is a term used to describe political and economic contacts between South and West Asian Bronze Age peoples in the third millennium B.C. There are four core areas involved—Meluhha in the Indus Valley, Turan in Central Asia, Mesopotamia in the Fertile Crescent, and Magan on the Arabian Peninsula. The evidence for inter-regional interaction includes textual sources from Mesopotamia indicating trade relationships with Meluhha from the Early Dynastic Period (2900-2373 B.C.) to the time of Hammurabi (1792-1750 B.C.). The interpretation of 'Meluhha' as 'Indus' is supported by evidence for trade in raw materials, common artifact styles and motifs among the two regions. In addition, contact among Mesopotamia and the Egyptians began prior to the Early Dynastic period in Egypt (3050-2686 B.C.).

Although leprosy existed in Europe by 400 B.C. it did not become widespread throughout the urban centers of that continent until the Medieval period, a time of expanding trade networks. We argue that if leprosy evolved in Africa in the Pleistocene, it is unlikely to have spread into Asia and become a serious health issue until the late Holocene, when South Asia and Northeast Africa were part of a larger regional trade network that stretched across the Arabian Sea. We argue that transmission of *M. leprae* between Asia and Africa is most likely in the third millennium B.C., when India had extensive, wide-ranging networks for movements of peoples, goods, and potentially infectious diseases. This is a more likely time for transmission of communicable diseases such as leprosy than the Late Pleistocene migrations proposed by Pinhasi et al. (2005) and thus supports the interpretation of the genetic data proposed by Monot and colleagues (2005).

Further research should be performed to determine the geographic origin of the disease using an integrated approach that examines paleopathology and ancient DNA. Paleopathological evidence for the disease should be examined in the skeletal collections belonging to Indus Age sites. Urban centers in the height of the Indus Age and post-urban sites occupied in the second millennium B.C. should be of particular interest. In addition, the skeletal material from Balathal and from Indus sites should be investigated for evidence of ancient DNA from the *Mycobacterium*. There could also be well-preserved molecular evidence in Egyptian skeletons from the second or third millennium B.C. Although the first

skeletal evidence from Dakhleh Oasis places the disease in Egypt only after 400-250 B.C., the Ebers papyrus has been interpreted as evidence of more ancient knowledge of the disease by 1550 B.C. Assuming that DNA from the *Mycobacterium* can be obtained from individual 1997-1, genetic comparison of the strain from Balathal and additional skeletal specimens may provide new insights into the origin of the disease if a relationship could be demonstrated with either the Type I or II strains previously identified. Until the origin of leprosy is confirmed through additional research, the significance of this individual from Balathal is that it marks the earliest skeletal evidence for lepromatous leprosy, demonstrating its presence in a North Indian population during a time of substantial interaction among populations throughout Asia, the Middle East, and Africa.

This piece for the newsletter was cut from an article that was recently accepted for publication in PlosOne. Please see that publication (forthcoming, 2009) for additional details and photographs.

<http://www.plosone.org/home.action>

PACIFIC
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**From:** Dr Hallie Buckley

University of Otago

**Email:** [hallie.buckley@stonebow.otago.ac.nz](mailto:hallie.buckley@stonebow.otago.ac.nz)

**Subject:** *Latest Projects in Papua New Guinea, Vanuatu and New Zealand*

In collaboration with the Otago Museum, Dunedin, New Zealand, Hallie Buckley participated in an excavation of the SAC burial site on Watom island, East New Britain, Papua New Guinea in February 2008. Three new Lapita-associated burials were uncovered. A further excavation at Watom is planned for May/June 2009.

Hallie has also been excavating at Teouma, Vanuatu, in collaboration with Australian National University. Excavations in June/July 2008 uncovered four new burials dated to the post-Lapita period and three Lapita-associated burials. Further excavations at Teouma are planned for June/July 2009.

Closer to home in New Zealand, Hallie co-ordinated a scientific reinvestigation of the Wairau Bar skeletal collection in collaboration with the Canterbury Museum and Rangitane iwi, from October 2008 to April 2009. Forty-one burials, approximately 700 years old, are believed to be among the first colonisers of NZ. Nancy Tayles, Sian Halcrow and John Dennison contributed to the study as have a number of students. The team carried out macroscopic observations of all bones and teeth; a full assessment of dietary isotopes, migration and aDNA is also being carried out. They also carried out CT scans of all complete elements and some pathological specimens. In addition Ms Sue Hayes completed a 2D facial reconstruction of two of the crania. The collection was reburied on the 16th of April back on the Wairau Bar in Blenheim, New Zealand.

And finally, Hallie also notes that the Anatomy and Structural Biology Department received two new collections from Polynesia last year. One from the 'Atele mounds in Tonga and one from Mangaia in the Cook Islands.

**From:** Professor Michael Pietrusewsky  
University of Hawai'i  
**Email:** [mikep@hawaii.edu](mailto:mikep@hawaii.edu)  
**Subject:** *Osteological Analysis in Guam*

Michael Pietrusewsky, Michele Toomay Douglas, Rona Ikehara-Quebral, and others will be in Guam for the month of July, 2009, to analyse approximately 43 human burials from the Ylig site on Guam for the International Archaeological Research Institute, Inc. (IARII).

**From:** Chris Mallows  
Opus International Consultants  
**Email:** [christopher.mallows@opus.co.nz](mailto:christopher.mallows@opus.co.nz)  
**Subject:** *Osteology Workshop Run in New Zealand*

In March 2009, the New Zealand Archaeological Professional Development group ran a workshop at Auckland University on Human Osteology. Presenters included Judith Littleton and Lisa Matsso-Smith (Auckland University); Matt Campbell (CFG Heritage) and Chris Mallows. The aim of the workshop was to increase the knowledge of the professional archaeological community in excavating and recording human remains.

