T 1 Akras, Stavros

National Observatory of Rio de Janeiro & MCTI, Brazil

Reclassifying symbiotic stars using the 2MASS and WISE catalogs: An Atlas of symbiotic star spectral energy distribution

We present a new catalogue of galactic and extragalacitc symbiotic stars (SySts). Since the last catalogue of SySts (Belczynski et al. 2000), the number of known SySts has almost doubled in the last 16 years. In particular, there are 297 known SySts in our Galaxy and 39 in other galaxies. Adding WISE colors to the 2MASS photometry, we are able to build infrared spectral energy distributions for 331 (known and candidate) symbiotic stars. We have used these SEDs to provide an accurate classification (S, D and D' type) for all of them with available 2MASS and WISE data. Fitting a black-body to all these SEDs, we get a rough indication of the temperature either for the cold giant or the dust. The SED of S-type SySts peaks between 0.8 and 2 mu and these of D-type between 2 and 5 mu. For a small number of SySts, probably the D'-type, the peak occurs at even longer wavelengths and they deserve further investigation. Preliminary analysis has revealed a number of candidate SySts with a giant companion of spectral type K or G.

T 2 Corral-Santana, Jesus

ESO, Chile

Hunting stellar-mass black holes

Since the beginning of the X-ray astronomy era, we have detected nearly 60 Galactic stellar-mass black hole (BH) candidates in transient X-ray binaries, a type of interacting X-ray binaries with low-mass companions, and 2 other systems with high-mass companion stars. However, only 17 out of the 60 have been dynamically confirmed since 1966. Actually, during this decade, we have confirmed only one black hole (XTE J1859+226; Corral-Santana+2011) and establish strong constrains in two more systems (Swift J1357.2-0933; Corral-Santana+2013, Mata Snchez+2015 and KY TrA; Zurita+2015). The formed has been established as the largest black hole ever measured in our Galaxy with more than 9 Msun. In BlackCAT, the catalogue of stellar-mass black holes; Corral-Santana+2016, we present a thorough compilation of all the dynamical parameters of the BH transients and show a statistical analysis of the expected population of BH transients in our Galaxy based on observations. Thus, we estimate 1300 systems in the Milky Way which imply that we have only detected the tip of the iceberg on a hidden population of black hole transients. In this contribution, we will summarise the status of this type of interacting binaries and present the latest relations that will eventually allow us to increase the current sample of black hole systems.

T 3 de Wit, Willem-Jan

ESO, Chile

The accretion process in young and evolved objects: a comparison

TBD

T 4 Heo, Jeong-Eun

Gemini Observatory & Sejong University, Republic of Korea

A profile analysis of Raman-scattered O VI bands at 6825 Å and 7082 Å in Sanduleaks star

We present a detailed modeling of the two broad bands observed at 6825 Å and 7082 Å in Sanduleak's star, a controversial object in the Large Magellanic Cloud. These bands are known to originate from Raman-scattering of O VI $\lambda\lambda$ 1032 and 1038 photons with atomic hydrogen and are only observed in *bona fide* symbiotic stars. Our high-resolution spectrum obtained with the *Magellan Inamori Kyocera Echelle* (MIKE) spectrograph at the Magellan-Clay Telescope reveals, quite surprisingly, that the profiles of the two bands look very different: while the Raman 6825 Å band shows a single broad profile with a redward extended bump, the Raman 7082 Å band exhibits a distinct triple-peak profile. Our model suggests that the O VI emission nebula can be decomposed into a red, blue and central emission regions from an accretion disk, a bipolar outflow and a further compact, optically thick region. We also perform Monte Carlo simulations with the aim of fitting the observed flux ratio $F(6825)/F(7082) \sim 4.5$, which indicate that the neutral region in Sanduleak's star is characterized by the column density $N_{HI} \sim 1 \times 10^{23}$ cm^{-2}.

T 5 Jones, Matias

Pontificia Universidad Católica de Chile, Chile

The FIDEOS high resolution spectrograph: instrument description and early scientific results

We have developed a high resolution spectrograph called FIDEOS (Fiber Dual Echelle Optical Spectrograph) in the Center of Astro-Engineering (AIUC), at the Pontificia Universidad Católica in Chile. The spectrograph covers the wavelength range of $\sim$ 4200-8600 Å, delivers a mean resolution of 42'000 and is mechanically stabilized and thermally controlled. The instrument is optimized for precision radial velocities (RV), with the aim of detecting exoplanets via RV measurements. In this talk I will describe the optical design and the main characteristics of the spectrograph. I will also present the early results obtained during the commissioning and I will discuss about the upcoming challenges.

