

PLANET WITHOUT APES

Craig Stanford, the second speaker in the Allan Wilson Centre 2013 Lecture Series, tours six cities throughout New Zealand from 30 August to 7 September. Craig is Professor of Biological Sciences and Anthropology at the University of Southern California (USC), where he also co-directs the USC Jane Goodall Research Centre.



Craig's research focus is the behaviour and ecology of primates, and the great apes in particular. His work has taken him around the globe, conducting field research in East Africa, South Asia, Southeast Asia, and Central and South America.

In addition to documenting his findings in academic articles prepared for scientific audiences, Craig has written several books throughout his career, making his theories and research findings accessible to the general public. The first of these, *The Hunting Apes*, was published in 1999 and examined the potential role hunting for meat may have played in early human evolution.

The book built on ideas developed during Craig's in-depth field study in the 1990s in Gombe Stream National Park, Tanzania. This work focused on the hunting behaviours of chimpanzees, who are frequent hunters, unlike the three other great ape species - bonobos, gorillas and orangutans. By following chimpanzee hunting parties, and studying two groups of the red colobus

monkey that are the chimpanzees' main prey, Craig identified several environmental and social factors which appear to contribute to hunting episodes. These findings were key points in developing a model of how and why human ancestors may have hunted meat. In *The Hunting Apes*, Craig argued that the desire to eat meat was an important factor in hominin evolution, driving increases in brain size, as the effective hunting and sharing of meat required enhanced social skills and organisation.

From 1996 until 2005, Craig conducted a field study within the evocatively named Bwindi Impenetrable National Park in Uganda, the only forest in which chimpanzees and mountain gorillas live together in the same habitat. It is known that several hominin species must have had shared habitats in the past, and the mountain gorillas and chimpanzees at Bwindi provide a contemporary example of the sharing of a habitat and its resources.

Over the study period very few interactions between chimpanzees and gorillas were observed, although they were seen to occasionally feed or nest in the same or adjacent trees. They only very rarely showed any aggression towards each other. As well as studying the interactions between the chimpanzee and mountain gorillas at Bwindi, Craig also studied the use of bipedal posture by chimpanzees. His observations of bipedalism in chimpanzees are described and discussed with theories of human evolution in his book *Upright: The evolutionary key to becoming human*, published in 2003.

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closely related to humans providing valuable clues and insights into the lives of our ancestors. In recent years, however, Craig has balanced this work with an increasing emphasis on conservation issues faced by primates and other animals. In his latest book *Planet without Apes*, he describes the immediate problems facing the world's great ape populations, and urges action to ensure their survival.

The loss of tropical forest habitat is a major threat to orangutan populations in Sumatra and Borneo, and bonobo, chimpanzee and gorilla populations in equatorial Africa. Over the last three decades vast areas of forest in Borneo have been replaced by palm oil plantations, and in Africa forests have also been reduced, and territories divided by roads.

Apes are also at risk in Africa from hunting. While people in Africa have hunted and eaten apes for millennia, a growing commercial trade in 'bushmeat' is now posing a serious threat to the survival of chimpanzees, bonobos and gorillas.

Our shared genetic ancestry also leaves the great apes susceptible to many human-borne diseases, several of which are now spreading into wild ape populations, causing further population losses. In *Planet without Apes* Craig describes these and several other threats to the great apes, and presents his case for why their continued existence is so important to humans, and why and how we should act urgently to save these four species so similar to ourselves.



Professor Craig Stanford will be touring New Zealand as a guest of the Allan Wilson Centre for Molecular Ecology and Evolution

Auckland	Tauranga	Wellington	Palmerston North	Christchurch	Dunedin
Friday 30 August, 6.15pm, Auckland Museum Events Centre, \$15/10 for Auckland Museum Institute members, Auckland Writers & Readers Festival Patrons and Friends, and students with ID	Monday 02 September, 6.30pm, refreshments, 7.00pm talk begins, Baycourt Community and Arts Centre, 38 Durham Street	Wednesday 04 September, 6.00pm, Embassy Theatre, Courtenay Place, \$15/10 for Royal Society Wellington Branch members and students with ID	Thursday 05 September, 6.30pm, Central Library, 4 The Square	Friday 06 September 6.30pm, University of Canterbury, CLT1/2/3	Saturday 07 September, 6.30pm, University of Otago, St David's Lecture Theatre

BOOKINGS: Seats may be reserved, and tickets purchased (for Wellington and Auckland) online at: <http://www.allanwilsoncentre.ac.nz> Click 'Book Now' under 'News and Events'. The Auckland lecture is in partnership with the Auckland Museum Institute and the Auckland Writers & Readers Festival.