**From:** Dr Judith Littleton  
University of Auckland  
**Email:** [j.littleton@auckland.ac.nz](mailto:j.littleton@auckland.ac.nz)  
**Subject:** *Latest Project from the University of Auckland*

Judith and Sarah Karstens (Hons student) will be in the field with the Smithsonian Institution/Mongolian Institute of Archaeology team working on Bronze Age Burials in the Hovsgol region from June to mid-July this year.

AUSTRALIA
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**From:** Dr Denise Donlon  
University of Sydney  
**Email:** [ddonlon@anatomy.usyd.edu.au](mailto:ddonlon@anatomy.usyd.edu.au)  
**Subject:** *Latest Projects from Australia and beyond*

Denise Donlon has been working with Casey and Lowe on two very early Australian historic sites. The first involved the excavation and analysis of early European settlers buried in the Old Sydney Burial Ground under the Sydney Town Hall. The second was the excavation and analysis of perinatal remains from the site of the Parramatta Convict Hospital in Sydney.

Denise has recently been involved in the recovery of the war dead from Vietnam and PNG. In 2008 the remains of 4 Australians from the Vietnam War were recovered and identified. In 2009 in PNG 10 sets of skeletal remains were analysed – mostly from the Kokoda Track but also from Buna and Wewak. In 2008 she also travelled to Fromelles in France where she acted as a monitor for the Australian Defence

Forces in the exploratory excavation of pits containing Australian and British soldiers from WWI. She continues her involvement in the repatriation of Aboriginal remains held at the University of Sydney.

**From:** Dr Kate Domett, Dr Lynley Wallis  
James Cook University and Flinders University

**Email:** [kate.domett@jcu.edu.au](mailto:kate.domett@jcu.edu.au)

**Subject:** *Historic cemetery excavation planned for 2009 in Adelaide.*

In collaboration with Dr Lynley Wallis from Flinders University and the Norwood/Payneham/St Peters Council we will be carrying out pilot excavations of graves at one of the oldest cemeteries in Adelaide: Maesbury Street Cemetery, now known as Pioneer Park. It is known that at least 550 people were buried here from approximately 1849 to 1874 with the cemetery finally being closed in 1964. Unfortunately after the closure the cemetery was grassed over and all headstones were removed.

An earlier project using non-invasive archaeological and geophysical surveying techniques has already been completed to attempt to locate the position of the burials and to pinpoint an appropriate location in which to undertake our small pilot excavation in September 2009. The pilot excavations will form a focal point for the Cultural Heritage Festival run by the council. The project will involve the local community as well as providing an excellent opportunity for training young researchers. We also have the ABC science programme *Catalyst* interested in filming the project. We hope that this pilot project will lead to a larger scale project in the near future.

Relevant links:

[http://ehlt.flinders.edu.au/archaeology/department/research/projects/wallis\\_kensington/index.php](http://ehlt.flinders.edu.au/archaeology/department/research/projects/wallis_kensington/index.php)

<http://www.kra.org.au/wp-content/uploads/2008/11/culheritagearchaeology.pdf>

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## ***Recent Publications***

Important Note: Professor Mike Pietrusewsky from the University of Hawaii has been appointed Associate Editor for the *American Journal of Physical Anthropology* (2008- 2012).

- Allen H, Holdaway S, Fanning P and J Littleton 2008 Footprints in the sand: appraising the archaeology of the Willandra Lakes, western New South Wales, Australia. *Antiquity* 82:11-24
- Bedford S, M. Spriggs, H. Buckley, F. Valentin and R. Regenvanu, The Teouma Lapita site, South Efate, Vanuatu: a summary of three field seasons (2004-2006). In P. Sheppard, T. Thomas and G. Summerhayes (eds), *Lapita Conference 2007*, Honiara. New Zealand Archaeological Association Monograph Series. (2009). Pp: 215-234.
- Bentley RA, Cox K, Tayles N, Higham C, Macpherson C, Cooper M and Hayes TEF. (In press) Community diversity at Ban Lum Khao, Thailand: Isotopic evidence from the skeletons. *Asian Perspectives*.

