Physics Major Information Session

THE UNIVERSITY OF MELBOURNE

Prof Matthew Dolan

School of Physics

Our focus

- Excellence in learning and teaching: The Melbourne Model Degrees
- Undergraduate degrees leading to our internationally compatible Masters of Science and PhD programs
- International standard research and research training

The School of Physics - snapshot

35 Academic Staff
9 Professional Staff
14 Research Support Staff
2 Outreach Staff
50 Research Staff

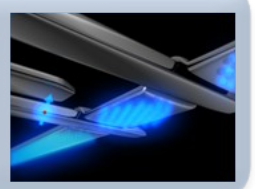
Research Students ~ 140

Undergraduates ~1,700

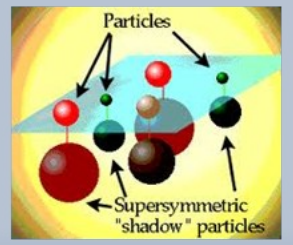
Big Questions in Physics

How did the Universe originate and what is Dark Matter and Dark Energy?

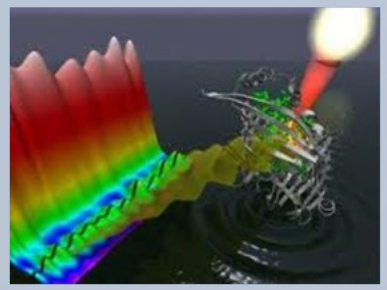
Will quantum computers allow us to deal with complexity



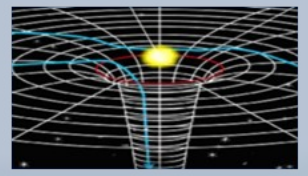
What is the nature of space, time and how is it related to supersymmetry, string theory and the elementary particles?



How does Physics deal with Biology and what is the significance of the third revolution in biology?

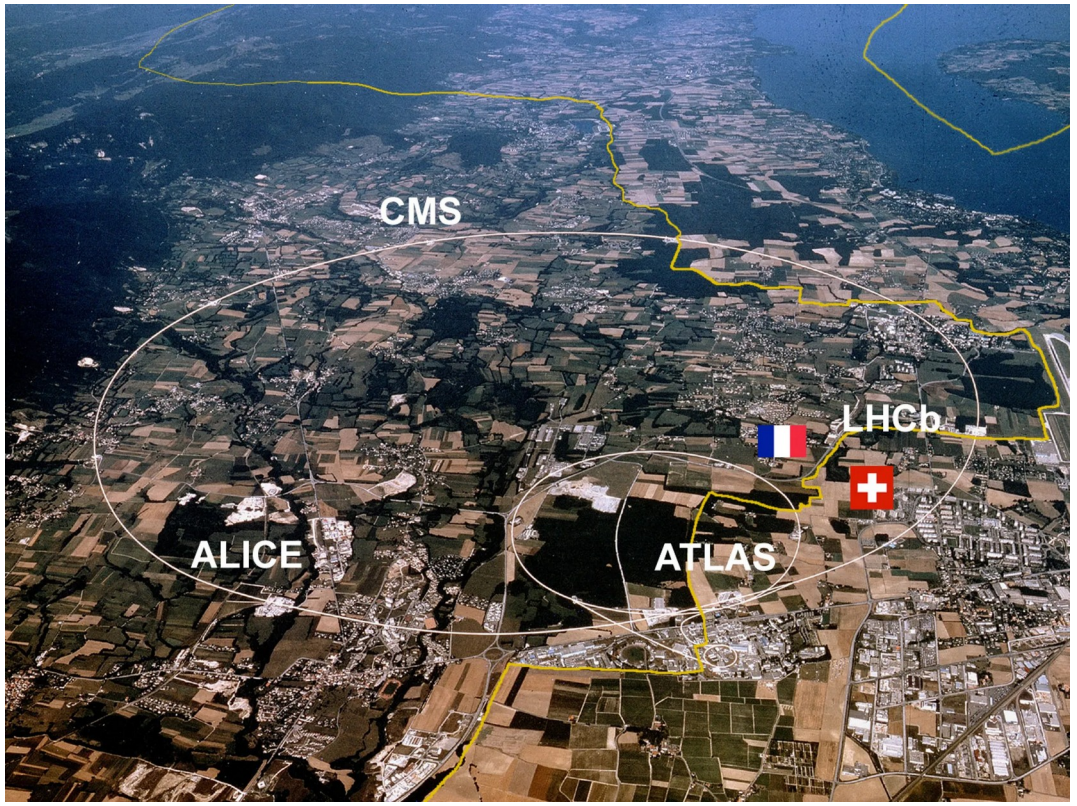


How does General Relativity (the big) relate to Quantum Mechanics (the small)?



