Monday, October 21

Name: Ashley Ruiter; ashley.ruiter@adfa.edu.au

Title: Type Ia supernova sub-classes and progenitor origin

Abstract:
It has become fairly clear over the last decade that the progenitors of Type Ia supernovae (SNe Ia) originate from more than one formation scenario. However, it is still uncertain what the different SN Ia progenitors are in terms of exploding white dwarf mass, nature of the mass-losing companion star, and how these properties are linked to the different observed sub-classes of SNe Ia (e.g. 'normal', 91bg-like, Type Iax, etc.). I will discuss how metallicity and other evolutionary factors influence theoretical rates of SN Ia explosions and how binary evolution models can constrain the ages (delay times), birthrates, and evolutionary channel origin(s) of SN Ia progenitors.

Name: Aleksandar Cikota; acikota@lbl.gov

Title: Investigating Progenitors of Type Ia Supernovae using Spectropolarimetry

Abstract:
Spectropolarimetry offers an independent method to the study inter/circum-stellar dust properties (by observing the continuum polarization) and the analysis of the three-dimensional geometrical properties of unresolved sources (by observing the intrinsic continuum polarization and line polarization).

I will discuss the results from a statistical analysis of the Si II line polarization measurements of a sample of ~35 SNe Ia, and argue possible implications on the progenitor system. We reduced and examined, in a systematic way, archival linear spectropolarimetric data of a sample of 35 SNe Ia observed with the VLT's FORS1+2 between 2001 and 2015 at 127 epochs in total (Cikota et al. 2019). We found a statistically significant linear relationship between the polarization of the Si II 6355 Å line
before maximum brightness and the Si II line velocity and suggest that this, along with the m 15 –P Si II relationship, may be explained in the context of a delayed-detonation model. In contrast, we compared our observations to numerical predictions in the m 15 –v Si II plane and found a dichotomy in the polarization properties between Chandrasekhar and sub-Chandrasekhar mass explosions, which supports the possibility of two distinct explosion mechanisms.

Name: Evan Bauer; evan.bauer.astro@gmail.com

Title: Thermonuclear Supernovae and White Dwarf Pollution

Abstract:
Surface compositions observed in white dwarfs have been shown to be a powerful tool for probing the physics of environments surrounding white dwarfs. This is because all but the lightest elements sink away from white dwarf surfaces before they can be observed unless they are externally supplied. However, connecting observations of heavy elements in white dwarf atmospheres to a quantitative understanding of the processes that supply them requires detailed theoretical work describing the many mixing processes that can occur on white dwarf surfaces. I will review the status of theoretical work to describe these mixing processes and the successes achieved in the context of systems where pollution is supplied by planetary debris. I will then discuss applying our understanding of these processes in the context of heavily polluted hypervelocity white dwarfs that appear to originate from binary systems that produced supernova explosions. With more progress in modeling, these stars may serve as probes of some aspects of the physics needed to produce thermonuclear supernova explosions.

Name: Carles Badenes; badenes@pitt.edu

Title: Binary White Dwarfs as Type Ia SN Progenitors

Abstract:
I will review the current state of the art on Type Ia Supernova progenitors, focusing on the potential of binary WDs as SN Ia progenitors. I will examine the evidence for and against WD mergers and collisions from the point of view of rates, delay time distribution, ejecta morphology, surviving companions, and circumstellar interaction, as constrained by observations of binary WD systems, supernovae, and supernova remnants.

Name: Yossef Zenati; oyossefzm@gmail.com

Title: The Origin of Standard Thermonuclear Supernovae from Hybrid White Dwarf Mergers

Abstract:
Type Ia supernovae (SNe) are thought to originate from the thermonuclear explosions of carbon-oxygen (CO) white dwarf (WD) stars[#2014ARA&A..52..107M, #Liv+18, #Wan+18]. They produce most of the iron-peak elements in the universe, and bright Type Ia SNe serve as important “standard candle” cosmological distance indicators. The proposed progenitors of standard Type Ia SNe have been studied for decades, and can be, generally, divided into explosions of CO WDs accreting material from stellar non-degenerate companions (single-degenerate; SD models), and those arising from the mergers of two CO WDs (double-degenerate; DD models). However, current models for the progenitors of such SNe fail to reproduce the diverse properties of the observed explosions, nor do they explain the inferred

rates and the characteristics of the observed populations of Type Ia SNe and their expected progenitors[#2014ARA&A..52..107M, #Liv+18, #Wan+18]. Population synthesis studies showed that a large fraction (15-30\%) of all WD-WD mergers could involve a unique type of Hybrid He-CO WDs[#Liu+17, #Yun+17, #Zen+18a]. Although it was suggested that they may play a role as DD progenitors of normal or peculiar type Ia SNe[#Dan+14, #Dan+15, #Liu+17, #Yun+17, #Zen+18a], no detailed explosion models with observable light-curve and spectra predictions, had ever tested this possibility. Here we use detailed thermonuclear-hydrodynamical and radiative-transfer models to show that a wide range of mergers of CO WDs with hybrid He-CO WDs (see [#Ibe+85, #Zen+18a] and references therein) can give rise to normal Type Ia SNe. We find that such mergers give rise to explosions for which the synthetic light-curves and spectra resemble those of observed Type Ia SNe, and in particular they can produce a wide range of peak-luminosities ({\rm M_{B}\sim}-18.3 to -19.4) and light-curve width ({\rm M_{B15}>1.1}), consistent with those observed for normal Type Ia SNe. Moreover, our population synthesis models show that together with the contribution of massive CO WD mergers (producing SNe with {\rm {\rm M_{B15}<1.1}}) they can reproduce the full range of Type Ia SNe, their rate and delay-time distribution. Mergers of hybrid He-CO WDs can therefore play a key role in explaining the origin of Type Ia SNe, serve to study their detailed composition yields, and potentially probe the systematics involved in Type Ia SNe measurements of the cosmological parameters of the universe.

