University of Southern Queensland

Centre for Astrophysics

- Exoplanetary Science
- Space Instrumentation
- Stellar Astrophysics
- Extragalactic Astronomy

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Exoplanetary Science

Exoplanet discovery

NASA Exoplanet Mission Official Follow-up - MINERVA Australis

Exoplanet team has discovered hundreds of planets, and 50% of all young planets from NASA TESS mission

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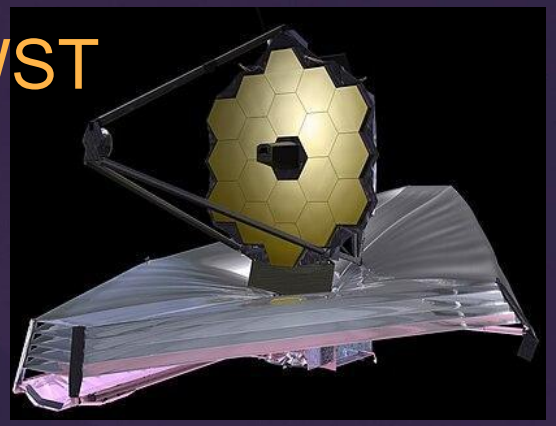
Exoplanetary Science

Exoplanet discovery

JWST



CHEOPS

Two JWST programs underway (most Cycle 2 JWST time awarded in Australia)

35 orbits of Hubble awarded for young planet atmosphere escape

Largest awarded ESA CHEOPS satellite time outside of Europe

Science team members in $170M NASA Small Explorers Mission Concept proposal (details blurred)

Hubble

NASA Small Explorer mission design

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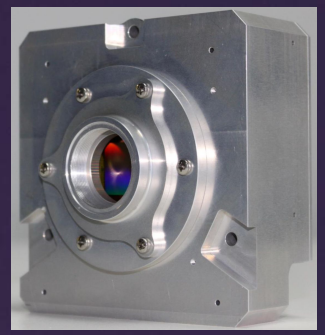
Exoplanetary Science
Space Instrumentation

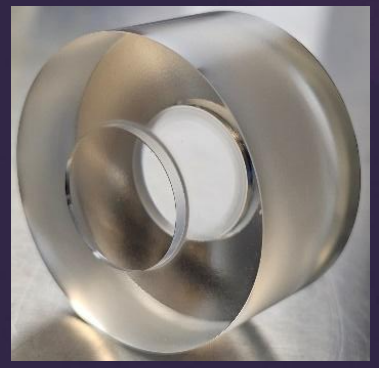
iLAuNCH Project Swift



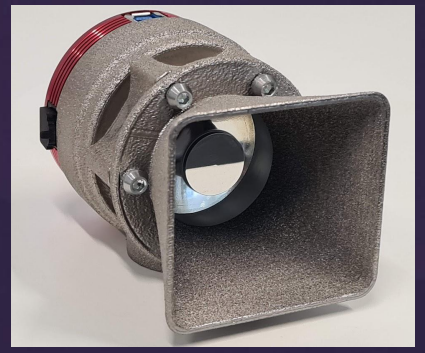
iLAuNCH

Project Swift

An $11M industry partnership for imaging and communications in space



Star tracker optical plastic lens



Star tracker prototype

UniSQ – UniSA monolithic miniaturized ultra-light star tracker

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Exoplanetary Science

Space Instrumentation

Future space missions

Twinkle (founding member)

$100M mission to study exoplanet atmospheres

STEP (team collaborator)