What the great apes can tell us about our past

Primate field studies of chimpanzees, in particular, have played an important role in reconstructions of fossil hominin behaviour.

While the human species has spread itself across the world in ever-increasing numbers, great ape populations are comparatively small and isolated, with habitats in West and Central Africa, and on the Southeast

Asian islands of Sumatra and Borneo. Little was known about the behaviour of any of the great ape species until about fifty years ago, when the first detailed field research programmes began. Jane Goodall was a pioneer in the field, immersing herself in the lives of her chimpanzee subjects in the Gombe Stream National Park in Tanzania.

Goodall's work was initiated and supported by Louis Leakey, a prominent Kenyan-born archaeologist. Leakey was searching for fossil evidence of early human evolution in Africa, and believed that studies of the behaviour of nonhuman primates could add valuable information to the picture of human evolution emerging from the growing body of fossil evidence. Goodall's chimpanzee research was one of three great ape field studies fostered by Leakey: Dian Fossey studied mountain gorillas in Volcanoes National Park in Rwanda, and Birute Galdikas, orangutans in Tanjung Puting Reserve in Central Borneo.

Modern field studies of great apes are similar to the early work of Goodall, Fossey and Galdikas, with researchers typically spending one to two years living in the animals' habitat. Many field studies have now been conducted over long periods, allowing researchers to follow a group through more than one generation. Researchers also now benefit from technological developments, for example taking samples from shed hairs, faeces or urine to determine paternity, or to test hormone levels; or using recording devices to study communication over large areas.

Great apes are often studied in captivity, as they present fewer challenges to researchers. The composition of groups and their physical environment can be manipulated, and resulting changes in



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behaviour easily observed. But research has shown that the animals' behaviour in these highly unnatural settings does not accurately reflect behaviour in the wild: for example captive groups have higher levels of aggression than wild populations. Studying animals in the wild gives researchers a clearer representation of their natural behaviour, but it can be a long time before the group becomes accustomed to the researcher, and allows him or her to observe them. As building up an observational relationship with a group of wild apes can also leave them open to approaches from other humans, and more vulnerable to attack from poachers, care

needs to be taken to choose study areas where the animals are protected.

Studying primate societies is therefore a time-intensive process. While much is yet to be learned, research by primatologists such as Jane Goodall, and AWC visiting lecturer Craig Stanford, Professor of Biological Sciences and Anthropology at the University of Southern California (USC), and also co-director of the USC Jane Goodall Research Centre, has provided us with many insights into the cultures and ecology of the great apes. At least eight field studies of wild chimpanzees have continued for twenty years or more, providing detailed pictures of the lives of different groups. Craig has summarised four key traits of chimpanzees that are likely to have been shared with the last common ancestor of apes and humans, which make studies of their behaviour so valuable for learning about our origins.

Firstly, chimpanzees make extensive use of both ground and arboreal travel – despite being highly adapted to movement through trees, chimpanzees commonly move along the ground. Terrestrial rather than arboreal movement is not energy-efficient for chimpanzees, and would not be inferred from their skeletal structure. Secondly, chimpanzees are omnivores, mainly eating fruit but also including many other plant products in their diets. Meat is captured during communal hunts without any weapon or tool use. The first stone tools appear in the archaeological record about two and a half million years ago, long after the estimated dates (~5-6 million years ago) of the most recent common human and chimpanzee ancestral species.

Tool use is the third trait of chimpanzees that may be able to give us a window into the past. Chimpanzees use a wide range of tools for extracting resources, and recent evidence indicates use in social contexts as well. Finally chimpanzees have cultural behaviours; traditions that are created, learned, and passed on through generations. Studying these four traits in chimpanzees, Craig argues, is essential for our understanding of early hominin evolution.

Learn more about Craig Stanford's research, and what it says about us, at his forthcoming public talks, organised by the Allan Wilson Centre.

Teaching suggestions

- Curriculum links: Nature of Science: Understanding about science, Levels 6-8, Living World: Evolution Levels 6-8.
- The Resource Library at the Primate Education Network (<http://www.primaledgeeducationnetwork.org/resources/?wpa-paged=2>) contains many teaching resources as pdf files, particularly suitable for Year 1-8 students.
- A major focus of Craig Stanford's field research has been the cooperative hunting behaviour of chimpanzees. This short video from BBCWorldwide follows a group of chimps hunting colobus monkeys: <http://www.youtube.com/watch?v=A1WBs74W4ik> (4 minutes).