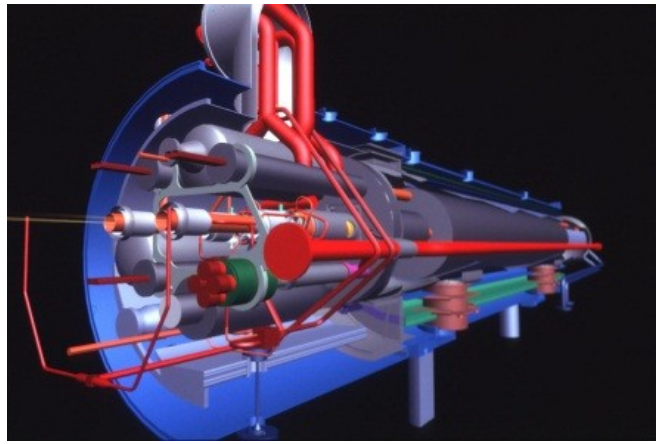
Can matter have strange new quantum properties and how does superconductivity work?

The School of Physics: Research



ARC CENTRE OF EXCELLENCE FOR DARK MATTER

CoEPP
ARC Centre of Excellence for Particle Physics at the Terascale

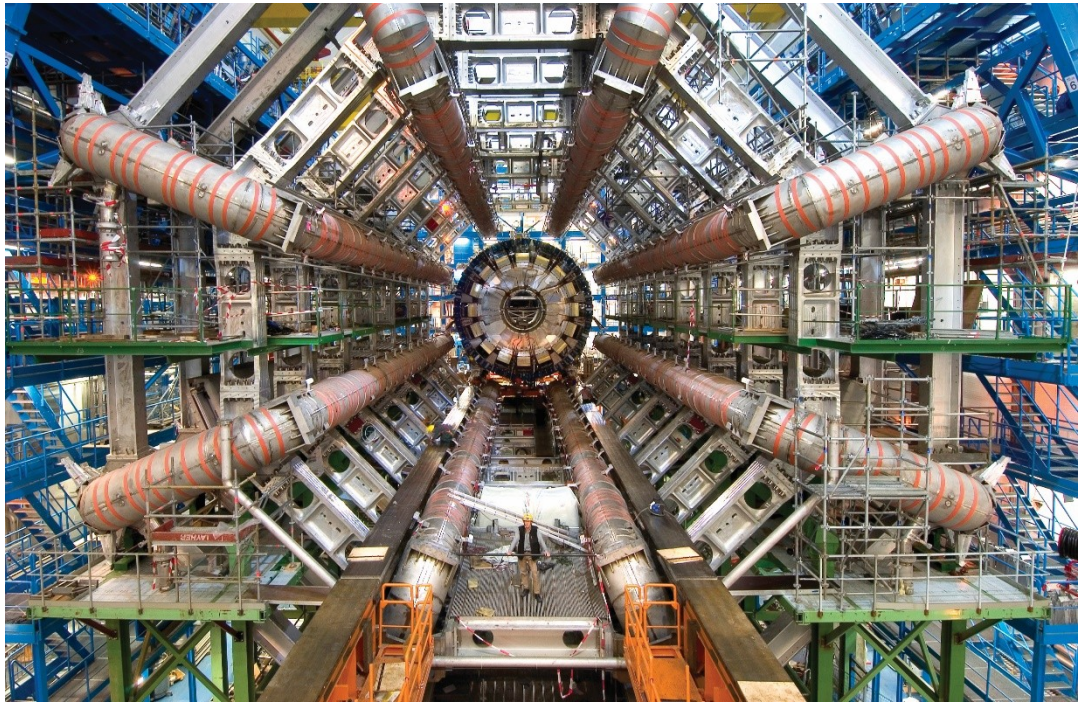


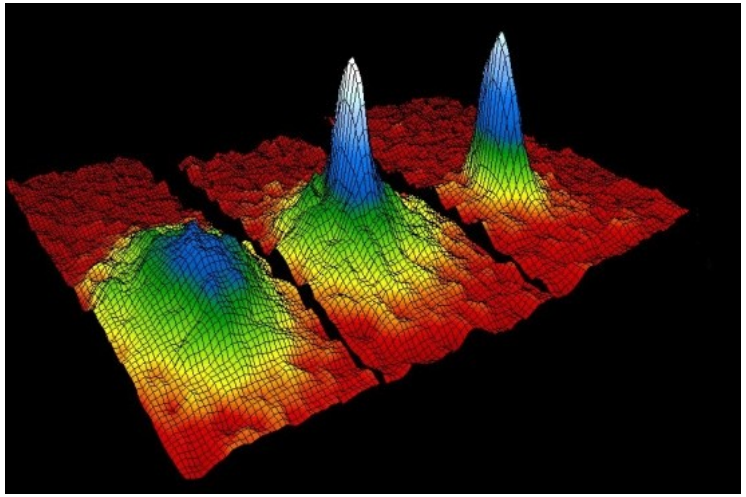
Searching *and finding* evidence for the Higgs boson; dark matter; super-symmetry; extra dimensions; new forces