$20M mission to study the internal structure of stars

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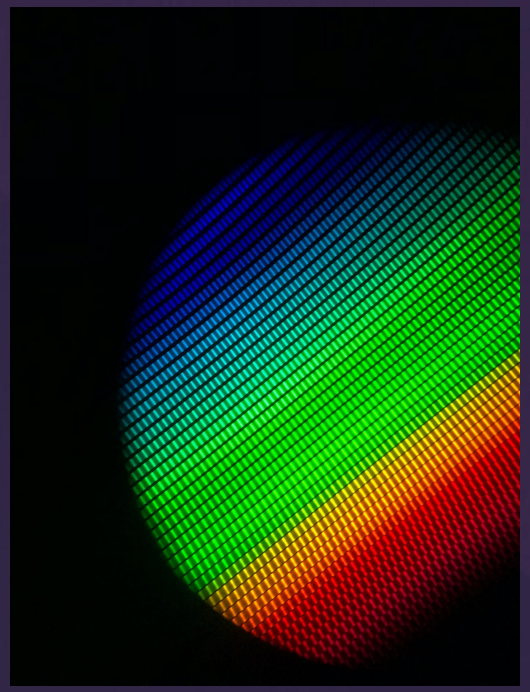
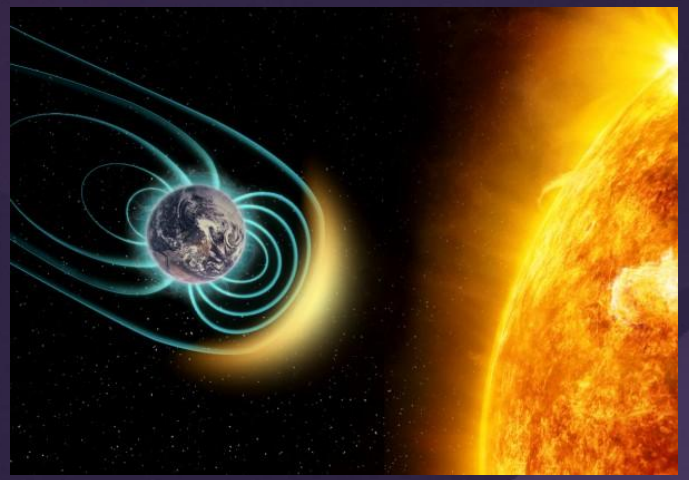
Exoplanetary Science

Stellar Astrophysics



Stellar Oscillations Network Group Node

Multi-site Project to study the stellar pulsations through high-resolution spectroscopy



Co-leadership of B-Cool

A survey of stellar magnetic fields and stellar activity in cool stars

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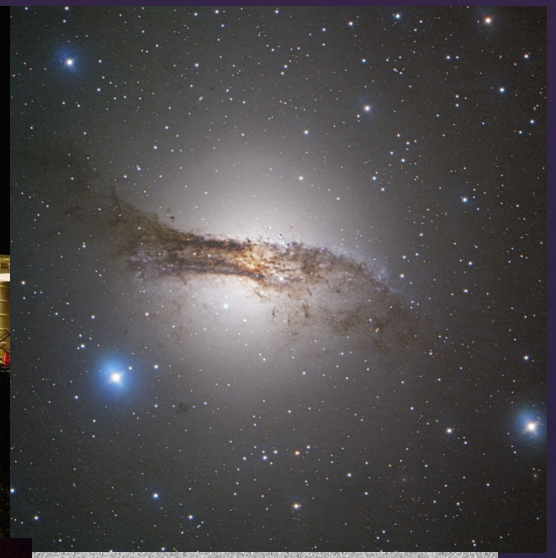
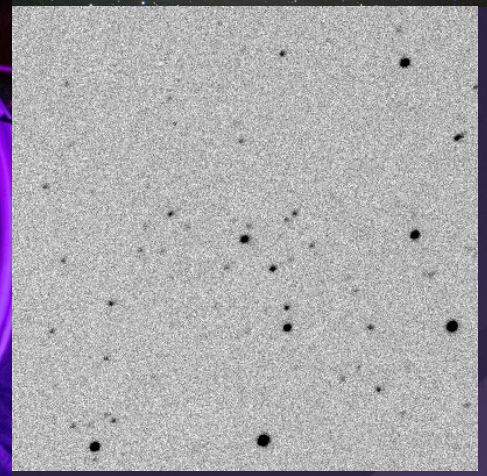
Mt Kent Observatory

Facilities





The 0.1 and 0.8m telescopes are available for remote imaging observations for teaching and outreach opportunities.

We are in the process of making the following facilities available to the wider community via remote and robotic observing. **Contact Prof Duncan Wright for more information.**

Example image from the 0.8m telescope & gif of Artemis II

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Extragalactic Astronomy

Galaxies, black holes, and large surveys

Legacy Survey of Space and Time begins this year, will create revolutionary maps of the sky with 3-day cadence

Co-lead two subgroups on black holes in the centres of galaxies

Leadership role in Australia-based **Hector** – using new astrophotonics technology

University of Southern Queensland

Prof Duncan Wright

Role: Director, Centre for Astrophysics

Expertise: Exoplanetary Science & Astronomical Instrumentation

Key Research: Detection and characterization of exoplanets using high-resolution spectroscopy and stellar pulsations.

Principal Investigator for the Minerva-Australis telescope array and oversees the technical operations of the Mount Kent Observatory.

