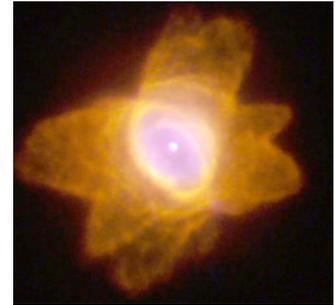


Planetary and substellar companions to PLANETary nebulae and other post-AGB stars

Supervisors: Dr Brent Miszalski (SAAO/SALT; brent@sao.ac.za)
Dr Rajeev Manick (SAAO; rajeev@sao.ac.za)

In the last decade astronomers have uncovered a wide range of planetary and substellar (brown dwarf) companions around other stars. Most of these are situated around “garden-variety” stars that are not considerably evolved. As these stars evolve, for instance through the Asymptotic Giant Branch (AGB), their planetary systems may interact strongly with the expanding stellar atmospheres, potentially creating some of the most peculiar and least-understood phenomena observed in evolved stars. Such phenomena may include the accretion of planetary debris by white dwarfs (e.g. Gaensicke et al. 2019) and the production of peculiar morphologies observed in planetary nebulae (e.g. Nordhaus & Blackman 2006; De Marco & Soker 2011).



The aim of this project is to use innovative observational techniques to detect planets around evolved post-AGB stars. This will fill a critical gap in the life-cycle of planet interactions in between the main-sequence and white dwarf phases, where no substantial planetary discoveries have yet been made, with potentially wide-reaching ramifications for our understanding of stellar evolution. Particular focus will be given to post-AGB stars (Van Winckel 2003) and the central stars of planetary nebulae (e.g. Miszalski et al. 2018), which under some circumstances are amenable to planet discoveries using telescopes hosted by the SAAO in Sutherland, as well as international telescopes. The High Resolution Spectrograph (HRS) on the Southern African Large Telescope (SALT) may be used to detect planets via the radial velocity (RV) or doppler method, while the high-speed photometric capabilities of SALT and other SAAO telescopes may detect transiting planets.

Significant emphasis will be placed on gaining international experience during the project and we anticipate substantial visits abroad to work with world-leading experts in post-AGB stellar astrophysics including Prof. Hans Van Winckel (KU Leuven, Belgium) and Dr. Devika Kamath (Macquarie University, Australia). The project will have a heavy observational focus, making use of SAAO facilities with an emphasis on SALT, but applications for international telescopes will also be encouraged to build a solid foundation in cutting-edge observing techniques. At SAAO, Dr. Miszalski is a world-leading expert in the discovery of binary systems in planetary nebulae with an NRF B-rating and Dr. Manick recently returned to SAAO following completion of his PhD in post-AGB stars with Prof. Van Winckel and Dr. Kamath.

For more details, please feel free to discuss any aspect of the project with Dr. Miszalski or Dr. Manick via email or in person at SAAO.

References: Gaensicke et al. 2019, arXiv:1904.04839; Nordhaus & Blackman 2006, MNRAS, 370, 2004; De Marco & Soker 2011, PASP, 123, 902; Van Winckel 2003, ARA&A, 41, 391; Miszalski et al. 2018, PASA, 35, 27.

