



Australian Government

THE PRIME MINISTER'S PRIZES FOR SCIENCE



KURT LAMBECK

PRIME MINISTER'S PRIZE FOR SCIENCE



Revealing the breathing Earth

Emeritus Professor Kurt Lambeck AO has revealed how our planet changes shape—every second, every day, and over millennia. These changes influence sea levels, the movement of continents, and the orbits of satellites.

Kurt's original work in the 1960s enabled accurate planning of space missions. It led him to use the deformation of continents during the ice ages to study changes deep in the mantle of the planet. It also led to a better understanding of the impact of sea level changes on human civilization in the past, present and future.

Today's highly accurate GPS-based systems build on his work and enable precision agriculture, new ways to explore for minerals, and the remarkable navigation tools we all use in our smartphones.

For transforming our understanding of our living planet, Kurt Lambeck receives the \$250,000 Prime Minister's Prize for Science. He is an Emeritus Professor at the Australian National University in Canberra.

"The Earth is remarkable," Kurt says. "It has this wonderful record of its history going back to almost its very beginning. Almost everywhere you look, you learn something new about what's been going on in our planet. It's a constant journey of discovery."

Kurt's journey started with a Bachelor of Surveying from UNSW, then a PhD at Oxford University in space geodesy—precise measurement of the Earth using satellites. It was 1967 and humankind was rushing into space.

Kurt discovered that the gravity field of the Earth was much more complex than anyone had thought. That turned out to be important for spaceflight, because the gravity field determines trajectories of satellites, and we needed better gravity field models to be able to navigate to the moon and beyond.

But for Kurt, what was more important was the insight that changes in the planet's gravity field were directly related to plate tectonics, the movements of continents on the Earth's surface.

Changes in the Earth's gravity field can help us look inside the planet today, but they can't tell us what happened in the past. For that, Kurt turned to the ice ages, when much of the Earth was covered in ice sheets up to four kilometres thick. Fifty million cubic kilometres of ice stressed and deformed the continents, pushing them down into the Earth's mantle. The continents are still rebounding from that stress. Parts of Sweden, for example, are rising at a metre a century, while southern England is sinking by 5 cm a century.

Changing sea levels have had a major impact on the rise and fall of civilisations and will continue to do so in the future. Kurt is now working with archaeologists in Europe, and with precision carbon dating equipment at ANU, to piece together a more precise understanding of past sea levels.

By measuring change over millions of years, thousands of years, and from day to day, Kurt and his colleagues can generate the best possible predictions of future sea levels so that local, national, and international governments can plan for a changing future.

Kurt's ideas have also seeded technological innovations that we use every day. Space geodesy has evolved the GPS navigation technology built into every smart phone.

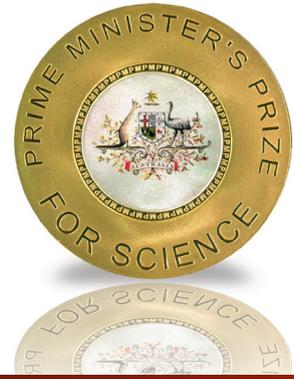
In Australia, Kurt guided the development of a comprehensive geodetic monitoring system called the AuScope network. Established with the support of the National Collaborative Research Infrastructure Strategy (NCRIS), the network consists of about 100 GPS stations, radio telescopes, and laser tracking systems, and enables us to track our location with sub-centimetre accuracy across the country.

"Today we can see the breathing of the Australian continent on a daily basis," Kurt says.

"We can watch the land rise and fall with the tides and observe the straining of the old continent as it collides with Southeast Asia. We can detect subtle variations in gravity that could indicate not only deep mineral deposits but also changes in groundwater through time."

Precise navigation is also essential for autonomous vehicles on the road, on the farm and on mine sites.

"You need to keep them on the road, and if the road is shifting in your reference frame then you're going to be in trouble, so you need to correct for that," Kurt says.



Kurt has received more than 30 international awards and distinctions and served as President of the Australian Academy of Science from 2006 to 2010.

"Kurt Lambeck is without question Australia's pre-eminent earth scientist in the fields of geodesy and geophysics, and a towering figure internationally," says Andrew Gleadow AO, Emeritus Professor in Earth Science at the University of Melbourne.

Career profile: Kurt Lambeck

QUALIFICATIONS

1976	DSc, University of Oxford
1967	DPhil, University of Oxford
1963	Bachelor of Surveying, University of New South Wales

CAREER HIGHLIGHTS

2018–2019	Visiting Professor, Istituto Nazionale di Geofisica e Vulcanologia, Rome
2016–2017	Johannes Geiss Fellow, International Space Science Institute, Berne, Switzerland
2014–ongoing	Honorary Professor, University of Wollongong
2013–2016	Visiting Professor, Ecole Normale Supérieure, Paris
2011–2012	Blaise Pascal Professor, Ecole Normale Supérieure, Paris
2008–ongoing	Emeritus Professor, Australian National University
2005–2008	Strategic science advisor to National Geospatial Reference System, Geoscience Australia
1998–2004	Chair, Antarctic Science Advisory Committee
1984–1993, 1998	Director, Research School of Earth Sciences, Australian National University
1977–2007	Professor of Geophysics, Research School of

Further reading

http://people.rses.anu.edu.au/lambeck_k

<http://www.auscope.org.au>

1970–1977	Earth Sciences, Australian National University
	Directeur Scientifique, Groupe de Recherches de Geodesie Spatiale, Observatoire de Paris; Professeur Associé, University of Paris; Institut de Physique du Globe, University of Paris
1967–1970	Geodesist, Smithsonian Astrophysical Observatory and Harvard University, USA
1965	Research Associate, University of Athens, Greece
1964	Research Associate, University of Delft, Netherlands
1962–1963	Trigonometric Surveyor, Department of Lands, New South Wales, Australia

CIVILIAN AWARDS

2013	Cavaliere Ordine al Merito della Repubblica Italiana, Italy
2011	Chevalier de l'Ordre National de la Legion d'Honneur, France
2009	Officer of the Order of Australia
2005	Centenary Medal, Australia

Full CV and honours at

http://people.rses.anu.edu.au/lambeck_k/index.php?p=bio