T 6 Lee, Ho-Gyu

Korea Astronomy and Space Science Institute, Republic of Korea

Circumstellar material around massive star implied by supernova remnant observations

Massive stars suffer strong mass-loss during their evolutionary period. The released material carried by stellar wind piles-up circumstellar material (CSM) around the star. The CSM itself is usually hard to observed due to dilution into surrounding space and lack of effective heating mechanism, contrasted with the bright central star. Interestingly, such structure can sometimes be revealed by the illumination of SNR shock. In this talk, I will introduce some observational examples.

T 7 Lee, Jae-Joon

Korea Astronomy and Space Science Institute, Republic of Korea

Immersion Grating Infrared Spectrograph (IGRINS) and its view of V1016 Cyg

The Immersion Grating Infrared Spectrometer (IGRINS) is a revolutionary instrument that exploits broad spectral coverage at high-resolution in the near-infrared. IGRINS employs a silicon immersion grating as the primary disperser and volume-phase holographic gratings cross-disperse the H and K bands onto Teledyne Hawaii-2RG arrays, providing simultaneous wavelength coverage from 1.45 - 2.5 microns with R $\sim$ 45,000. In this talk, I will report the performance of IGRINS and its current status. I will also report IGRINS observations of V1016 Cyg and the preliminary results.

T 8 Lucy, Adrian

Dept. of Astronomy, Columbia University, United States

Symbiotic outflow and the 26th anniversary outburst of MWC 560

I will present results from a 2016 Chandra/VLA/Swift/optical campaign monitoring the optically-brightest outburst of MWC 560 = V694 Mon, an unusual system which first attracted attention with transient 6000 km/s outflows during its 1990 outburst. This system is widely believed to possess the only jet known to be aligned with our line of sight to a symbiotic star, though it could instead host the fastest wind from a symbiotic star. Widened optical absorption troughs, order of magnitude -enhanced outflow shock X-rays, and the first radio detections of this system suggest a strengthened and expanding outflow. With multi-wavelength monitoring, we watch both the outflow and the accretion disk as they co-evolve. If time and nature allow, I may describe a novel method for finding non-burning symbiotic stars with SkyMapper, and discuss the possibility that MWC 560 is a holotype for an unappreciated class of windy symbiotics.

T 9 Luna, Gerardo Juan Manuel

IAFE/Conicet, Argentina

On the source of power in symbiotic stars: nuclear burning vs accretion

Nuclear burning on the surface of a white dwarf produces roughly 50 times more energy per nucleon than accretion. In turn, accretion produces flickering on time scales of minutes to hours. We will present the results of our ongoing program to study the source of power on a sample of symbiotic stars through their UV emission. To this aim, we have observed a sample of 60 symbiotics with the Swift/UVOT instrument during 4 years, for more than 1 megasecond. Preliminary results will be discussed about the statistics of our survey and the usage of UV photometry as a proxy to determine the source of power in symbiotic stars.

T 10 Nuñez, Natalia

ICATE-UNSJ, Argentina

X-rays from symbiotic stars: a glimpse on their source of power

After the detection of more than 40 symbiotic stars in X-rays, they are now recognized as a significant X-rays population. Their high energy emission allow us to unveil the accretion mechanism onto the WD and we are starting to estimate what is their main source of power, i.e. accretion versus nuclear burning. Our observational program aimed to detect X-rays using different satellites such as Suzaku, Chandra, XMM-Newton and Swift indicates that X-ray emitting symbiotics are accretion and burning-powered in about equal proportions. At the same time, our program is allowing us to uncover a previously unknown population of hard X-ray emitting symbiotics. In this talk, I will review our main results and comment on their likelihood of symbiotics to become SNIa progenitors.

T 11 Rodrigues, Claudia

Instituto Nacional de Pesquisas Espaciais, Brazil

The accretion column of AE Aqr

AE Aqr is a magnetic cataclysmic variable, whose white dwarf rotates at the very fast rate of 33 s modulating the flux from high-energies to optical wavelengths. There are many studies of the origin of its emission, which consider emission from a rotating magnetic field or from an accretion column. Recently, MAGIC observations have not found emission from AE Aqr in very high energy gamma-rays discarding non-thermal emission. Furthermore, soft and hard X-ray data from Swift and NuSTAR were reproduced using thermal models. Here we present a successful modelling of AE Aqr X-ray spectra and light curve considering the emission of a magnetic accretion column using the Cyclops code. The model takes into consideration the 3D geometry of the system, allowing to properly represent the white-dwarf auto eclipse, the pre-shock column absorption, and the varying density and temperature of a tall accretion column. To our knowledge, we present the first physical modelling of AE Aqr light curve in high energies.

