

EPIDERM 2008

PROFESSOR ALAN COOPER

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Prof. Alan Cooper was awarded a prestigious Australian Research Council Federation Fellowship award in 2004, allowing him to move from Oxford University (where he was the Director of the Henry Wellcome Ancient Biomolecules Centre) to Adelaide in 2005 to establish the Australian Centre for Ancient DNA (ACAD). This international standard research facility was formally opened by the Premier, Mike Rann in August 2006 and provides the specialist equipment and ultra-sterile working environment required for the study of minute traces of preserved genetic material.

ACAD has been designed to provide a centre for evolutionary research in the Southern Hemisphere, particularly the impacts and timing of environmental change (eg climate, humans) on animals, plants and microbes by measuring the genetic records preserved in bones, teeth, leaves and seeds, faeces, and other remains from caves, museums and even sediment cores from lakes, rivers and marine sites.

Prof. Cooper specialises in using ancient DNA to record and study evolutionary processes in real time, especially those associated with environmental change. His work ranges over timescales of hundreds of years old (eg museum specimens) to material well beyond the ca. 60 kyr range of carbon-dating, such as permafrost-preserved bones of mammals and sediment dating to >300 kyr. His research is characterised by multi-disciplinary approaches involving the combination of information from areas such as geology, archaeology, anthropology, and even forensics to provide novel views of evolution, population genetics and palaeoecology. Recent research highlights include the use of Ice Age mammal populations to record the effects of environmental change, the first complete mitochondrial genome sequences of any extinct species (two New Zealand moas), and the study of how evolutionary rates change over time.

Prof. Cooper's current research features studies of Australian megafaunal species, permafrost preserved material from the Arctic and Antarctic, ancient human DNA (modern human, Neandertals and Flores hominids), and DNA from sedimentary deposits (marine, terrestrial and freshwater). He is also heavily involved in developing new molecular biology techniques to both improve the ability to recover DNA from the past (eg nuclear genomes, mass sequencing approaches), and to analyse the authenticity of aDNA data. This involves recording how DNA is damaged over time, and the effects on retrieved sequence information (which is relevant for forensics work). Current fieldwork areas include Australia, Beringia and North America, South America, South Africa, China and New Zealand.

A further major research theme concerns the use of molecular clocks to estimate the timing of past evolutionary events. Recent work with ancient DNA data suggests that evolutionary rates may change according to the time period over which they are measured, and has major implications for our ability to date recent evolutionary events.