New computing techniques for LHC / ATLAS data analysis

The School of Physics: Research

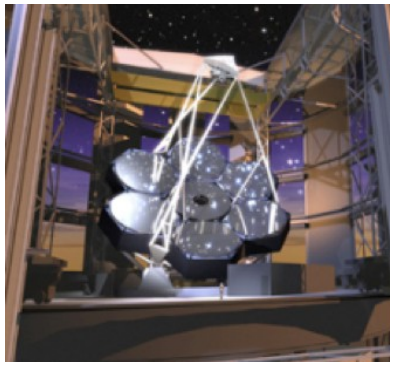
- Particle Physics Theory
- Beyond the Standard Model
- Quantum phases of matter





The School of Physics: Research

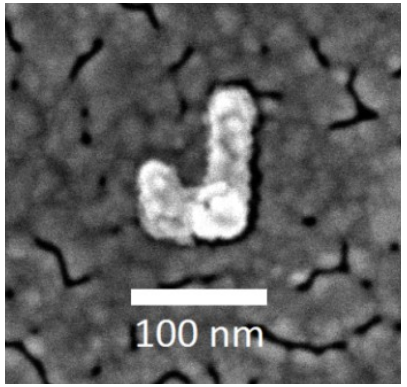
OzGrav
ARC CENTRE OF EXCELLENCE FOR GRAVITATIONAL WAVE DISCOVERY



ASTRO 3D

- The Square Kilometre Array: A radio telescope for the 21st Century
- Hubble Space Telescope: The most distant galaxies
- LIGO: Gravitational wave detector
- South Pole Telescope: Cosmic microwave background

