AUSTRALIAN RESEARCH COUNCIL
Centre of Excellence for Australian Biodiversity and Heritage

MEDIA RELEASE

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Mapping the 'superhighways' travelled by the first Australians

'Superhighways' used by a population of up to 6.5 million Indigenous Australians to navigate the continent tens of thousands of years ago have been revealed by new research using sophisticated modelling of past people and landscapes.

The new insights into how people not only survived, but thrived, in harsh environments provide further evidence of the capacity and resilience of the ancestors of Indigenous people, and help paint a picture of large, well-organised groups navigating tough terrain.

The 'peopling' of Sahul — the combined megacontinent that joined Australia with New Guinea when sea levels were lower than today — could have taken as little as 5,000 years as people moved from the far northwest, all the way to Tasmania in the southeast.

Models also predict that the total population of Sahul could have reached as much as 6.5 million people, according to the studies led by researchers from the Australian Research Council Centre of Excellence for Australian Biodiversity and Heritage (CABAH).

Many Aboriginal cultures believe people have always been here, while others have strong oral histories of ancestral beings arriving from the north.

While there are many hypotheses about where, how and when Indigenous Australians first settled in Sahul, archaeological evidence is scarce.

Now, a group of multidisciplinary experts have collaborated to investigate these questions using state-of-the-art modelling techniques, with the findings published in two companion papers in *Nature Communications* and *Nature Human Behaviour*.

Real-world data about long-distance dispersal of people, human survival, fertility rates and the chance of natural disasters were used in combination with principles of human ecology and behaviour and with anthropological, ecological and environmental data to model the peopling of Sahul, in the *Nature Communications* study led by Professor Corey Bradshaw, CABAH Chief Investigator at Flinders University.

Data for the 10 million km^2 super-continent were used to develop a simulation model and run more than 120 scenarios to predict population size and growth rate. Strongest support was found for the arrival of people 50,000 or 75,000 years ago, with the average establishment rate of 1 km per year emerging from the model giving rise to a maximum population of up to 6.5 million people.

"Guided by Indigenous knowledge, we are coming to appreciate the complexity, prowess, capacity and resilience of the ancestors of Indigenous people in Australia," Professor Bradshaw said. "The more we look into the deep past, the more we understand that many people have long underestimated the ingenuity of these extraordinary cultures."

To investigate travel pathways across Sahul, an international team of archaeologists, anthropologists, geographers, ecologists, geneticists, geologists, and computer scientists built

the most complete digital elevation model ever constructed for the continent, including areas now underwater.

The model featured in the sister paper in *Nature Human Behaviour* allowed researchers to understand what early people would have seen — particularly prominent land features within a relatively flat landscape. Other factors, including the physiological capacity of people, difficulty of the terrain, and availability of water were also included.

“If it's a new landscape and we don't have a map, we're going to want to know how to move efficiently throughout a space, where to find water, and where to camp — and we'll orient ourselves based on high points around the lands,” said *superhighways* lead author, archaeologist and computational social scientist Stefani Crabtree, a CABAH Associate Investigator, Fellow at the Santa Fe Institute, and Professor at Utah State University.

The scientists identified and tested more than 125 billion possible pathways using rigorous computational analysis in the largest movement-simulation project ever attempted, with the pathways compared with the oldest known archeological sites to help to distinguish the most likely routes.

The patterns that emerged formed distinct ‘superhighways’ across the continent, as well as secondary routes. Several of the identified superhighways echo well-documented Aboriginal trade routes criss-crossing the country — including the trade of pituri native tobacco from Cape York to South Australia via Birdsville, and the trade of Kimberley baler shell into central Australia.

“Australia’s not only the driest, but also the flattest populated continent on Earth,” explained CABAH Deputy Director, Distinguished Professor Sean Ulm from James Cook University. “Our research shows that prominent landscape features and water sources were critical for people to navigate and survive on the continent.

“In many Aboriginal societies, landscape features are believed to have been created by ancestral beings during the Dreaming. Every ridgeline, hill, river, beach and water source is named, storied and inscribed into the very fabric of societies, emphasising the intimate relationship between people and place. The landscape is literally woven into peoples’ lives and their histories. It seems that these relationships between people and Country probably date back to the earliest peopling of the continent.”

Professor Lynette Russell, CABAH Deputy Director and Co-Chair of its Indigenous Advisory Committee, said: “This modelling established the infrastructure for detailed local and regional studies to engage respectfully with Indigenous knowledges, ethnographies, historical records, oral histories and archives.”

The results of these new studies suggest that there are fundamental rules people follow as they move into new landscapes, and that these same approaches could shed light on other major migrations in human history, such as the first waves of migration out of Africa at least 120,000 years ago.

Future work could inform the search for undiscovered archaeological sites, or even apply the techniques to forecast the movements of human migration in the near future, as populations flee drowning coastlines and climate disruptions.

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Resources

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Articles

Title: Stochastic models support rapid peopling of Late Pleistocene Sahul
Journal: *Nature Communications*

doi:10.1038/s41467-021-21551-3
Authors: Corey Bradshaw (Flinders University), **Sean Ulm** (James Cook University), **Alan N Williams** (University of New South Wales), **Chris Clarkson**, University of Queensland), **Joel Chadœuf** (French National Institute of Agricultural Research), Kasih Norman (University of Wollonong), **Sam Lin** (University of Wollongong), **Zenobia Jacobs** (University of Wollongong), **Richard 'Bert' Roberts** (University of Wollongong), **Michael Bird** (James Cook University), **Laura Weyrich** (Pennsylvania State University), **Simon Haberle**(The Australian National University), **Sue O'Connor** (The Australian National University), **Bastien Llamas** (University of Adelaide),**Tim Cohen** (University of Wollongong), **Tobias Friedrich** (University of Hawai'i),**Peter Veth** (University of Western Australia), **Matthew Leavesley** (University of PNG), **Frédérik Saltré**(Flinders University).

Title: Landscape rules predict optimal super-highways for the first peopling of Sahul
Journal: *Nature Human Behaviour*
doi: 10.1038/s41562-021-01106-8
Authors: Stefani Crabtree (Utah State University & Santa Fe Institute), **Devin White** (Sandia National Laboratories), **Corey Bradshaw** (Flinders University), **Frédérik Saltré** (Flinders University), **Alan N Williams** (University of New South Wales), **Robin Beaman** (James Cook University), **Michael Bird** (James Cook University), **Sean Ulm** (James Cook University).

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Notes to editors

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development responsibilities in nuclear deterrence, global security, defence, energy technologies and economic competitiveness, with main facilities in Albuquerque, New Mexico, and Livermore, California.

The **Santa Fe Institute** is a non-profit research centre located in Santa Fe, New Mexico. Its scientists collaborate across disciplines to understand the complex systems that underlie critical questions for science and humanity. The Institute is supported by philanthropic individuals and foundations, forward-thinking partner companies, and government science agencies.