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David C. Petit

PhD student

Democratization of Space-Based (exoplanet) Astronomy with Project *Swift* 🛰️

University of Southern Queensland

A/Prof Simon Murphy

Role: Deputy Director, Centre for Astrophysics

Expertise: Stellar Astrophysics & Asteroseismology

Key Research: Inferring the ages of stars from their oscillations, and pulsation timing to discover binary star systems

He uses high-precision time-series photometry from NASA's Kepler and TESS space telescopes.

simonjmurphy.github.io

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Anuj Gautam
PhD student

Studies the physics of intermediate-mass stars through asteroseismology, using stellar evolution and pulsation modelling.

Saakshi Wadhwa
PhD student

Catalogue construction and g-mode asteroseismology of Gamma Doradus stars using TESS data.

Tom Love
MRes student

Investigating the distinctive properties of High Amplitude Delta Scuti pulsating stars.

Joachim Krüger
PhD student

Studies properties of A- and F-type stars with high-resolution spectroscopy.

University of Southern Queensland

A/Prof Chelsea Huang

Expertise: Observational Exoplanetary Science & Big Data

Key Research: Discovering small exoplanets and studying planetary system architectures using large-scale survey data.

She focuses on the physical nature of sub-Neptunes and planets with unique orbital configurations discovered by the TESS mission.

https://chelseahuangexoplanets.com/

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Alice Ellerton

Masters student

Studying the eccentricity of multi-transiting TESS systems

University of Southern Queensland

Prof Rob Wittenmyer

Expertise: Exoplanet Detection & Radial Velocity Surveys

Key Research: Searching for planetary systems around nearby stars to understand the statistical distribution of planets in our galaxy.

He leads the Australian efforts for the Minerva-Australis project, specifically targeting the discovery of Earth-analogs.

University of Southern Queensland

Sakhee Bhure

PhD student

Follow-up of TESS planet candidates with shallow transits using Minerva-Australis

University of Southern Queensland

A/Prof George Zhou

Expertise: Planet Evolution

Key Research: Observing young stars and their orbiting planets to determine how planetary systems form and migrate over time.

He specializes in the atmospheric characterization of "Hot Jupiters" and their interactions with host stars.

https://georgezhouastro.com/

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Ylenia Mascolo

PhD student

What is the composition of cold small planets

Owen Downes

Honours student

What governs the atmospheres of ultra-hot Jupiters

University of Southern Queensland

Prof Jonti Horner

Expertise: Planetary Dynamics & Astrobiology

Key Research: Investigating planetary habitability and how the orbital architecture of a system impacts the potential for life.

He is a prominent science communicator, frequently translating complex celestial dynamics into insights regarding the search for life beyond Earth.

University of Southern Queensland

Amber Tilly

PhD student

The Impact of Planetary Architecture on Exoplanet Habitability

University of Southern Queensland

Dr Rebecca McElroy

Expertise: Galaxy Evolution & Supermassive Black Holes

Key Research: Feedback mechanisms between supermassive black holes and their host galaxies and understanding black hole variability

She investigates changing-look active galactic nuclei to understand rapid transitions in black hole accretion and prepares for the LSST to track these rare, variable events across the sky.

rebeccamcelroy.github.io

University of Southern Queensland

Josh Bardwell

PhD student

Increasing Astronomy and STEM Engagement

Nicole Jenkins

PhD student

The Distribution of Star Formation in Merging Galaxies

Thomas Dunn

PhD student

Variable active galaxies & LSST

Matt Battam

Masters student

Stellar Population Gradients in Type 1 Active Galaxies

University of Southern Queensland

Dr Belinda Nicholson

Expertise: Stellar Activity & Planet Validation

Key Research: Developing methods to mitigate magnetic "stellar noise" to ensure small planetary signals are correctly identified.

Her work is essential for distinguishing between a star's natural boiling surface and the presence of a truly Earth-like orbiting planet.

University of Southern Queensland

Dr Gang Li

Expertise: Asteroseismology

Key Research: Investigating the internal properties of stars through the analysis of gravity modes.

His research focuses on measuring internal rotation, core magnetic fields, and mixing processes in stars.

Current work includes ensemble asteroseismology of stellar clusters and pulsating stars in binary systems.

University of Southern Queensland

Dr Alexander Wallace

Expertise: Exoplanet Discovery & Orbital Dynamics

Key Research: Identifying and characterising new exoplanetary systems

He uses high-precision astrometry and radial velocity data to refine our understanding of planetary orbits and mass distribution.