- Bentley RA, Buckley H, R., Spriggs M, Bedford S, Ottley CJ, Nowell GM, Macpherson CG, and Pearson DG. (2007) Lapita migrants in the Pacific's oldest cemetery: Isotopic analysis at Teouma, Vanuatu. *American Antiquity* 72(4):645-656.
- Buckley H, R., Tayles NG, Spriggs MJT, and Bedford S. (in press) A preliminary report on health and disease in early Lapita skeletons, Vanuatu: Possible biological consequences of island colonization. *Journal of Island & Coastal Archaeology*.
- Buckley H, R. (2007) Possible Gouty Arthritis in Lapita-Associated Skeletons from Teouma, Efate Island, Central Vanuatu. *Current Anthropology* 48(5):741-749.
- Domett K and O'Reilly DJW (in press) Health in Pre-Angkorian Cambodia: a bioarchaeological analysis of the skeletal remains from Phum Snay. *Asian Perspectives* 48(1). [accepted April 2008]
- McDonald JJ, Donlon D, Field JH, Fullagar RLK, Coltrain JB, Mitchell P, and Rawson M. (2007) The first archaeological evidence for death by spearing in Australia. *Antiquity* 81(314):877.
- Donlon, D, (2009) The Development and Current State of Forensic Anthropology: An Australian Perspective. Ch.8, pp.104-114. In Blau, S. and Ubelaker, D. (eds) *Forensic Anthropology in Australia*. Left Coast Press, California.
- Donlon, D. (2008) Forensic anthropology in Australia: A brief history and review of casework, Ch 7 in Oxenham, M. (ed.) pp.97-110, *Forensic Approaches to Death, Disaster and Abuse*. Perth: Western Australia University Press.
- Griffin, R. and Donlon, D. (In press) Patterns in dental enamel hypoplasia by sex and age at death: a possible insight into hypoplasia aetiology? *Archives of Oral Biology*
- Halcrow SE and Tayles N. (2008) A case of talon cusp in a primary canine from prehistoric Southeast Asia. *International Journal of Osteoarchaeology* DOI: 10.1002/oa.1020.
- Halcrow SE and Tayles N. (2008) Stress near the start of life? Localised enamel hypoplasia of the primary canine in late prehistoric mainland Southeast Asia. *Journal of Archaeological Science*. 35: 2215-2222.
- Halcrow SE and Tayles N. (2008) The bioarchaeological investigation of childhood and social age: problems and prospects. *Journal of Archaeological Method and Theory*. 15: 190-215.
- Halcrow SE, Tayles N and Livingstone V. (2008) Infant death in prehistoric Southeast Asia *Asian Perspectives*. 48: 371-404.
- Kusaka S, Ikarashi T, Hyodo F, Yumoto T, and Katayama K. (2008) Variability in stable isotope ratios in Late-Final Jomon communities in the Tokai coastal region and its relationship with sex and ritual tooth ablation. *Anthropological Science*.

- Lertrit P, Poolsuwan S, Thosarat R, Sanpachudayan T, Boonyarit H, Chinpaisal C, and Suktitpat B. (2008) Genetic history of Southeast Asian populations as revealed by ancient and modern human mitochondrial DNA analysis. *Am J Phys Anthro* 137:425-440.
- Littleton J (2007) Memory and Time: Historic accounts of Aboriginal burial in southeastern Australia. *Aboriginal History* 31:1-121
- Littleton, J (2007) From the perspective of time: hunter-gatherer burials in southeastern Australia. *Antiquity* 81(314): 1013-1028.
- Matsumura H, Oxenham MF, Dodo Y, Domett K, Nguyen KT, Nguyen LC, Nguyen KD, Huffer D, and Yamagata M (2008) Morphometric affinity of the late Neolithic human remains from Man Bac, Ninh Binh Province, Vietnam: key skeletons with which to debate the 'two layer' hypothesis. *Anthropological Science* 116(2): 135-148.
- O'Reilly DJW, Domett K, and Pheng S (2008) The Excavation of a Late Prehistoric Cemetery in Northwest Cambodia. *Udaya* 7:207-222.
- Oxenham MF, Matsumura H, Domett K, Nguyen KT, Nguyen KD, Nguyen LC, Huffer D, and Muller S. (2008) Health and the experience of childhood in Late Neolithic Viet Nam. *Asian Perspectives* 47(2):190-209.
- Oxenham MF, Matsumura H, Domett K, Nguyen KT, Nguyen KD, Nguyen LC, Huffer D, and Muller S (2008) Childhood in late neolithic Vietnam: Bio-mortuary insights into an ambiguous life stage. In K Bacvarov (ed.): *Babies Reborn: Infant/Child burials in Pre- and Proto-History*. Union Internationale des Sciences Prehistoriques and Protohistoriques. Proceedings of the XV World Congress, Lisbon 2006. BAR International Series 1832. Oxford: Archaeopress, pp. 123-136.
- Oxenham, M. (ed.) (2008) *Forensic Approaches to Death, Disaster and Abuse*. Perth: Western Australia University Press.
- Pietrusewsky, M., A. Lauer and C.H. Tsang. (2009) Dental indicators of health in early Neolithic and Iron age skeletons from Taiwan. *American Journal of Physical Anthropology Supplement* 48: 211.
- Pietrusewsky, M. (2009) A multivariate analysis of measurements recorded in early and more modern crania from East Asia and Southeast Asia. *Quaternary International*. doi:10.1016/j.quaint.2008.12.011
- Pietrusewsky, M. (2008) Craniometric variation in Southeast Asia and neighboring regions: a multivariate analysis of cranial measurements. *Human Evolution* 23 (1-2):49-86.
- Pietrusewsky, M. (2008) The modern inhabitants of Island Southeast Asia: a craniometric perspective. In E. Indriati (ed.) *Proceedings of the International Seminar on Southeast Asian Paleoanthropology: Recent Advances on Southeast Asian Paleoanthropology and Archaeology*, pp.185-201. Laboratory of Bioanthropology and Paleoanthropology, Faculty of Medicine Gadjah Mada University, Yogyakarta, Indonesia, pp. 185-201.

- Pietruszewsky, M. (2008) Metric analysis of skeletal remains: methods and applications. In Katzenberg, M.A. and S.R. Saunders (eds.) *Biological Anthropology of the Human Skeleton, Second Edition*. pp. 487-532. New York: John Wiley & Sons Inc.
- Shaw BJ, Summerhayes GR, Buckley HR, and Baker JA. (2009) The use of strontium isotopes as an indicator of migration in human and pig Lapita populations in the Bismarck Archipelago, Papua New Guinea. *Journal of Anthropological Science* 36(4):1079-1091.
- Tayles N, Halcrow SE and Pureepatpong N. (In press) Regional Developments: Southeast Asia, In: J. Buikstra and C. Roberts (eds) *The History of Palaeopathology*. Oxford: University of Oxford Press.
- Tayles N, Domett K and Halcrow SE. (In press) Can dental caries be interpreted as evidence of farming? The Asian experience. In: Koppe T, Meyer G, and Alt KW. (eds) *Interdisciplinary Dental Morphology*. Basel: Karger.
- Willis A. and Tayles N. (2009) Field Anthropology: application to burial context in prehistoric Southeast Asia. *Journal of Archaeological Science* 36: 547-554

