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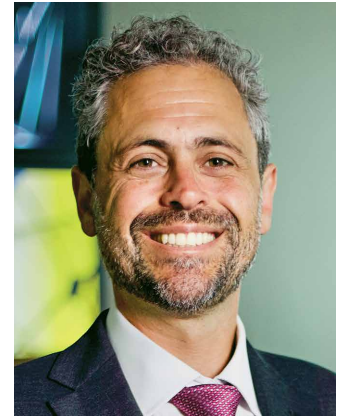
THE PRIME MINISTER'S PRIZES FOR SCIENCE

Dr Keith Bannister

CSIRO, New South Wales

2021 MALCOLM MCINTOSH PRIZE FOR PHYSICAL SCIENTIST OF THE YEAR

- Dr Keith Bannister is a world-leading astronomer and engineer who helped solve the mystery of fast radio bursts (FRB) – short, sharp pulses of radio waves that last a few milliseconds and are extremely hard to detect.
- In 2017, Dr Bannister modified CSIRO's Australian Square Kilometre Array Pathfinder (ASKAP) radio telescope in Western Australia with a new 'fly's eye' mode to search large areas of sky simultaneously for FRBs. As a result, the number of known FRBs increased by 20 bursts by 2018.
- By contrast, in the decade following the discovery of the first FRB (in 2007), only 30 more bursts had been found by astronomers worldwide – proving the significance of Dr Bannister's work.
- In 2019, he designed a world-first system for ASKAP to firstly detect a single FRB, then narrow in on its location within a galaxy. By pinpointing the precise location of where a burst came from in that galaxy – and measuring the distance from Earth to the host galaxy through other observations – Dr Bannister's discoveries confirmed that these FRBs actually came from galaxies that were billions of light years away.
- By studying the origins of FRBs, astronomers are now closer to determining what causes them, and are using them as tools to understand the content of the entire Universe. These discoveries are solving several of the big astronomical mysteries of our generation.
- For example, these discoveries resolved the decades-old scientific question of the missing 'normal matter' in the vast space between stars and galaxies in the Universe. Dr Bannister and his team used FRBs to show that the missing 'normal' matter was a tenuous gas residing between galaxies.
- This is different from 'dark' matter, which remains elusive and accounts for about 85 per cent of the total matter in the Universe.
- Australian and international researchers used FRBs and their distances from Earth to directly detect the missing 'normal' matter and determine the density of the Universe.
- Dr Bannister has also developed new ways of handling large amounts of data in real time, which are now influencing the design of future SKA radio telescopes. His work also inspired CSIRO engineers to design and prototype new wide-field receiver systems for tracking multiple satellites in Earth's orbit simultaneously.
- His work is an outstanding example of bringing together innovative researchers, great collaborative partnerships in astronomy, and world-class Australian research infrastructure.
- Dr Bannister's discoveries have captured the public's imagination, generating national pride in Australian science and technology, placing the country at the centre of an important new field of astrophysics research.





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CAREER HIGHLIGHTS

- 2021 Newcomb Cleveland Award, American Association for the Advancement of Science
- 2021 Australian Research Council LIEF Project – next generation FRB detector for Australia
- 2021 Australian Research Council Discovery Project – Solving the mystery of ultra-luminous FRB emission
- 2019 CSIRO Science Excellence Award
- 2018 Australian Research Council Discovery Project – Weighing the Universe with Fast Radio Bursts
- 2017 Louise Webster Prize, Astronomical Society of Australia
- 2016 CSIRO Chairman's Medal
- 2016 Principal Research Engineer, CSIRO Astronomy and Space Science
- 2013 Charlene Heisler Prize (commendation), Astronomical Society of Australia
- 2008 Australian Postgraduate Award
- 2011 CSIRO Bolton Fellow
- 2009 Australian Telescope National Facility – Student Symposium
- 2001 Automation control and instrumentation thesis competition (commendation)