T 12 Sekeras, Matej

Astronomical Institute of Slovak Academy of Sciences, Slovakia

Investigating physical processes in the symbiotic nova V1016 Cyg

In 1964, V1016 Cyg underwent a nova-like outburst. Since then its brightness was slowly fading from its peak V 10.6 mag (1967 - 1970) to V 11.4 mag (2016). V1016 Cyg is a D-type symbiotic star. The dust emission dominates the near-IR spectrum. It can be fitted by a model of two dust shells of different temperature heated by both the hot component and the Mira-variable. Environment of V1016 Cyg can be investigated throughout the observed effects of the Thomson and Raman scattering processes. Thomson scattering produces very broad and shallow wings of most intense emission lines. Modelling the line profile of OVI 1032, 1038 A resonance doublet, we determined the optical depth and electron temperature of the nebula in V1016 Cyg. Investigating Raman scattering of the HeII 1025 A emission line into the emission feature at 6545 A, we determined the efficiency of this process, and using a simplified ionization model of symbiotic stars, we estimated the mass-loss rate of the Mira-variable to around of 1E-6 solar masses per year. Using only the optical spectrum represents a strong advantage of this method to determine the mass-loss rate in D-type symbiotic stars. The symbiotic nebula of V1016 Cyg can be investigated by analyzing the optical spectrum, which consists of strong Balmer emission lines, forbidden emission lines, low excitation permitted lines of metals and emission lines of highly ionized elements. Most of the forbidden lines have double-peaked profile, suggesting a bipolar structure of the low density emitting region in the binary.

T 13 Shagatova, Natalia

Astronomical Institute of Slovak Academy of Sciences, Slovakia

Properties of the wind outflow from the cool components in symbiotic binaries

Mass outflow from the majority of cool components in symbiotic binaries is still not understood well mainly due to unknown mechanism of the wind acceleration for the red giants. Here, we present the wind velocity profiles derived from measured column densities of neutral hydrogen for two symbiotic systems, EG And and SY Mus. The obtained velocity profiles represent an important restriction for the theoretical models of mass outflow from red giants in symbiotic binaries. Moreover, our column density models provide an indication of the wind focusing towards the orbital plane in S-type symbiotic binaries. Further, we use the wind velocity profiles to investigate the origin of the asymmetric UV light-curve profiles of the symbiotic star SY Mus and the asymmetric distribution of the absorption in the H-alpha line along the orbital phase as observed in the symbiotic star EG And.

T 14 Silva, Karleyne

Gemini Observatory, Chile

High and low states of polars from CRTS

Polars are cataclysmic magnetics variables, binary systems composed by a highly magnetic white dwarf (WD) star accreting matter from a low mass red dwarf companion via Roche lobe overflow, which is captured by the WDs magnetic field and channelled to the surface, forming an accretion column. Cyclotron and bremsstrahlung radiation dominate the infrared/optical and X-ray emissions of these systems, respectively. Polars can show an optical brightness variation of up to 3 mag due to the cyclotron beaming combined with the orbital motion, and could also show long term variation of 2-3 magnitudes, in three different states: high, intermediate and low brightness. The explanation for this long term variations is the fluctuation in the mass accretion rate itself, however what switch off and on the mass transfer is still unknown. A possible explanation comes from the magnetic spot model (MS), where the companion star is active and sunspots in the L1 region could decrease the mass transfer, therefore linking the high and low states with the companion star activity cycles. A second possibility comes from the magnetic locking model (ML), where the WDs magnetic field regulates the flux of accreted matter, relating it with variations of the WDs magnetic field. A previous study alongside the long term variation of the polar AM Her indicated that the magnetic locking model offered an good explanation for its behaviour, however it is unclear if this is a common behaviour among all Polars or it is a special/singular/unique case. We extended this study to investigate the optically high and low state of 11 polars observed by the Catalina All Sky Survey along 10 years. Although the period of observation is smaller than what was analysed for AM Her, we can already see similar behaviour in the data for some of these systems, favouring the ML model. Here we present the complete analysis of this sample and discuss it in the light of magnetic spot versus locking models.