## ***Graduate Student Projects***

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HONOURS PROJECTS
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### ***Those underway...***

- Alana Colbert, James Cook University, Townsville, Australia  
Alana has begun her thesis focusing on the biology and archaeology of three distinctive burials from our recent excavations at Ban Non Wat including one individual with a healed fracture of the femur.  
Supervisor: Kate Domett
- Charlotte King and Stacey Ward, University of Otago, Dunedin, New Zealand  
Charlotte and Stacey are both undertaking projects on aspects of diet through isotope analysis and heavy metals in the bones of bronze age skeletons.  
Supervisor: Nancy Tayles

### ***Those recently completed...***

- Rachel Mapson, James Cook University, Townsville, Australia 2008  
*A Dental Pathology Profile of Southeast Asia: a bioarchaeological case study from pre-Angkorian Phum Snay, Cambodia.*

The village of Phum Snay, located in Northwest Cambodia, is the first Iron Age site excavated in this region. It is pre-Angkorian and it is hoped the material will provide evidence for the transition to the

state of Angkor. The site has been dated to c. 350 B.C – 200 A.D and contained 23 burials. A further c. 94 individuals were added to the sample from stratigraphically unprovenanced material collected after the site was disturbed by looters. Very few are sub-adults and as such this study focuses upon four dental health conditions of the adults only. These dental conditions are caries, advanced wear, periapical cavities and antemortem tooth loss. The analysis of these pathologies together sheds light upon the prehistoric inhabitants' diet and a sexual division of labour. Phum Snay's dental pathology percentages are compared with seven other Southeast Asian sites of various ages to not only gauge their level of health but to gain an overview of trends occurring in this region over time. Findings indicate that Phum Snay had a reasonable level of dental health overall, despite the intensification of agriculture which has accompanied a decrease in health in many other areas of the world. However, caries were high for the total sample and males recorded a high percentage of advanced wear but otherwise pathological conditions for both sexes and overall were moderate to low. These results support the theory that rice is less cariogenic than other crops and that the inhabitants maintained a broad-based subsistence pattern. The two outstanding results are common in other studies and have been linked to the likelihood that females tended the crops, whilst males spent time hunting. Therefore, females consumed a higher level of carbohydrates whereas males consumed a higher degree of fibrous protein in the form of animal meat.

Supervisor: Kate Domett

- Christina Antonypillai, University of Sydney, Australia 2008  
Christina has just completed her honours project on the analysis of the donated skeleton of a man who suffered from Marfan Syndrome.  
Supervisor: Denise Donlon

- Christina Adler, University of Sydney, Australia 2008  
Christina has recently completed her honours year on sexual dimorphism in deciduous human teeth.  
Supervisor: Denise Donlon

## MASTERS PROJECTS

### *Those underway...*

- Michael Dickson, University of Auckland, New Zealand  
Michael is undertaking research on the taphonomic analysis of Bronze Age burials from Mongolia.  
Supervisor: Judith Littleton
- Nathan Harris, University of Otago, Dunedin, New Zealand  
Nathan has begun research for a Master of Science degree on Field Anthropology (the interpretation of burial practices from the disposition of skeletal remains), continuing the work begun by Anna Willis on Ban Non Wat.  
Supervisor: Nancy Tayles
- Kristen Selwood, University of Auckland, New Zealand  
Kristen is completing her thesis on the relationship between dental pathology and marine diets.  
Supervisor: Judith Littleton

- Var Inariddh, Belgium

Inariddh is currently undertaking a project that includes an analysis of some stratigraphically unprovenanced skeletal remains from Phum Sophy, Banteay Menachey, Cambodia. There is still many unprovenanced remains after looting has been carried out on prehistoric sites in this area.

*Those recently completed...*

- Kasey Robb, University of Otago, Dunedin, New Zealand 2008

*Adaptation to the Pacific Island Environment. An Investigation of Non-specific Indicators of Stress in Prehistoric Human Skeletal Remains*

Goodman *et al.* (1988) explain that stress focuses on the cost and limits of adaptation. This study investigated non-specific indicators of stress in human skeletal remains from seven prehistoric sites in the Pacific islands as an attempt to gauge the success or failure of adaptation to an island environment. The samples used in this study represent both colonising and established populations and are spread geographically throughout the Pacific islands. The Pacific island environment varies in the distribution of biota, including important nutritional sources and vectors for disease transmission (particularly malaria) that all have implications for the adaptability of prehistoric populations to their island environment. The study of cortical thickness in Pacific island samples has not previously been included with the investigation of other non-specific indicators of stress and therefore allows comparisons of patterns of appositional growth both between and within populations. In the current study both inter and intra sample comparisons of cortical thickness, maximum femoral length and linear enamel hypoplasia were made to assess if there were any differences in patterns of growth disruption in subadults (n=17) and adults (n=100). No significant correlations were determined between the non-specific indicators of stress and the temporal and spatial distributions of the samples. This is because there was very little variation in results between samples. Within all the samples there was evidence of an age related decline in cortical thickness and sexual dimorphism of cortical thickness and maximum femoral length. There was no evidence that incidences of childhood stress affect the adult attainment of their genetic potential for growth. Subadult measures of cortical thickness in neonates showed increased values when compared to modern reference standards but the adult means clustered around the minimum recommended cortical thickness for modern healthy populations. These results suggest a difference between prehistoric and modern growth patterns but show no evidence for chronic ill-health. Overall, the indicators used in the current study showed very similar results and therefore do not reflect evidence for differential adaptation to the Pacific island environment through time and across the island groups. This could have been the result of small sample sizes or the limitations of bioarchaeological studies and needs to be further investigated with the use of other non-specific indicators of stress and evidence of disease in Pacific island samples.

