

Physics & Mathematics

Australia's research field leaders

These are the top researchers and institutions in the 21 fields of physics and mathematics

Acoustics & Sound

Field leader: Jie Yang, RMIT

Lead institution: UNSW

Algebra

Field leader: Aidan Sims, Uni of Wollongong

Lead institution: UNSW

Astronomy & Astrophysics

Field leader: Joss Bland-Hawthorn, Uni of Sydney

Lead institution: ANU

Computational Mathematics

Field leader: Seyedali Mirjalili, Torrens

Lead institution: UNSW

Condensed Matter Physics & Semiconductors

Field leader: Daniel Brown, Uni of Adelaide

Lead institution: ANU

Discrete Mathematics

Field leader: David Wood, Monash

Lead institution: Monash

Electromagnetism

Field leader: Yingjie Jay Guo, UTS

Lead institution: UTS

Fluid Mechanics

Field leader: Ivan Marusic, Uni of Melb

Lead institution: Uni of Melb

Geometry

Field leader: Xuan Duong, Macquarie

Lead institution: Macquarie

Geophysics

Field leader: Dietmar Müller, Uni of Sydney

Lead institution: ANU

High Energy & Nuclear Physics

Field leader: Peter Skands, Monash

Lead institution: Uni of Sydney

Mathematical Analysis

Field leader: Yihong Du, UNE

Lead institution: Curtin

Mathematical Optimisation

Field leader: Fred Roosta, Uni of Queensland

Lead institution: Curtin

Mathematical Physics

Field leader: Ian Marquette, Uni of Queensland

Lead institution: Uni of Melb

Nonlinear Science

Field leader: Samaneh Sadat Sajjadi, RMIT

Lead institution: UWA

Optics & Photonics

Field leader: David Moss, Swinburne

Lead institution: ANU

Physics & Mathematics (general)

Field leader: Md. Rabiul Awual, Curtin

Lead institution: UNSW

Probability & Statistics with Applications

Field leader: Rob Hyndman, Monash

Lead institution: Monash

Pure & Applied Mathematics

Field leader: David Wood, Monash

Lead institution: Monash

Spectroscopy & Molecular Physics

Field leader: Giuseppe Barca, ANU

Lead institution: Curtin

Thermal Sciences

Field leader: Maziar Arjomandi, Uni of Adelaide

Lead institution: Uni of Adelaide

David Moss

Swinburne University of Technology

Field leader in Optics & Photonics

David Moss and his colleagues set a world record in 2020: the fastest data transmission down an optical fibre from a single chip. Published in *Nature Communications*, the paper on this record-setting research almost immediately attracted huge worldwide attention.

Moss first saw an article about it on the BBC website and it took a few seconds before he realised it was about his research. "It got a lot of traction, which was a bit of a surprise," he says of the mainstream media attention.

Now a distinguished professor of photonics and the director of the optical sciences centre at Swinburne University, he is also deputy director of the newly-funded Australian Research Council Centre of Excellence called COMBS: the Centre for Optical Microcombs for Breakthrough Science.

Born and educated in Canada, with a doctorate from Toronto University, Moss gravitated to physics, he says, after he decided mathematics was too difficult. As a child he had a vague idea of becoming an astronomer but toward the end of his undergraduate degree he met his future doctorate supervisor and developed an interest in lasers and then photonics.

Photonics might not be very well known or understood, he says, but it's foundational to our modern world. "In a sense it's right under everyone's nose because the fabric of the internet we use every day is laser-based, it's optical fibre and high-speed lasers," he says.

"It's enabled the modern technological society, the internet and communications, that almost defines our modern age."

From photonics Moss moved into exploring the potential of optical microcombs, where he has been working for 15 years. Simply put, a microcomb is a regular array of precisely spaced frequencies of light, like the teeth of a comb, he says.

Optical clocks, which are 100,000 times more accurate than anything else we have developed, are now based on optical frequency combs, and ultimately,