

PHYSICS AND ASTRONOMY

We have internationally renowned capabilities in astrophysics, supercomputing, optical physics, quantum optics, spectroscopy and nanophotonics.

AREAS OF RESEARCH FOCUS

- . Advanced statistics and big data
- . Applied optics
- . Atom cooling and trapping
- . BEC entanglement
- . Big bang cosmology
- . Black holes and galaxy structure
- . Biophotonics and cell biophysics
- . Condensed matter theory and cosmology
- . Galaxy formation and globular clusters
- . GPU and advanced HPC algorithms
- . Gravitational waves
- . High harmonic generation
- . Many-body localisation
- . Matter-wave interferometry
- . Multi-dimensional optical data storage
- . Nanostructured materials
- . Nanomaterials and nanofabrication
- . Nanophotonics and nanoplasmonics
- . Optical fibre sensors and optomechanics
- . Phase-space theory
- . Photovoltaics
- . Precision measurements
- . Pulsars
- . Quantum foundations, simulation and technology
- . Scientific computing and visualisation
- . Square kilometre array
- . Star and planet formation
- . Stochastic processes
- . Strongly interacting Fermi gases
- . Super massive black holes
- . Super resolution microscopy
- . Topological matter & ultracold quantum gases
- . Ultrafast laser science and spectroscopy
- . 3D astronomy animations and movies

RESEARCH CENTRES

Swinburne's **Centre for Astrophysics and Supercomputing (CAS)** is the largest astronomical research group in Victoria with research covering observational, theoretical and computational astronomy. We operate a significant supercomputing facility and a virtual reality theatre and have direct access to the world's largest optical and infrared telescopes – the 10 metre Keck telescopes in Hawaii.

Swinburne's **Centre for Micro-Photonics (CMP)** is a leading international centre in biophotonics and nanophotonics research.

The **Centre for Quantum and Optical Science (CQOS)** comprises of four research groups: quantum gases, ultrafast science, applied optics and theoretical physics.

ARC CENTRES OF EXCELLENCE

ARC Centre of Excellence in Future Low-Energy Electronics Technologies (FLEET)

ARC Centre of Excellence for All-sky Astrophysics (CAASTRO)

ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav)

RESEARCH FACILITIES

- . Keck Observatory and Parkes Radio Telescope
- . Swinburne OzStar Supercomputer
- . Microfabrication Facility
- . Nanofabrication Laboratory
- . Swinburne Optics and Laser Laboratories (SOLL)
- . Ultrafast Micro-Spectroscopy Facility
- . Virtual Reality Theatre

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