CENTRE WELCOMES NEW INVESTIGATORS

Professor Russell Gray, of The University of Auckland, joins the Allan Wilson Centre (AWC) this month as a Principal Investigator. We also welcome our five new Associate Investigators: Professor Marti Anderson, Associate Professor Murray Cox, Dr Anthony Poole, Dr James Russell and Professor Jason Tylianakis.



Russell Gray

Russell Gray is a Research Professor of Psychology at The University of Auckland. He is a Fellow of the Royal Society of New Zealand, and a recipient of the James Cook Fellowship, the Hood Fellowship and the inaugural Mason Durie Medal awarded for advances in frontiers of social science. Russell has diverse research interests, and his work has made significant contributions to the fields of linguistics, animal cognition, philosophy of biology and behavioural phylogenetics.

Together with his colleague Gavin Hunt, Russell has led a long-term study into cognition and tool use among New Caledonian crows. This work has revealed that the crows' remarkable tool manufacturing skills are the product of a lengthy learning period and are underpinned by brains with large associative regions and the ability to make causal inferences, challenging assumptions about the evolution of tool use and cognition in general.

Russell and colleagues have pioneered the application of computational evolutionary methods to questions about linguistic prehistory. Their work

on the Indo-European languages examined basic vocabulary terms and geographic information from 103 ancient and contemporary languages, and found that the likely geographic location of the ancestral speakers was in Anatolia (present-day Turkey). The age of the ancestral language was also estimated using these methods, and taken together the evidence supports the hypothesis that the ancestral Indo-European speakers lived in Anatolia about 8,000 to 9,500 years ago, and the languages spread out from there with the expansion of farming into Europe. Russell and colleagues have also worked on the Austronesian language family (to which the Polynesian languages belong) using the same approach. They found that the languages spread out in a series of expansion pulses and pauses from Taiwan, to reach their present-day distribution which covers a vast geographic area, including Madagascar, Island Southeast Asia and Polynesia.



Marti Anderson

Professor Marti Anderson is based at Massey University's Albany campus, in the New Zealand Institute for Advanced Study.

Marti describes herself as a 'statistical ecologist and ecological statistician', whose work centres on the development of new statistical methods tailored to the needs of ecological studies.

Traditional statistical methods are often not well-suited to describing and understanding ecological processes, and changing geographical and temporal patterns of plants and animals, and new and creative statistical approaches and ideas are often required to answer questions.

Marti takes an inter-disciplinary approach as an applied statistician and a practising field ecologist to tackle these issues. She is actively involved in ecological and environmental consulting and also develops computer programmes to implement the newest statistical methods and techniques available.



Murray Cox

Associate Professor Murray Cox is based at Massey University's Palmerston North campus, where he leads the Computational Biology Research Group in the Institute of Fundamental Sciences. Murray has been an AWC affiliate since 2009, when he returned to New Zealand after working as

a postdoctoral fellow at the Leverhulme Centre for Human Evolutionary Studies (University of Cambridge, UK), and the Arizona Research Laboratories (University of Arizona, USA). In 2010 Murray was awarded a Rutherford Discovery Fellowship, to pursue his research into the computational reconstruction of genomic evolution. Murray, along with AWC Principal Investigator Alexei Drummond and new Associate Investigator Jason Tyljanakis, were among the first ten recipients of this prestigious fellowship, which supports the recipients for a five-year term. In the 2011 round, Associate Investigator Anthony Poole also became a Rutherford Fellow.

Murray's research interests include modeling genome dynamics: examining how genetic variation is distributed within and between individuals, and how these distributions change through evolutionary time. His work draws together his skills and interests in genetics, biochemistry, statistics, computer science and anthropology. Projects that Murray and members of his group are working on include reconstructions of aspects of human prehistory in the Pacific region, determining how the transcriptome (the set of RNA molecules produced within a cell from DNA) evolves, and developing new methods of demographic inference.



Anthony Poole

Dr Anthony Poole is a senior lecturer in the School of Biological Sciences at the University of Canterbury.

Anthony completed his PhD at Massey University, where he studied the evolutionary origins of cellular life,

supervised by former AWC Director, Professor David Penny. Following this Anthony was one of the first AWC postdoctoral fellows, before taking up a position at Stockholm University in Sweden, as a Swedish Research Council-funded Assistant Professor. In 2011 Anthony was awarded a Rutherford Discovery Fellowship to continue his research into the evolution of biological complexity.

Anthony and members of his group at the University of Canterbury are working on several projects with national and international collaborators to further explore molecular evolution. One major project currently underway is investigating the evolution of protein synthesis in bacteria, which appears to be inexplicably complex. Another is using comparative genomics to study the evolution of small RNA molecules. With collaborators in Japan, Anthony is also investigating the evolutionary origin of DNA.