The School of Physics: Research



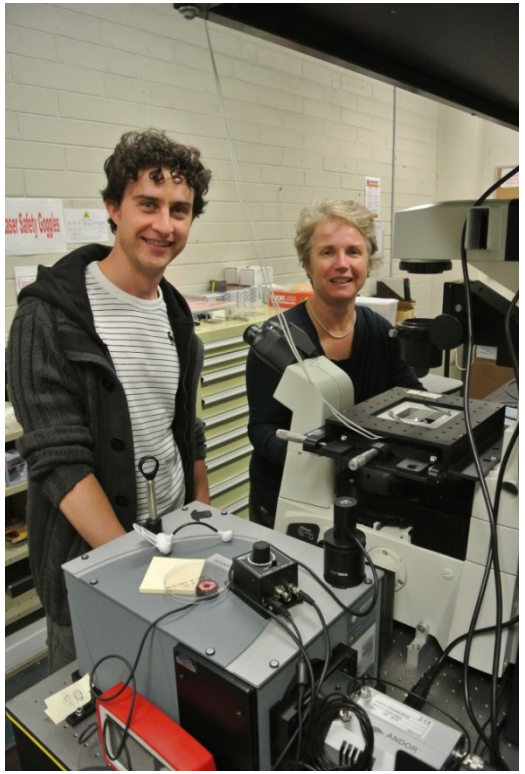
Nanophotonics

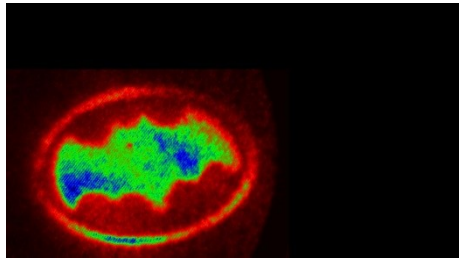
Imaging cells & biomolecules

Biosensing

Laser physics and quantum optics

X-ray and synchrotron physics

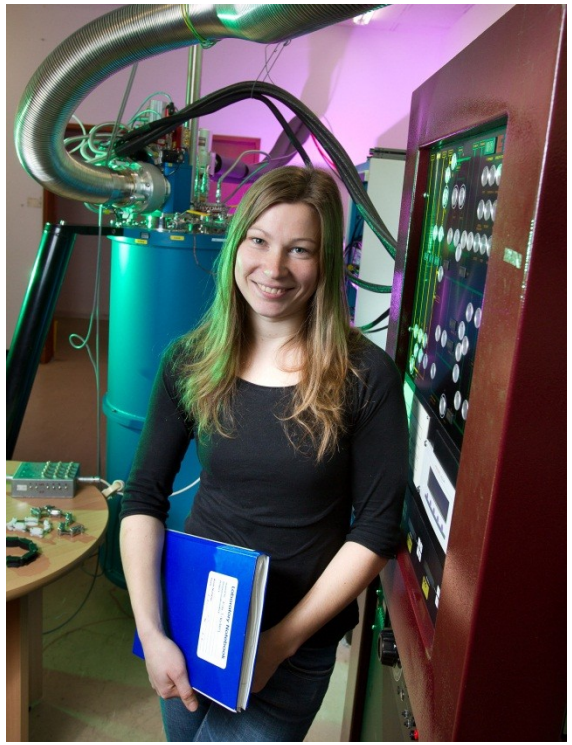




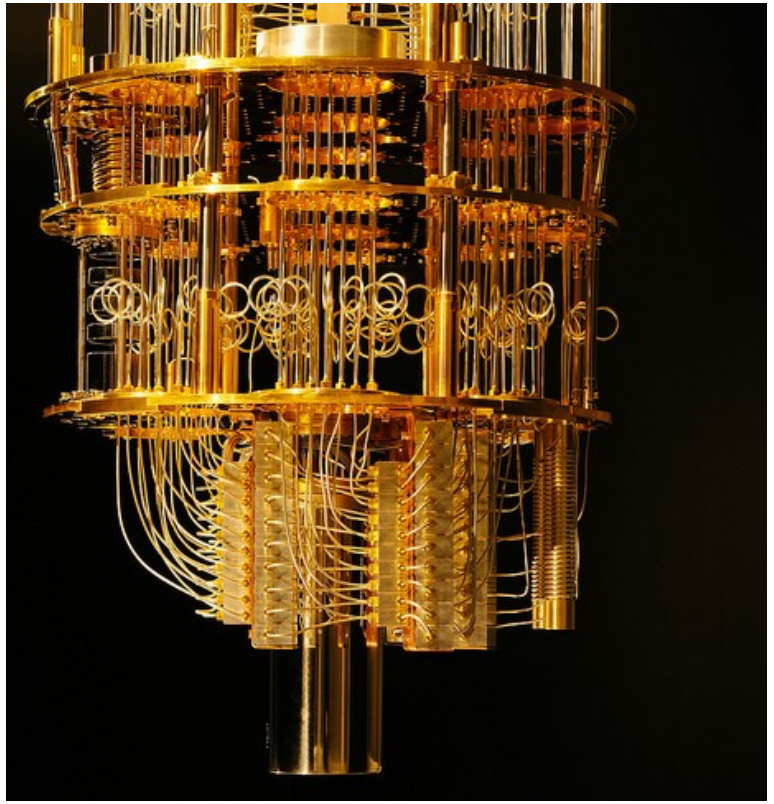
TMOS
ARC CENTRE OF EXCELLENCE FOR
TRANSFORMATIVE META-OPTICAL SYSTEMS

The School of Physics: Research

CENTRE FOR
QUANTUM COMPUTATION &
COMMUNICATION TECHNOLOGY
AUSTRALIAN RESEARCH COUNCIL CENTRE OF EXCELLENCE

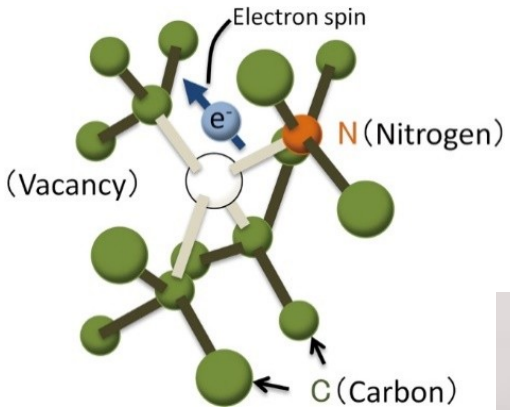


- Global quantum computing
- Information network
- Ultra-fast quantum computation
- Secure quantum communication
- Quantum information processing
- Quantum nanotechnology
- IBM Quantum Hub



The School of Physics: Research

Physical Biosciences, Neural Interfaces, Medical Applications



Diamond bionic eye – iBionics

Quantum biosensing

The Physics Major Edge

- **Interesting! Challenging! The forefront of new science!**
- **Develop analytical thinking and problem-solving skills**
- **Acquire strong IT competency**
- **Top salary (compared to national workers) and are highly employable!**

- http://jobsearch.gov.au/Careers/jo_home.aspx

Geena Glass

"I like understanding why things happen at a fundamental level, and physics lets me do this. I have been able to establish some amazing friendships with like-minded students in physics, as I have come to feel truly a part of the Physics cohort and wider faculty."

Where do Physics graduates go?