Goodman, A.H., R.B. Thomas, A.C. Swedlund, and G.J. Armelagos. 1988. Biocultural Perspectives on Stress in Prehistoric, Historical and Contemporary Population Research. *Yearbook of Physical Anthropology* 31:169-202.

Supervisor: Hallie Buckley

- Rachel Scott, University of Otago, Dunedin, New Zealand 2008  
*Skeletal Trauma in prehistoric Oceania*

Until recently, the study of trauma in prehistory has been limited to individual case studies. Applying a broader anthropological approach to the analysis of traumatic lesions found in archaeological samples can highlight the environmental and cultural factors that may have influenced trauma in the past. The aim of this study was to record the types and prevalence of adult skeletal trauma in pre-contact Pacific Island samples using a biocultural approach in an attempt to understand variation in the stressors causing trauma. Adult skeletal remains from Nebira, Papua New Guinea (AD1230-AD1560), Taumako, the Solomon Islands (AD1530-AD1698), Teouma, Vanuatu (1000BC- 500BC), Tongatapu, Tonga (AD1100-AD1250), and Palliser Bay, New Zealand (AD1261-AD1480) were macroscopically examined for evidence of cranial trauma, postcranial fractures, dislocations, *ossificans exostoses*, and piercing or perforating wounds to assess the relationship the inhabitants had with their environment, with each other, and to identify how different groups in the Pacific were affected by the ecological boundaries and social systems they lived in. Three hypotheses were tested. First, that frequencies and patterns of skeletal trauma would differ between coastal and inland samples. Hypothesis 1(A) stated that the island environments of Teouma and Taumako would produce similar patterns of trauma. This hypothesis was proven as the samples exhibited a similar prevalence of trauma. The distribution of the injuries at Teouma suggested a balanced sexual division of labour, possibly while establishing a new settlement on the island. Cranial trauma in the Taumako sample indicated some level of non-lethal interpersonal violence between men and women while piercing trauma in the sample suggested the inhabitants actively participated in warfare, perhaps compounded by environmental pressure and resource stress. Hypothesis 1(B) stated that the inland sample from Nebira would exhibit a higher prevalence of accidental injuries compared with the coastal sites. The inhabitants from Nebira did not exhibit higher numbers of accidental injuries but instead showed a high prevalence of cranial trauma (21.42%) indicative of interpersonal violence. One explanation for this may be that the inhabitants were encouraged by climate change to compete for resources causing disputes between groups. Hypothesis 2 stated the founder populations of Teouma and Palliser Bay would exhibit a higher prevalence of accidental injuries because of their unfamiliarity of the terrain and the extra physical pressures placed on them to construct a community and establish agriculture. The sample from Palliser Bay, while small (n=8), has individuals who have experienced accidental injuries suggesting that, like Teouma, the foundation of a new settlement in unfamiliar geography was difficult, supporting the hypothesis. Hypothesis 3 stated the inhabitants from Tongatapu, who lived during a tumultuous period, would exhibit a high prevalence of traumatic injuries from interpersonal violence or warfare. This hypothesis was not conclusively proven. The sample consisted of forearm fractures indicative of defence fractures. However, the lack of cranial trauma in the sample contradicted the hypothesis. A tentative explanation for this is that the people of Tongatapu practiced non-lethal ritualised violence as a way of dispute resolution in the form of boxing or wrestling. The results illustrate that the physical surroundings of the Pacific Islands in prehistory influenced the risk of injury in the past. Injuries occurred accidentally while practicing occupational or subsistence strategies, and intentionally because of social pressures that could have been influenced by many factors including climate change and resource stress.

Supervisor: Hallie Buckley

- David Stiles, University of Otago, Dunedin, New Zealand 2008  
*Vertebral Joint Degeneration in a Prehistoric Sample*

The skeletons excavated from the Namu burial mound on Taumako in the Duff Group of the Southwest Pacific Ocean is one of the few collections of Polynesian origin available for osteological study. This study examines the joints of the spine in a sample (N=73) from the collection in an attempt to explain how any degeneration, if present, may shed light on the overall health of the prehistoric people of Taumako and the Polynesian people of the Pacific in general. The study attempts to ascertain the incidence and severity of joint degeneration in the spine and makes a comparison between synovial and cartilagenous joints and to compare the incidence and severity between males and females, based on the hypothesis that patterns of degeneration present would reflect the lifestyle of the people and their adaptation to a small island environment, however this study is limited by the caution expressed by Knüsel *et al* (1997), Jurmain (1999) and Weiss and Jurmain (2005) that the vertebral column is not the ideal structure to study markers of occupational stress because these patterns are not testable. A high incidence of degeneration was found, with all individuals showing some signs of degeneration. Overall there was little difference between males and females, but spondylosis deformans is higher in males which suggests they are more severely affected. The patterns did not reflect any degeneration that may be related to any habitual activity such as canoe paddling or heavy gardening work as hypothesised (Houghton 1996) and Merbs (2002). The expected pattern of degeneration being more prevalent in the old adult ages group compared with the younger groups is evident in this sample, however young adult males show greater signs of degeneration in the lower thoracic region than the other groups. Spondylosis deformans in the lumbar region is more prevalent in mid adult females, although young old adult males also show evidence of spondylosis deformans. Old adult males show both spondylosis deformans and osteoarthritis in the cervical region the inferior thoracic and superior lumbar regions. Overall the degeneration of the articular facets, including osteoarthritis, is spread evenly throughout the spine. The lack of recognisable patterns of degeneration may indicate an adaptation to a small island environment where there is no strict sexual division of labour, or where work intensity is the same throughout the population.

