

Due to a number of successful grant awards, the Australian Centre for Ancient DNA (ACAD) at the University of Adelaide is offering several PhD project opportunities for 2015.

We are seeking highly motivated students to join a dynamic research team who must have, as a minimum, a 1st Class Honours or MSc degree, a high undergraduate academic record and meet the English Language Proficiency (ELP) requirement. A background in either of the following areas is essential: evolution, genetics, molecular biology, bioinformatics, palaeontology, archaeology or microbiology. Refer to project specific details below and note the closing date for domestic scholarship applications is 31 October, 2014.

Project: *Investigate evolution of the human microbiome and its impacts on health and disease using ancient DNA.*

Using ancient bacterial DNA obtained from calcified dental plaque (calculus) and Next Generation Sequencing technologies, we are actively investigating the evolution of the human microbiome to understand how long-term changes in the microbiome impact health and disease. Using ancient samples obtained from around the world that date back to 55,000 years ago, we ask how microorganisms establish themselves in the human body, understanding how diverse bacterial communities are formed under different selection regimes, i.e. environment, diet, culture, and disease. Our aim is to know how different microbiomes, established through different evolutionary histories, impact our ability to fight infectious disease, in ancient, modern, westernized and Indigenous human and primate populations around the world. Our research team is also analysing bacterial genome evolution in real-time, investigating the selection pressures that drive bacterial evolution in diversity microbial communities through time. To read more about this research, please see our Nature Genetics article published last year (Adler et al, 2013, Sequencing ancient calcified dental plaque shows changes in oral microbiota with dietary shifts of the Neolithic and Industrial revolutions. Nature Genetics 45:450-455).

We are looking for 2-3 motivated PhD students to join our fast-paced research team. A background in molecular biology, microbiology, medicine, or molecular archaeology and previous research experience are preferred, although not required. Prospective students should also be able to demonstrate a desire to learn, work independently, multi-task, and self motivate. Full PhD stipends and tuition for successful applicants will be provided for a

minimum of three years. To inquire, please send a full CV and a cover letter via email to laura.weyrich@adelaide.edu.au and for further information about ACAD, please visit our blog/official website* .

Project: *Human genomics and evolutionary genetics.*

Meet the team



Prof Alan Cooper



Dr Wolfgang Haak



Dr Laura Weyrich

There are 2-3 PhD positions open to international and domestic students with a strong and demonstrated skill-set in human biology, bioinformatics, or population genetics. In addition, a passion for human history and archaeology is desirable. The projects will suit hard-working and self-motivated candidates equipped with a healthy dose of critical and independent thinking. Training will focus on the analysis of Next Generation Sequencing data with special emphasis on adoption and expansion of population genetic tool sets. Training opportunities to advance wet laboratory techniques can be offered in parallel. The individual projects will generate and analyse ancient human genome data from a range of samples accessible through our collection at ACAD (e.g. from South America, Eurasia and Australia), and will cover many time periods and/or time transects in prehistory and history. Understanding the migration and admixture histories, and the demographics of past populations forms a critical basis for the investigation of human diversity and distribution. Well-dated ancient human genome data provide important temporal clues, which are important in studying the processes and factors at play in selection and adaptation to new environs and pathogens. Time-stamped sampling also serves as calibration points for evolutionary rate estimates. Comparisons

with microbiome data gleaned from the same ancient individuals will form an exciting new angle and integral part of these projects, as they will allow unprecedented insights into the interplay between natural and cultural drivers of evolution. As such, all ancient human genome projects will be tightly linked to our human microbiome projects (see above/below). Two full PhD stipends and tuition for successful applicants will be provided for a minimum of three years. Additional competitive scholarships are available via the University of Adelaide Graduate Centre for [domestic](#) (including NZ) students and [international](#) students. Interested applicants are encouraged to send a resume, a cover letter, and the contact details of 3 referees to Dr Wolfgang Haak (wolfgang.haak@adelaide.edu.au) and Prof Alan Cooper (alan.cooper@adelaide.edu.au).

For more information about ACAD, check us out on our social media or official website *

Projects in *Phylogenomics and epigenomics*

Two PhD positions are open to both international and domestic students with a strong academic achievement in either of the following areas: evolutionary biology, bioinformatics, or molecular biology. The projects will suit hard-working and motivated candidates who can demonstrate independent thinking.

Training will focus on the analysis of Next Generation Sequencing data, with opportunities to gain skills in both laboratory techniques and bioinformatics.

- 1) The role of epigenetic modifications in bovid adaptation to environmental change (Australian Research Council grant LP130100646). Supervision: Dr Bastien Llamas and Prof Alan Cooper. This project will use a novel experimental system to explore the potentially important role of epigenetics in long-term evolution and how animals adapt to rapid climate change. Bones of ancient bison and cattle preserved in permafrost or caves will be analysed for epigenetic markers using advanced Next Generation Sequencing approaches, and the patterns contrasted over a 30,000-year record of major climatic and environmental shifts. It has strong potential to reveal key loci for climate adaptation in modern cattle. Most previous genetic research has been blind to epigenetic marks, and this study promises to be a major advance in addressing this issue, with considerable implications for conservation genetics and the cattle industry.
- 2) Using phylogenomics to record the impacts of climate change, extinction and population fragmentation (Australian Research Council grant DP140104233). Supervision: Dr Julien Soubrier and Prof Alan Cooper. We recently sampled bison bones from deep frozen soils of gold mines in Canada (see [blog article here](#)) that will be key to understanding evolutionary processes of large mammal genomes. We will use ancient DNA from permafrost-preserved Steppe bison bones and bovid exome capture systems to build a detailed record of the genomic impacts of rapid climate and environmental change at the end of the Pleistocene (30-11 kyr). The project will analyse how ancestral genetic diversity is distributed amongst surviving bison populations, and the role of nuclear loci under selection and drift. It will create a novel temporal dataset of genomic adaptation and evolution, and will generate critical data for studies of evolutionary processes such as extinctions,

speciation and conservation biology and management.