Our graduates find work in…

- Research and development *(scientists, laboratory managers)*
- Government *(policy making, environment, research, defense)*
- Business *(IT, sales, finance, consulting, management, analysis)*
- Manufacturing *(engineering, mining, modeling, forecasting)*
- Legal *(patent lawyer, attorney, technology commercialization)*
- Communication *(publishing, editing, writing, marketing)*
- Education *(teachers, lecturers)*
- Bioinformatics, Medical Imaging, Meteorology, Climatology
- Econophysics

And work at…

- CSIRO, WEHI, Howard Florey Institute, Austin Hospital, Australian Synchrotron, Brookfield Multiplex, Boston Consulting, Australian Stock Exchange, Department of Human Services, DSTO, ANTSO, universities, schools, Bureau of Meteorology, Ernst & Young, Australian Strategic Policy Institute, GBC Scientific equipment, Google (USA)

Some job profiles of our recent PhDs

Iason Baldes (Postdoctoral Fellow) – DESY, Hamburg, Germany

Damien George (Postdoctoral Fellow) – Cambridge University, UK *(pictured top)* – now IT entrepreneur

Shannon Orbons (Senior Strategy Manager) – Price Waterhouse Coopers, Melbourne

Anna Phan (Research Scientist) – IBM, Melbourne (*pictured middle*)

Magda Michna (Expert Clinical Lead) – Alcon Laboratories, Fort Worth, Texas

Alicia Oshlack (Head of Bioinfomatics) – Murdoch Institute, Melbourne *(pictured bottom)*

Rob Barone Nugent (Data Scientist) – Champion Sports Data

Fred Hiskens (Researcher) – Beyond Zero Emissions

Physics students starting 2025

The First Three Years: BSc

- Physics will offer an excellent educational experience with strong discipline breadth and depth
- In-depth understanding of Physics alongside and highly sought skills
- Wide horizons through breadth subjects

Plus Two: MSc in Physics

- Advanced course work and research project, the prelude to the doctorate program in Physics or workforce

Plus Three: PhD in Physics

- Students are ideally placed to complete a research doctorate, either at Melbourne or any other internationally leading physics department

First-year subjects 2025

With VCE Physics

Advanced Physics 1 & 2 (PHYC10001 & PHYC10002)

– *Score 35 or higher in both Physics 3 + 4 and Specialist Maths 3 + 4*

Physics 1 & 2 (PHYC10003 & PHYC10004 or PHYC10006)

– *Physics 3 + 4 and Mathematical Methods 3 + 4 or equivalent*

Without VCE Physics

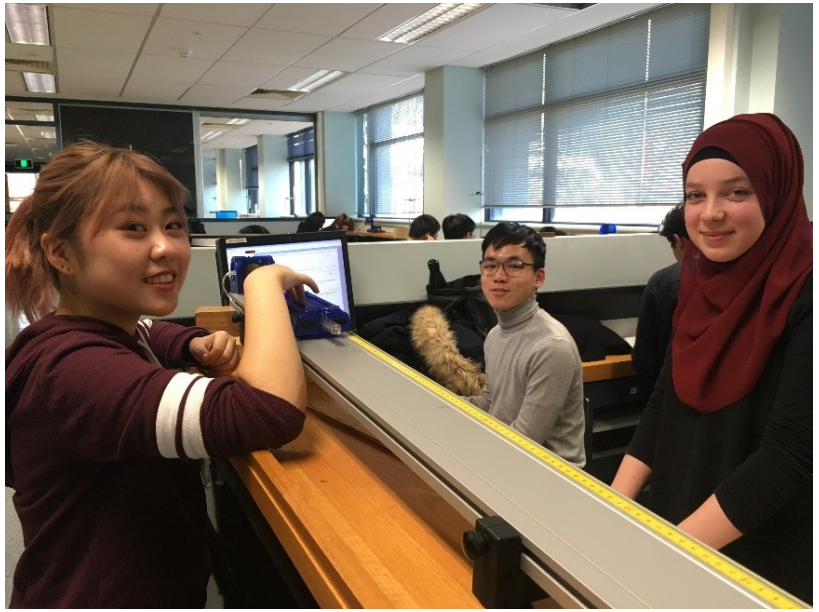
Physics Fundamentals first (PHYC10005 & PHYC10004 or PHYC10006)

– *Mathematical Methods 3 + 4 or equivalent*

Physics for Biomedicine (PHYC10007)