Supervisor: Hallie Buckley

## DOCTORAL PROJECTS

### *Those underway...*

- Chelsea Budd, University of Durham, UK  
Chelsea recently collected samples for stable isotope analysis of the teeth for her PhD on migration. Chelsea's project is a continuation of the work started by Katharine Cox for her PhD at Otago.  
Supervisor: Alex Bentley
- Helen Cekalovic, James Cook University, Townsville, Australia 2008  
Helen is nearing completion of her PhD concerning the health status and burial archaeology of the Bronze and Iron Age graves from Ban Non Wat.  
Supervisor: Kate Domett & Nigel Chang, James Cook University

- Sarah Croker, University of Sydney, Australia

Sarah is looking at the problem of identification on bone fragments as human or non-human origin, through the study of cortical bone thickness.

Supervisor: Denise Donlon

- Aimee Glover, University of Otago, Dunedin, New Zealand

Aimee has completed collection of data on musculo-skeletal markers from 77 adults for her PhD at the University of Otago.

Supervisor: Nancy Tayles

- Marcus Robinson, University of Sydney, Australia

Marcus is examining variation in the paranasal sinuses of Melanesian skulls with a view to their clinical and forensic significance.

Supervisor: Denise Donlon

- Anna Willis, Australian National University

The site of An Son discussed above is an integral component of Anna's PhD research which will include the mortuary archaeology of the site and the palaeohealth of the individuals. Although the sample size at this stage is still small, it is anticipated that An Son will provide a good temporally similar comparative site for the Northern Vietnamese site of Man Bac, among other assemblages.

Supervisor: Marc Oxenham

### *Those recently completed...*

- Katharine Cox, University of Otago, Dunedin, New Zealand

Katharine has now submitted her thesis and writing papers for publication while waiting for examiner's reports. During the year Katharine Cox attended the International Symposium on Dental Morphology at Griefswald, Germany and the conference of the European Association of Southeast Asian Archaeologists at Leiden, Holland, where she presented results from her PhD research.

### *Human Migration in Prehistoric Northeast Thailand*

The aim of this thesis is to examine the scale of human migration in three prehistoric settlements in the Upper Mun River Valley (UMRV) Northeast Thailand, from c. 1700BC - AD500. Archaeological data implies migration may have had a central role in the development of agriculture and later metal technology in the region, which is suggested to show increased social complexity over this important stage in the development of states in mainland Southeast Asia. The scale of these migrations, however, are not known and based on archaeological evidence it is unclear whether there were large numbers of individuals migrating into the region in order to bring about the changes seen in the archaeological record.

Two potentially complementary methods are used to identify the extent of migration in the UMRV in this thesis. The first method, the study of dental morphological traits, is used as an indication of genotype of 78 prehistoric individuals. The second method is isotope analysis of the dental enamel of 74 individuals, used as indicators of childhood residence and diet. Strontium (Sr), Carbon (C) and Oxygen (O) isotopes are analysed. The first method reflects an individual's genetic heritage through inherited traits, while the second method is an indication of an individual's migration during their

lifetime. Together, these methods may provide a powerful means to assess the scale of migration over an extended period of time in this region.

As it has been posited that the introduction of agriculture is related to migration of people into the region, the current study hypothesises that while immigrants would be identified from outside the UMRV during all phases of occupation at the sites, this would be particularly so during the earlier phases. It is also hypothesised through analysis of the morphological traits that genetic relationships at each site could be suggested. Finally, it is also hypothesised that individuals with evidence for infectious diseases, which are otherwise rare in the region, would be immigrants.

The frequencies of the dental morphological traits at each site are calculated, and a local pattern for each site developed. The results from the morphological traits suggest low levels of migration into the UMRV, and overall group homogeneity. Despite this homogeneity, it is suggested that several individuals may have been from a different genetic pool to others at the sites, reflected in a different combination of dental traits. There is also some evidence for genetic relationships between individuals, and over time, possibly indicating familial relationships at the sites.

Stability in the Sr isotopes over time suggests a local signature for the UMRV. Sr isotopes did not support a hypothesis of large-scale immigration into the UMRV, as there were few isotopic outliers identified. Those individuals with clear outlier Sr results, and therefore probable immigrants, were predominately female. All phases of occupation of the UMRV attracted some long-range inward movement of people, although the data suggests long-range migration diminished over time.

$\delta^{13}\text{C}$  values show no significant change over time, possibly supporting the Sr data of limited migration into the region. While the interpretation of this isotope is primarily from a perspective of migration it is recognised that this may be limited to understanding variation in diet in the individuals.  $\delta^{18}\text{O}$  values show significant change over time ( $p = 0.00$ , ANOVA), perhaps consistent with previous research which suggested increased aridity in the UMRV. An alternative explanation of the  $\delta^{18}\text{O}$  data is that migration increased with time, with people who were differentiated by their O isotopes but not their Sr, however the increased aridity hypothesis is favoured here.

The hypothesis that individuals with evidence for infectious disease would be long-range immigrants into the region is rejected. None of the individuals who had physical evidence for infectious disease had chemical data to support their being immigrants.

