



Australian Government



THE PRIME MINISTER'S  
PRIZES FOR SCIENCE

## PROFESSOR TREVOR MCDUGALL AC

### UNIVERSITY OF NEW SOUTH WALES, SYDNEY

### 2022 PRIME MINISTER'S PRIZE FOR SCIENCE

Professor Trevor McDougall AC is a global leader in oceanography – the study of physical and chemical aspects of global oceans.

Professor McDougall is recognised for his contribution to our understanding of the fundamental physics of the ocean, including how it moves and its mixing processes. His ground-breaking research has also transformed the field of ocean thermodynamics.

Ocean thermodynamics explores the role of the ocean in the movement of heat around the planet, including how to keep track of the heat that is exchanged with the atmosphere and how heat is mixed in the ocean interior. The ocean's mixing processes have long been a mystery for oceanographers. They are a key part of the ocean's role in our climate and are crucial to understanding climate change.

The ocean plays a significant role in our climate system. More than 90 per cent of planetary heating caused by global warming is found in the ocean.

Professor McDougall discovered previously unknown ocean mixing processes, which greatly improved the work of both theoretical and observational oceanographers. These discoveries have led to completely new research areas that have improved our understanding of ocean physics.

Professor McDougall defined the ocean's neutral density surfaces and developed a theoretical framework to map them. He made his complex equations accessible through computer programming that is now used by oceanographers around the world and has improved the accuracy of climate predictions.

Professor McDougall's contribution to the field of oceanography continued when he led an international group of researchers in redefining the 30-year-old definition of seawater thermodynamics and improving the accuracy of the treatment of "heat content" by a factor of 100, which helped to understand how the ocean affects Earth's climate. This revised definition has been adopted by the Intergovernmental Oceanographic Commission and has become the new international standard in marine science.

Professor McDougall has continued to correct misconceptions and inaccuracies existing in the field for a century, providing rigour to marine science and ocean modelling.

Professor McDougall has transformed our understanding of the ocean's role in regulating Earth's climate system and his equations have been incorporated into the climate modelling of the Intergovernmental Panel on Climate Change. As a leader of the field, Professor McDougall is committed to upholding the accuracy and rigour of oceanography in the next generation of researchers.

Professor McDougall's advancements of our understanding of the relationship between the ocean and the climate is of great benefit to humans and the Earth's future.

## Career highlights

- 2019 President, International Association for the Physical Sciences of the Oceans (IAPSO)
- 2018 Fellow, American Geophysical Union
- 2018 Prize of Excellence, Werner Petersen Foundation
- 2018 Appointed Companion of the Order of Australia
- 2017 NSW Premier's Prize for Excellence in Mathematics, Earth Sciences, Chemistry and Physics
- 2016 Australian Laureate Fellowship, Australian Research Council
- 2015 Jaeger Medal, Australian Academy of Science
- 2015 Fellow, The Royal Society of NSW
- 2015 Henry Houghton visiting chair, Massachusetts Institute of Technology (MIT)
- 2013 Royal Society of Tasmania Medal
- 2012 Fellow, Institute of Physics
- 2012 Appointed Scientia Professor, School of Mathematics and Statistics, UNSW Sydney
- 2012 Fellow, The Royal Society of London
- 2011 Prince Albert I Medal, International Association for the Physical Sciences of the Oceans
- 2009 Anton Bruun Medal, Intergovernmental Oceanographic Commission
- 2007 Fellow, Commonwealth Scientific and Industrial Research Organisation (CSIRO)
- 2005 A.G. Huntsman Award for Excellence in Marine Science, The Royal Society of Canada
- 2004 Inaugural Fellow, Australian Meteorological and Oceanographic Society
- 2001 Centenary Medal, Federal Government of Australia
- 1998 M.R. Banks Medal, The Royal Society of Tasmania
- 1997 Humboldt Research Award, Alexander Von Humboldt Foundation of Germany
- 1997 Fellow, Australian Academy of Science
- 1992 David Rivett Medal, CSIRO
- 1988 Frederick White Prize, Australian Academy of Science
- 1978 Queen's Fellowship in Marine Science, Australian National University
- 1976 Summer Fellowship of the Geophysical Fluid Dynamics Program, Woods Hole Oceanographic Institution
- 1976 J.T. Knight Prize, University of Cambridge
- 1975 South Australian Engineering Design Award, Australian Institution of Engineers