Competitive scholarships are available via the University of Adelaide Graduate Centre for [domestic](#) (including NZ) students and [international](#) students. Both the Australian Department of Immigration and University of Adelaide expect international applicants to meet the English Language Proficiency (ELP) requirements. See below for details of the ELP.

There is the potential for fieldwork, and training in ancient DNA, bioinformatics, genomics, and population genetics. Interested applicants are encouraged to send a resume, a cover letter, and the contact details of 3 referees to Dr Bastien Llamas (bastien.llamas@adelaide.edu.au) and Dr Julien Soubrier (julien.soubrier@adelaide.edu.au).

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Project: *Investigate evolution of the cereals genomes in the Near East*

We are looking for highly motivated individuals to join a dynamic research team based in Adelaide, Australia, that investigates the evolution of founding crop species (specifically wheat and barley) in the Near East.

The Fertile Crescent region of the Near East (encompassing Iran, Iraq, Kuwait, Turkey, Syria, Jordan, Palestine, Lebanon) was an important region for the development of human civilisation and agriculture. Many of the founding crops (such as wheat, barley and rye) and livestock (cattle, sheep, pigs, etc) were first cultivated there. But as crops were selectively bred for characteristics such as height and yield, many unique phenotypes and their underlying genomic counterparts were lost over time. Now, as genetic

diversity is extremely reduced in crops like wheat and barley, breeders are turning to wild cultivars to introduce new traits to continue to improve agricultural populations. With the improvement of next-generation genome sequencing (NGS) technology and ancient DNA extraction methodology it is now possible to directly access ancient alleles from 5,000-year-old wheat and barley seeds, preserved in ancient storage jars buried in a cave in Armenia. This project aims to investigate ancient wheat and barley genomes and identify lost genes and alleles through comparison with modern breeds.

Meet the team



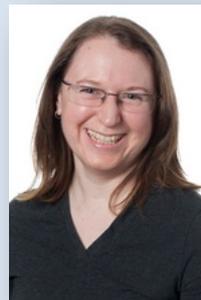
Dr Bastien Llamas



Dr Julien Soubrier



Dr Jimmy Breen



Dr Vicki Thomson

We are looking for 1-2 motivated PhD students to join our research team. A background in molecular biology, plant biology, or molecular archaeology and previous research experience are preferred, although not required. Prospective students should also be able to demonstrate a desire to learn, work independently, multi-task, and self motivate. Full PhD stipends and tuition for successful applicants will be provided for a minimum of three years. To inquire, please send a full CV and a cover letter via email to jimmy.breen@adelaide.edu.au. For further information on ACAD, visit our blog/official website *

Project: *Investigate the development of rice agriculture in SE Asia using agricultural and commensal rodents as a proxy.*

We are looking for a highly motivated person to join a dynamic research team based at the Australian Centre for Ancient DNA in Adelaide, Australia - refer to our blog/official website*.

The worldwide emergence of agriculture during the Holocene is arguably one of the key transformational 'events' in human history and in recent earth history due to the pervasive impacts on global ecosystems and biodiversity. The history of agriculture and its impacts in Southeast Asia remain uncertain and is worthy of resolution given the unique features of the Neolithic in Southeast Asia: the predominance of rice agriculture, the diversity of habitats spread over temperate and tropical zones, and the simultaneous expansion of commensal rodents that evolved *in situ* within Southeast Asia. We will use the recent evolutionary and demographic history of the agricultural and commensal rodent guild (ACRG) as a proxy for the transition to agricultural lifestyles in ISEA. Our work draws on previous successes in using commensal rodents (*Rattus*) as a proxy for human dispersal in the Western Pacific and the Indian Ocean but will considerably extend the approach used in these previous studies through: 1) the consideration of a wider suite of commensal rodent species; and 2) the use of population genetic approaches to identify the location and timing of population expansions among members of the ACRG, thereby informing on regional histories of habitat disturbance associated with various kinds of agricultural activity. There is the potential for fieldwork, and training in ancient DNA, bioinformatics and next-generation sequencing.

Experience: This project will ideally suit an enthusiastic student who is interested in learning more about ancient DNA experimental work and Next-Generation Sequencing (NGS), and investigating the mechanisms of rodent commensalism and evolution by using these unique ancient samples. A good level of molecular biology is essential, and computational knowledge (especially in UNIX systems) is desirable. Competitive scholarships are available via the University of Adelaide Graduate Centre [website here](#).

Interested applicants are encouraged to send a resume and a cover letter to Prof. Steve Donnellan (Steve.Donnellan@samuseum.sa.gov.au) and Dr Vicki Thomson (vicki.thomson@adelaide.edu.au)

Of note, the Australian Department of Immigration and the University of Adelaide expect international applicants to meet the English Language Proficiency (ELP) requirements. See below for details of the ELP.



The ELP is based on high scores in IELTS (International English Language Testing System) or TOEFL (Test of English as a Foreign Language). For further information please refer to [this link](#).



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*For all our social media & official website [click here](#) to find us in the one spot.



ACAD provides world-class facilities for ancient DNA research in Australia and across the southern Hemisphere



ACAD has strong collaborative links with a broad variety of Australian and international groups, museums and bio-tech companies.