– *Mathematical Methods 3 + 4 or equivalent*

– *Only available in the Bachelor of Biomedicine degree*

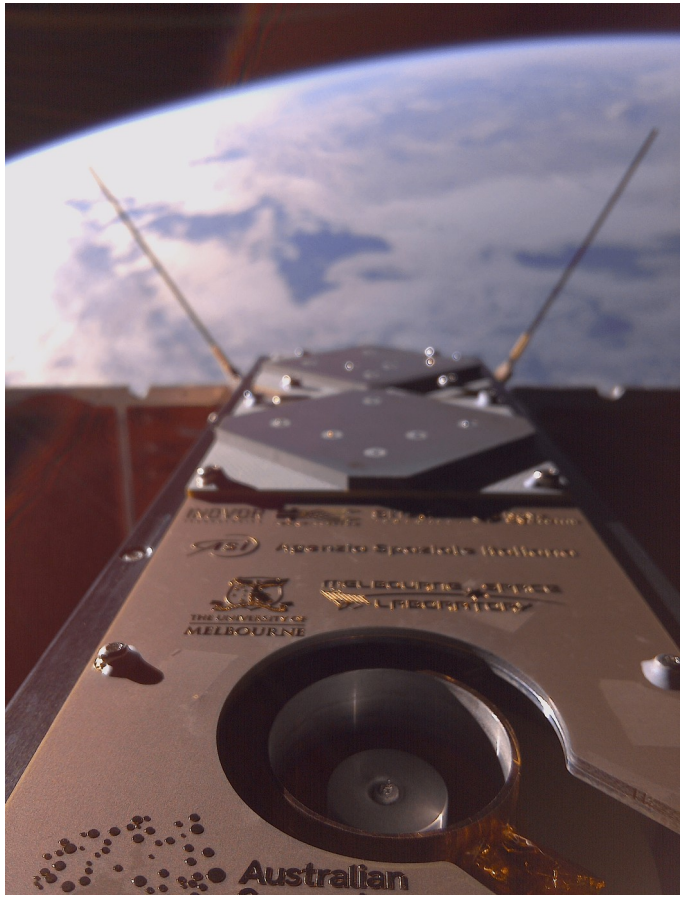


First-year subjects 2025

Also available

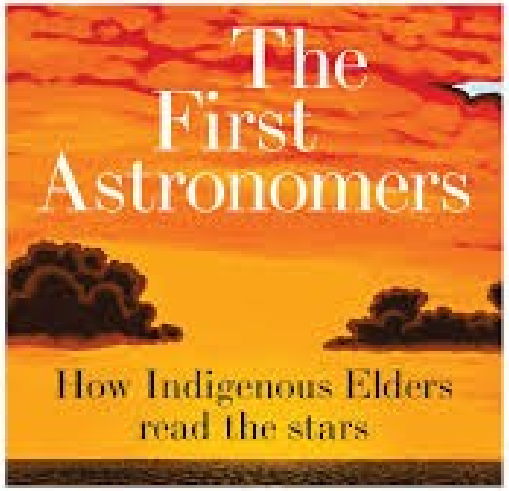
Indigenous Astronomy (PHYC10010, S1)

This subject introduces students to the discipline of Cultural Astronomy, focusing on the astronomical knowledge and traditions of contemporary Indigenous cultures around the world, with an emphasis on Australia.

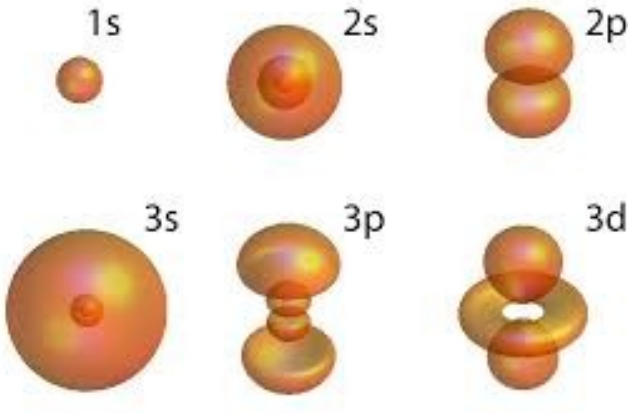


From the Solar System to the Cosmos (PHYC10009,S1)

This subject explores the ideas of modern cosmology, with an up-to-date discussion of the latest discoveries.



Second Year subjects 2025



Must take

Quantum and Thermal Physics (PHYC20012, S1)

Laboratory and Computational Physics 2 (PHYC20013, S1/S2)

Special Relativity and Electromagnetism (PHYC20015, S2)