The putative migrants to the UMRV are presented as case studies, assessing the complementarity of the methods used. It is argued that given the changes in the environment over time in the UMRV the area may have become less attractive to immigrants and as a result the communities may have become more insular. The data yielded from the two methods have demonstrated the value of using inherited dental traits together with isotopic data of individual migration for investigating human mobility in the past. Using these methods, this study shows that there were low levels of migration into the UMRV and that long-range migration was more frequent in the earliest phases of occupation in the region.

Supervisor: Nancy Tayles

- Jacqui Craig, University of Auckland, New Zealand  
Jacqui will graduate next month having completed her doctorate on the stable isotope analysis of pigs, dogs and humans from Aitutaki, Cook Islands.

Supervisor: Judith Littleton and Melinda Allen

## *Conference Details*

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PAPERS PRESENTED AT RECENT CONFERENCES
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- ASHB (Australasian Society of Human Biology)  
ADELAIDE, December 2008  
<http://school.anhb.uwa.edu.au/ashb/index.html>

Abstracts from these meetings are usually published in *HOMO - Journal of Comparative Human Biology*. The following are **some** presentations that may be of interest to readers. If you wish to have further information you could email the author(s).

- Quantification of DNA in ancient human teeth.  
C Adler, W Haak, A Cooper (The University of Adelaide, Australia)  
[christina.adler@adelaide.edu.au](mailto:christina.adler@adelaide.edu.au)
- Identification of Marfan Syndrome from skeletal remains – Is it possible?  
JC Antonypillai, D Donlon (University of Sydney, Australia)  
[ddonlon@anatomy.usyd.edu.au](mailto:ddonlon@anatomy.usyd.edu.au)
- The accurate determination of variations in tooth morphology  
AH Brook, RN Smith (University of Liverpool, UK)  
[a.h.brook@liverpool.ac.uk](mailto:a.h.brook@liverpool.ac.uk)
- Stress in the prehistoric Marquesean (East Polynesia) ecology: A comparative analysis of enamel hypoplasia in humans and commensal animals.  
H Cowie, JH Littleton, M Allen (University of Auckland, New Zealand)  
[hannahcowie@gmail.com](mailto:hannahcowie@gmail.com), [j.littleton@auckland.ac.nz](mailto:j.littleton@auckland.ac.nz)
- Variability in the cortical thickness of the human tibia.  
SL Croker, D Donlon (University of Sydney, Australia)  
[scroker@anatomy.usyd.edu.au](mailto:scroker@anatomy.usyd.edu.au)
- Richard Parkinson: Observer of the people of the Bismarck Archipelago and the Solomon Islands: 1882-1907.  
KJ Dennison (University of Otago, New Zealand)  
[john.dennison@stonebow.otago.ac.nz](mailto:john.dennison@stonebow.otago.ac.nz)
- Perinatal human skeletal remains from the Parramatta Convict Hospital, Sydney

D Donlon (University of Sydney, Australia)

[ddonlon@anatomy.usyd.edu.au](mailto:ddonlon@anatomy.usyd.edu.au)

- Variation in femoral neck-shaft angle among human groups

I Gilligan (Australian National University)

[ian.g@bigpond.net.au](mailto:ian.g@bigpond.net.au)

- Faces of the Teouma Lapita people: Art, accuracy and facial approximation

S Hayes (University of Western Australia), F Valentin, H Buckley, M Spriggs, S Bedford

[shayes@anhb.uwa.edu.au](mailto:shayes@anhb.uwa.edu.au)

- The excavation of the human skeletal remains from the Old Sydney Burial Ground, Sydney Town Hall

KB Hendrix (Consultant to Casey & Lowe Pty Ltd)

[khendrix@anatomy.usyd.edu.au](mailto:khendrix@anatomy.usyd.edu.au)

- Genetic influences on variability in human dental development and morphology

T Hughes, M Brockmann, L Richards, G Townsend (The University of Adelaide, Australia)

[toby.hughes@adelaide.edu.au](mailto:toby.hughes@adelaide.edu.au)

- Tooth wear: the significance of the Yuendumu Longitudinal Growth Study.

JA Kaidonis, GC Townsend, LC Richards (The University of Adelaide, Australia)

[john.kaidonis@adelaide.edu.au](mailto:john.kaidonis@adelaide.edu.au)

- The anatomy of cretinism

CE Oxnard (University of Western Australia and the University of York)

[coxnard@anhb.uwa.edu.au](mailto:coxnard@anhb.uwa.edu.au)

- Dental occlusion – changing concepts

LC Richards, GC Townsend, JA Kaidonis (The University of Adelaide, Australia)

[lindsay.richards@adelaide.edu.au](mailto:lindsay.richards@adelaide.edu.au)

- Murray J Barrett: a life reviewed

JR Rogers, GC Townsend, T Brown (The University of Adelaide, Australia)

[james.rogers@adelaide.edu.au](mailto:james.rogers@adelaide.edu.au)

- Palaeohealth and its relationship to culture and the environment: A comparative study of palaeohealth in two precontact Papua New Guinean skeletal samples

G Stannard (Australian National University)

[georgia.stannard@gmail.com](mailto:georgia.stannard@gmail.com)

- Primary tooth emergence in Australian singletons and twins

G Townsend (The University of Adelaide, Australia), T Hugher, S mihailidis, M Bockmann, L Richards, N Gully, T Gotjamanos, K.Seow

[grant.townsend@adelaide.edu.au](mailto:grant.townsend@adelaide.edu.au)

NOTE: Abstracts from the Dunedin ASHB conference held in December 2007 will be published in an upcoming volume of *HOMO - Journal of Comparative Human Biology*.