James Russell

James Russell is a senior lecturer at The University of Auckland, where he is jointly appointed in the School of Biological Sciences and the Department of Statistics.

In 2012 James won the Prime Minister's MacDiarmid Emerging Scientist Prize, which rewards an outstanding scientist (within five years of completion of their PhD) for leading-edge work. James is well known internationally for his work on the ecology and genetics of invading rat populations on islands. This research is helping to keep endangered species safe and strengthening New Zealand's reputation as a world leader in island conservation.

James's work often has a strong statistical modelling or analytical component. He is interested in a wide range of ecological questions that often have underlying applications to conservation, and has a particular enthusiasm for islands, where complex ecological relationships can become reducible and tractable. James has conducted fieldwork at many sites around the world, including the Indian Ocean, French Polynesia, the Mediterranean and the Tibetan Plateau.



Jason Tyljanakis

Ecologist Jason Tyljanakis is a Professor in the School of Biological Sciences at the University of Canterbury and part-time Chair in the Department of Life Sciences at Imperial College London. He has been based at the University of Canterbury since 2006, following the completion of his PhD at Georg August University in Goettingen, Germany, and in 2010 became one of New Zealand's first Rutherford Discovery Fellows.

Jason's research concentrates on the effects that human changes to the environment have on biodiversity, species interactions and ecological networks. He also studies the conditions under which biodiversity is most important for maintaining ecosystem functioning. Members of his group work on a broad range of topics in community ecology, including food webs, global environmental change and ecosystem functioning.

Are there good reasons for the Allan Wilson Centre to focus more on New Zealand's biodiversity?

By Professor Ian G Jamieson, Department of Zoology, University of Otago, Dunedin

Photo by Gerard O'Brien



The Allan Wilson Centre (AWC) is currently preparing for its next rebid application for six years funding from the government. The AWC's focus on molecular ecology and evolution has changed from examining the broad and theoretical aspects of this research area to increasing its focus on the importance of New Zealand's biodiversity.

One theme we are currently working on is: Understanding our Past, to Protect the Present and Enhance our Future: Securing Our Biological Heritage. The specific emphasis on New Zealand's biodiversity (including humans) coincides with a general lack of understanding of how biodiversity impacts on evolutionary, ecological, social and economic environments.

Another force for focusing more of New Zealand's science on biodiversity has come from the government itself. The Minister of Tertiary Education, Hon Steven Joyce has, on a number of occasions, stated that funding to support science research programmes comes from the New Zealand taxpayer, and therefore a greater proportion of that research effort should focus on problems and solutions that are immediately beneficial to New Zealand. The Minister is keenly aware that many of the immediate problems facing New Zealanders, such as the difficulty of eradicating or controlling introduced predators on the mainland, or the conflicting issues between economically productive dairy farming and misappropriation of native waterways, all deserve more attention from New Zealand scientists. Although these statements from Mr Joyce sound promising, there are still a number of outstanding issues that need to be overcome. First, while stating that more science funding should be directed toward problems of national significance, the government

has restructured and seriously reduced funding to its main government agency – the Department of Conservation (DOC) – which is responsible for managing our national biodiversity. The government has said that DOC's ability to carry out this mandate has actually improved because the restructuring has increased the emphasis on working closely with the community and big business. However, this is likely to be a strategic way of making up for the loss of funding from the national budget by placing greater reliance on lay people to make science and management decisions and on companies to provide more funding, even at times when it may not economically suit their interests.

Crown Research Institutes (CRIs), such as Landcare Research and the National Institute of Water and Atmospheric Research, are relied upon to provide the science capabilities for management agencies like the Department of Conservation and the Ministry for Primary Industries. They also claim to be underfunded and do not have the laboratory and equipment capabilities to handle the increasing complexity of molecular research, which is often the driving force of many of the new management techniques being employed in New Zealand and across the world. The universities have the molecular laboratories and expertise, yet their main research funding driver is the Performance-Based Research Fund (PBRF), which is primarily based on individual academics' top four publications in international journals, whether the research is fundamental or

applied and not necessarily focused on problems at the national level.

Centres of Research Excellence like the AWC can play an important role in traversing this political minefield. Consisting of the top senior scientists and their postgraduates from universities and CRIs, with strong associations and affiliations with agencies such as DOC, the AWC has a great opportunity to fill this research gap.

IT CAN DO THIS BY ASKING PERTINENT QUESTIONS SUCH AS:

- *What is the nature and extent of New Zealand's biota?*
- *How is our biota changing both from an historic and contemporary nature, and are these changes anthropogenic or natural?*
- *What might our biota be composed of in the future, and how might this alter our environment and economy?*
- *And finally, how will science not only inform our management and policy decisions, but also our education and outreach to the taxpaying public for maintaining and growing our biodiversity?*

Time will tell whether the AWC has been successful in doing so.