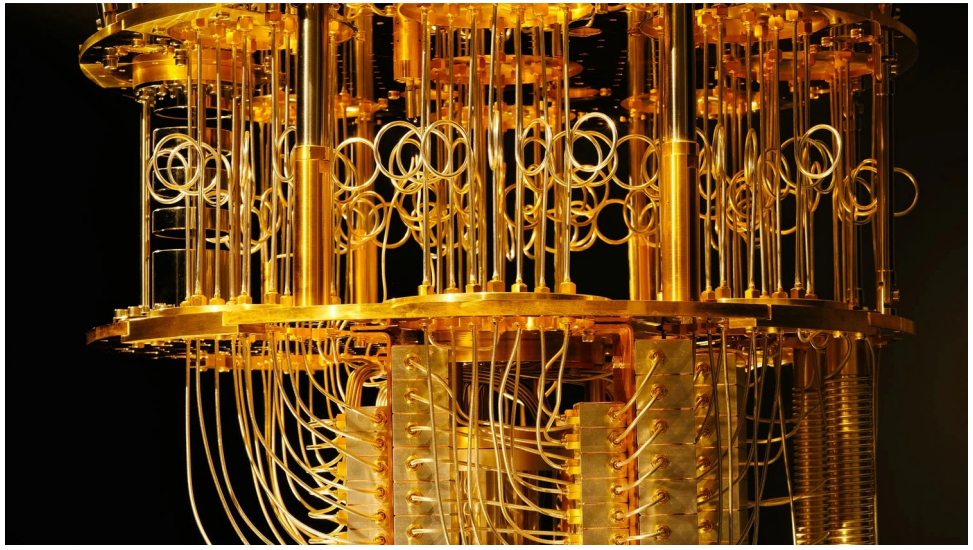
Vector Calculus/Vector Calculus Advanced (MAST20009,S1)

One of: Theoretical Physics 2 (PHYC20014), or Real Analysis/Advanced (MAST20026), or Differential Equations (MAST20030)

Optional

Archaeoastronomy (Breadth,PHYC20017)

Elements of Quantum Computing (MULT20015)



Third Year subjects 2025

Core subjects:

Quantum Physics (PHYC30018)

Laboratory and Computation Physics 3 (PHYC30021)

– *Follows on from Lab and Comp 2*

Electives: One of:

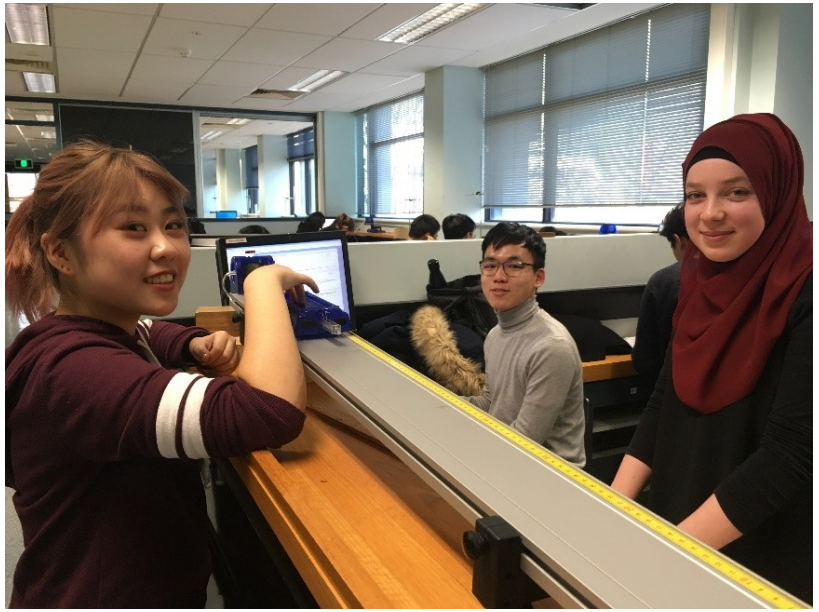
Electrodynamics (PHYC30016)

Statistical Physics (PHYC30017)

Both required for Msc entry

Electives: One of

Astrophysics (PHYC30019)
Subatomic Physics (PHYC30011)
Theoretical Physics 3 (PHYC30022)
Light, Lasers, and Optics PHYC30016)
Condensed Matter Physics 3 (PHYC30016)



Third Year subjects 2025

Also:

Science Research Project SCIE30001

Individual program of research undertaken as part of degree – design, execute, present a research project in collaboration with supervisor in lieu of coursework subject (12.5 points). Entry: WAM>75 in relevant subjects.

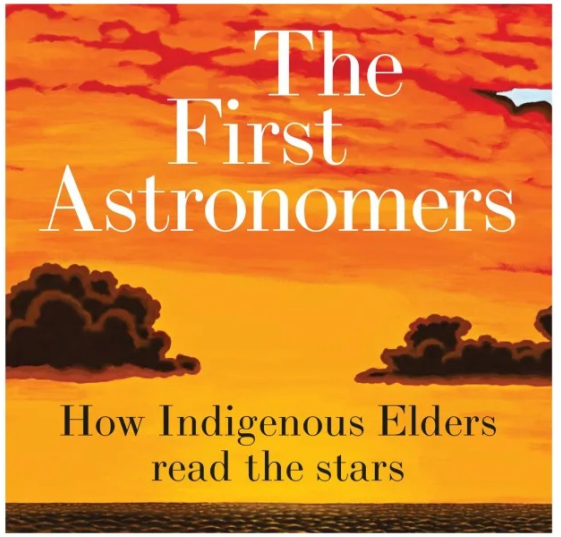
Astronomy and Society in the Space Age (PHYC30025)

Breadth subject: final subject of breadth track in cultural astronomy.

