

# MESA

## Modules for Experiments in Stellar Astrophysics

The only completely open-source (and most widely-used internationally) stellar evolution code available, MESA was identified as a key software tool for astronomy in the 2020 U.S. Decadal Survey. It has "**seeped into the foundation of research and education efforts and has given rise to an immense amount of new research across multiple subfields of astrophysics,**" as quoted in the 2021 Beatrice M. Tinsley Prize awarded to the first MESA developer, Bill Paxton, by the American Astronomical Society.

SCIENCE USING MESA

### & extra-galactic GALACTIC ASTROPHYSICS

Metzger et al. (2022)



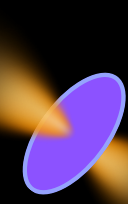
Sources of quasi-periodic eruptions in galactic nuclei

Joyce et al. (2023)



Ages of stars in the Galactic Bulge.

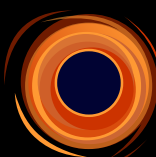
Cantiello et al. (2021)



Stellar evolution in active galactic nuclei (AGN) disks

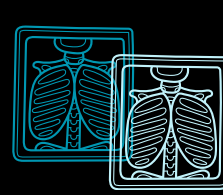
### GRAVITATIONAL WAVE ASTRONOMY

Farmer et al. (2019)



Lower edge of the pair-instability supernova black hole mass gap

Gallegos-Garcia et al. (2022)



High mass X-ray binaries.

Riley et al. (2021)



Formation channels for binary black holes.

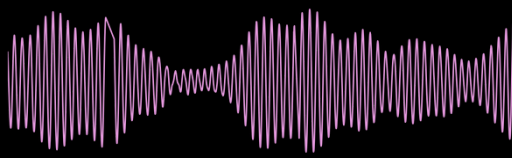
### STELLAR PHYSICS

Bauer et al. (2020)



White dwarf cooling models

Pedersen et al. (2021)



Interior mixing profiles of stars from dipole gravity modes.

Cinquegrana et al. (2023)



Final fates of stars as a function of metallicity

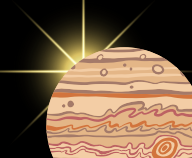
### EXOPLANET SCIENCE

Louca et al. (2023)



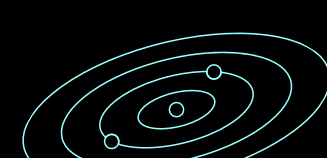
Metal-enhanced planetary atmospheres.

O'Connor et al. (2023)



Giant stars eating giant planets.

Faridani et al. (2023)



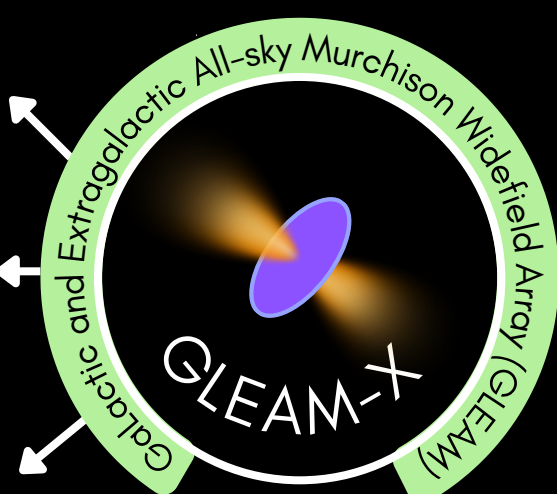
Short-period planets in multi-planet systems.

## MUTUAL INTERESTS OF MESA USERS WITH AUSTRALIAN SURVEYS AND OBSERVATORIES

**supernovae progenitors**  
Hurley-Walker et al. (2019, PASA)

**AGN morphology**  
Ross et al. (2021, MNRAS)

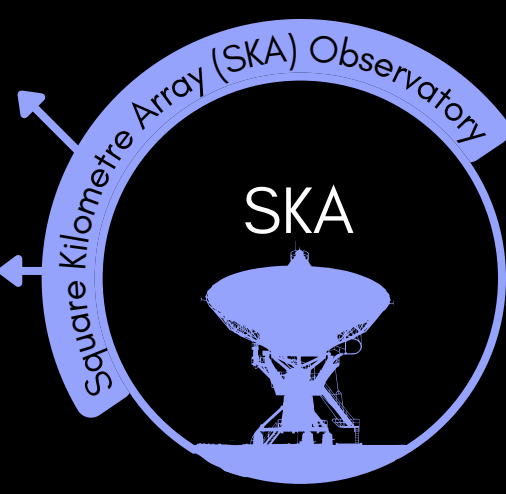
**rotating neutron stars**  
Hurley-Walker et al. (2022, Nature)



**rates of star formation**  
Prandoni & Seymour (2015)

**compact object binaries**  
Kramer & Stappers (2015)

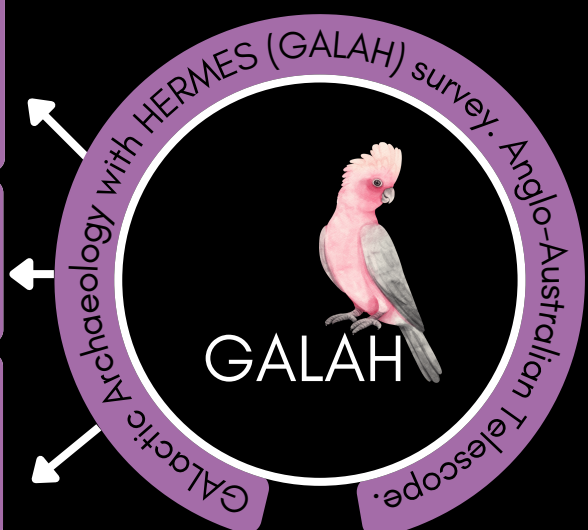
**physics & chemistry of discs**  
Hoare et al. (2015)



**stellar abundances**  
Buder et al. (2021, MNRAS)

**stellar ages**  
Hayden et al. (2020, MNRAS)

**binary black holes**  
El-Badry, et al. (2023, MNRAS)



Applications for the MESA Down Under Winter School (17th - 21st of June, 2024) is open **now** until the 31st of January. See <https://maygpedersen.github.io/mesa-down-under-2024/> for more information.



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