- *Dynamics of human diversity in mainland Southeast Asia*  
Siem Reap, Cambodia, 7th-10th January 2009

This international, interdisciplinary workshop was organised by Nick Enfield and Joyce White and held at the *Ecole Française d'Extrême-Orient* (EFEO) in Siem Reap. The following report was by submitted Sian Halcrow, Nick Enfield and Joyce White.

This meeting posed the general questions: What is the nature of human diversity in mainland Southeast Asia, and how did it come about? There was an emphasis on exploring the relationships among different anthropological approaches to answering these questions. As well as a range of linguistic, archaeological, and social anthropological papers, several biological anthropological papers were presented during the workshop:

- **Korakot Boonlop** and **Sureeratana Bubpha** “Prehistoric people from Ban Chiang, NE Thailand: A physical anthropology perspective on a Southeast Asian agrarian population”
- **Alan Fix** “Origin of genetic diversity among the Malaysian Orang Asli: A simulation study”
- **Siân Halcrow**, Nancy Tayles and Katharine Cox “Human Diversity in mainland Southeast Asia: A view from bioarchaeology”
- **Patcharee Lertrit**, Samerchai Poolsuwan, Rachanie Thosarat, Thitima Sanpachudayan, Hathaichanoke Boonyarit, Chatchai Chinpaisal and Bhoom Suktitipat “Genetic history of Southeast Asian populations as revealed by ancient and modern human mitochondrial DNA analysis”
- **Hirofumi Matsumura** and **Mariko Yamagata** “Population history of mainland Southeast Asia: Perspectives from the prehistoric human skeletal remains and the cultural contexts in Vietnam”
- **Maru Mormina**, **Pedro Soares**, **Catherine Hill**, **Vincent Macaulay**, **David Bulbeck**, Stephen Oppenheimer and **Martin Richards** “mtDNA variation and modern human dispersals in mainland Southeast Asia”

Names in bold indicate the presenter/s of each paper.

A volume is in preparation from this workshop, with contributions from presenters as well and commissioned chapters.

- *36<sup>th</sup> Annual Meeting of the Paleopathology Association*  
Chicago, Illinois. March 31<sup>st</sup> - April 1<sup>st</sup>, 2009  
Presentation titles are available from this website:  
[http://www.paleopathology.org/2009\\_Meeting\\_Info.html](http://www.paleopathology.org/2009_Meeting_Info.html)

- 78<sup>th</sup> Annual Meeting of the American Association of Physical Anthropologists

Chicago, Illinois. 1<sup>st</sup> – 4<sup>th</sup> April

Abstracts are available from this website:

<http://physanth.org/>

UPCOMING CONFERENCES
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- *Pacific Island Archaeology in the 21<sup>st</sup> Century: Relevance and Engagement*

Koror, Palau from July 1-3, 2009.

Michael Pietrusewsky will be chairing a symposium entitled “Physical Anthropology and Bioarchaeology in the Pacific” at this conference.

Symposium Abstract:

Studies of human skeletal and dental remains from archaeological sites provide a rich source of information about human activity, demography, diet, health, disease, adaptation, migration, and relationships of past peoples; issues that provide an important context for understanding some of the social, economic, health and environmental challenges contemporary Pacific Islanders now face. Using information from skeletal and dental remains, this symposium presents a series of papers that address two major themes: 1) population history and relationships in the Pacific and 2) health and lifestyle of the earlier inhabitants of the Pacific.

Please contact Mike if you would like more information

[mikep@hawaii.edu](mailto:mikep@hawaii.edu)

- *Indo-Pacific Prehistory Association*

Hanoi, Vietnam. Sunday 29<sup>th</sup> November to Saturday 5<sup>th</sup> December 2009

This conference is only held every four years so is well worth a visit.

Registration

A secure website to take credit card payments will be online by mid-May (another email will be sent about this later). Registration costs will be:

Rate A: Australia, Canada, Hong Kong, Japan, New Zealand, Singapore, South Korea, USA, Western Europe: AU\$150

Rate B: All other countries, and bone fide students registered in a tertiary institution: AU\$75

If you would like to be added to the IPPA email recipient list for this conference please email:

[ippa2009@vnn.vn](mailto:ippa2009@vnn.vn)

Abstracts or titles may be submitted to session or conference organisers.

<http://arts.anu.edu.au/arcworld/ippa/19thcongress.htm>

<http://arts.anu.edu.au/arcworld/ippa/ippa.htm>

- *Australasian Society of Human Biology*

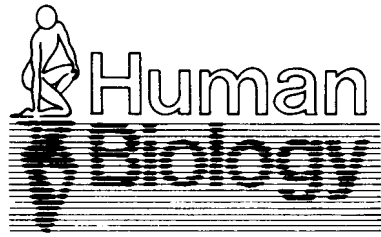
Rottnest Island, Western Australian

1<sup>st</sup> - 4<sup>th</sup> December 2009

The 23rd annual conference of ASHB will be held on Rottnest Island (Perth). Further details will be available on the following website later this year.

<http://school.anhb.uwa.edu.au/ashb/index.html>

See following page for First Announcement.



# Australasian Society for Human Biology 23<sup>rd</sup> Annual Conference

to be held on

**Rottnest Island, Western Australia**

1<sup>st</sup> – 4<sup>th</sup> December 2009



*Photograph: N. Milne 2009*

## First Announcement and Call for Symposium Suggestions

ASHB website: <http://school.anhb.uwa.edu.au/ashb/>

Please check the ASHB website for:

- Conference updates
- Call for papers
- ASHB membership information
- Registration details (when available)



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is hosted by the  
**School of  
Anatomy & Human Biology**  
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