Not for course credit:

Laby Research Scholars Program: Scholarship program aimed at second or third year students who are considering enrolment in postgraduate studies and wish to gain research experience.

4-8 weeks, get paid to do physics research.



Strategic Sciences Program (SSP)

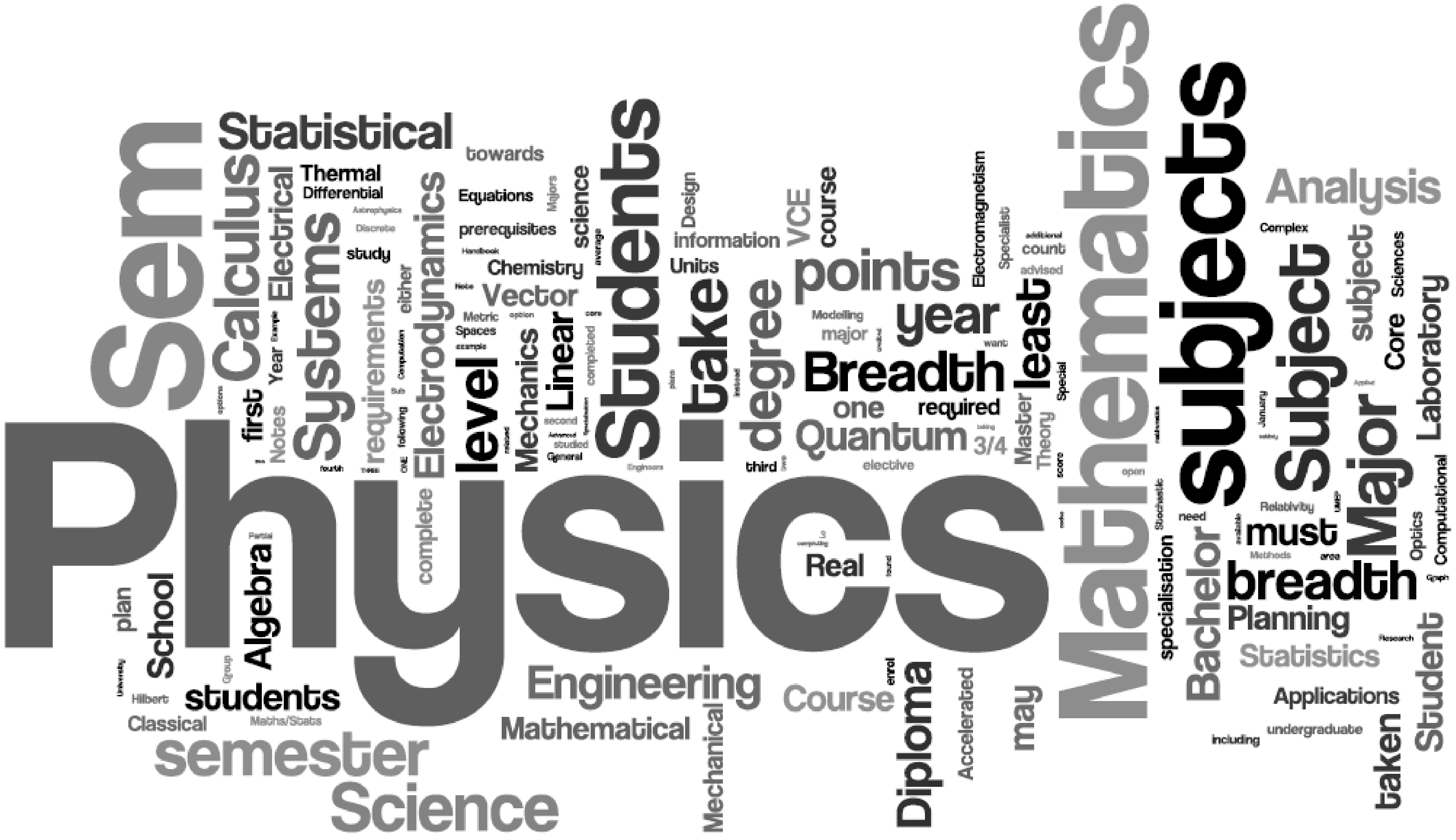
What is SSP?

The Strategic Sciences Program connects students to experiences and activities to develop the skills and knowledge essential for diverse STEM careers.

What will you get?

1. Emails on STEM-related events
2. A one-on-one career consultation in the second year of your study

Scan the QR code to join


Physics
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Spaces
Engineers

Thank you

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