WHAT DOES IT MEAN TO BE A NEW ZEALANDER?

Professor Lisa Matisoo-Smith,
University of Otago

The first DNA samples for Lisa Matisoo-Smith's research project 'The Longest Journey – from Africa to Aotearoa' are being collected this month. Lisa and her team will have a stall introducing the project and inviting members of the public to participate at Dunedin's Stadium Market on the first two Sundays in August.



Lisa, a Principal Investigator in the Allan Wilson Centre, has been awarded a prestigious James Cook Fellowship to enable her to concentrate on the Africa to Aotearoa project for two years from mid-2013. This genetic ancestry study aims to collect data from about 2000 volunteers to explore questions of New Zealand identity: our common ancient origins, our unique histories and our shared future as New Zealanders.

The islands of New Zealand were one of the last parts of the world to be permanently occupied by humans, with Maori settlers arriving about 750 years ago. Our small population of 4.4 million, and recent settlement history compared to other countries, makes New Zealand an ideal place to study the development of a national identity.

Census data has shown that the way we identify ourselves has changed through time, with one clear example being that many now tick the 'New Zealander' description for themselves, rather than the 'European' box. Lisa's nationwide study of maternal and paternal ancestry will provide valuable data to add to our social history, and is likely to

stimulate valuable discussions about our national identity. Participants will contribute to answering the 'big picture' questions, and will also receive personalised information about their own genetic ancestry.

Later this year, and throughout next year Lisa and her team will travel New Zealand collecting samples from the other major urban centres of Auckland, Hamilton, Wellington and Christchurch. Lisa also plans to recruit volunteers from some selected regional towns and communities, before processing all of the data and presenting the results in a series of public forums. If you are keen to learn more about this project, and keep up with its progress, the webpage <http://AfricatoAotearoa.otago.ac.nz> will be up and running soon.

AND THE MATHS OF LIFE WINNERS ARE...!

We congratulate Maths Quest Poster Competition winners, Kate Anderson of Fairfield Intermediate School and Lakshitha Singhalage of Remuera Intermediate School, for their winning entries in the AWC-sponsored 'Mathematics of Life' category of the national competition. The Maths Quest competition, for students in Years 7-13, was organised by the New Zealand Association of Mathematics Teachers to celebrate the 2013 Year of Mathematics. The winners will receive an iPad mini and a trip to Wellington for the award ceremony.



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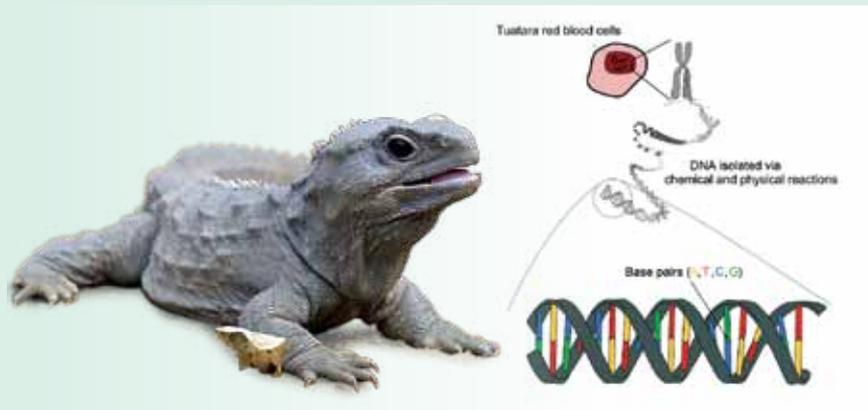
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THE TUATARA BLOG

Tuatara are a national treasure, and of great importance scientifically for their place on the vertebrate evolutionary tree.

The Allan Wilson Centre has begun a major project (in collaboration with Ngātiwai, and several research and funding bodies) to sequence the entire genome of one of these living fossils, coordinated by Principal Investigator Neil Gemmell.



Dr David Winter's new blog: '**Sequencing the tuatara genome**' at Sciblogs (<http://sciblogs.co.nz/tuataragenome/>) is following the progress of the project, describing the scientific theory and techniques used by researchers, and answering questions as they arise. David is well-known for his 'The Atavism' blog and brings his considerable skills in science communication to the tuatara genome blog. Topics covered so far include 'First find your tuatara (or how to sequence a genome)' and 'How many species?', and provide entertaining, as well as informative, reading.