Name: Emily Wilson; ewilson519@gmail.com

Title: Convection in Common Envelopes and the formation of Double White Dwarfs

Abstract:

Formation of close double white dwarfs likely requires the initial binary to evolve through two subsequent common envelope (CE) phases. A prominent method for describing CE outcomes involves defining an ejection efficiency, αeff, which quantifies the fraction of orbital energy that can be used to unbind the envelope. The post-CE orbital separations, and thus the orbital periods, can then be determined given knowledge of the binding energy of the primary's envelope. Producing the observed post-CE orbital parameters has proven difficult for numerical simulations, as the decaying orbit of the companion fails to eject the envelope. With detailed stellar interior models of primaries, αeff is calculated for unique primary-companion mass pairs. Where the convective transport timescale is shorter than the orbital decay timescale, the energy released during inspiral is carried to the stellar surface where it is radiated away. The ejection failure seen in numerical simulations may be resolved with a proper treatment of convection, whereby the binary orbit shrinks before energy can be tapped to drive ejection. With the inclusion of convection, we find post-CE orbital periods of less than a day which is an observed phenomenon infrequently achieved by population studies with a constant αeff. We present results for the population of double white dwarfs that evolve through two convecting CE phases.

Name: Na'ama Hallakoun; naama.c.hallakoun@gmail.com

Title: Characterizing the local double white dwarf population

Abstract:
The characterization of the local double white dwarf (DWD) population is crucial to our understanding of multiple questions, from stellar evolution, through the progenitors of Type-Ia supernovae (SNe Ia), to gravitational wave sources. From a spectroscopic sample of 439 WDs from the SPY survey, we measure the maximal changes in radial-velocity (DRVmax) between epochs, and model the observed DRVmax statistics via Monte-Carlo simulations, to constrain the population characteristics of DWDs. We then combine the results with those of a complementary sample from the SDSS to obtain new and precise information on the DWD population and on its gravitational-wave-driven merger rate. We find that ~10% of WDs are in DWD systems in the separation range ~<4 AU within which the data are sensitive to binarity. The Galactic WD merger rate per WD is ~1e-11 per year. Integrated over the Galaxy lifetime, this implies that 8.5-11% of all WDs ever formed have merged with another WD. If most DWD mergers end as more-massive WDs, then some ~10% of WDs are DWD-merger products. The implied Galactic DWD merger rate is 4.5-7 times the Milky Way's specific SN Ia rate. If most SN Ia explosions come about from the mergers of some DWDs then ~15% of all WD mergers must lead to a SN Ia.

Name: JJ Hermes; jjhermes@bu.edu

Title: Paparazzi lightning: 68 million images of white dwarfs from space

Abstract:
The stars have set on the Kepler space telescope, after nearly a decade of extremely productive service in space. I will describe some of the most exciting results to come from analyzing nearly 3000 light curves (each longer than any run of the Whole Earth Telescope) collected on more than 2200 white dwarfs. I will focus on how the unprecedented light curves we have collected are revolutionizing our understanding of white dwarf rotation rates, providing fresh insight into how and when stars lose most of their angular momentum. I will also discuss additional big insights, the bright future with TESS, and a surprising discovery enabled by Kepler along the way.

Name: Joseph Barnett; joebarnett1224@yahoo.com

Title: Double Degenerates in the Open Cluster NGC 6633

Abstract:
Studying white dwarfs, the end stage of stellar evolution for more than 95% of stars, is crucial to understanding the late stages of the lives of low mass stars. In particular, the post main sequence evolution of binary star systems is more complex than for single star systems, so determining the masses and ages of binary white dwarfs will help us to understand the kind of

interactions a binary system experienced in the past. Binary white dwarfs in open star clusters are particularly useful because cluster parameters such as distance, metal content, and age are much more constrained than for field binaries. NGC 6633 is an open star cluster containing three potential white dwarf members. One of these stars was confirmed to be a single white dwarf cluster member in a study conducted in 2007. The two other white dwarfs were identified as potential double degenerates (if cluster members); high-resolution spectroscopic studies in 2015 failed to find short period radial velocity variations that would be indicative of Type Ia supernova progenitors. Yet astrometric data from Gaia DR2 indicate that these two objects are highly likely to be double degenerate cluster members. We proceeded to use catalog photometry along with a re-analysis of the spectra of each white dwarf in order to constrain the mass and temperature of each binary component. Our results add crucial data to the study of binary star evolution in open star clusters.

Name: Chien-Hsiu Lee; lee@noao.edu

Title: ANTARES: a community broker to digest the LSST firehose

Abstract:

With the avalanche of alerts delivered by ZTF/LSST and the limited resources for follow-up, we will need brokers to select intriguing alerts that warrant follow-ups in a timely manner. At NOAO and University of Arizona, we are developing the Arizona-NOAO Temporal Analysis and Response to Events System (ANTARES), to hunt for the rarest of the rare event in the time-domain. In this talk we will give
an overview of the ANTARES system, how we use ZTF as a training set, and the way forwards for LSST. I will also give a brief description of how to use ANTARES to catch varying white dwarfs in action.

Name: Thomas Prince; prince@caltech.edu

Title: Observations of short period white dwarf systems with the Zwicky Transient Facility

Abstract:

The Zwicky Transient Facility (ZTF) is a large area sky survey operating since early 2018. The Caltech group has specialized in detection of short period periodic objects (Porb<60min), which include many white dwarf systems. This talk will present an overview of ZTF white dwarf studies including ultra-compact binaries, shirt period pulsators, BLAPS, and short-period rotators.

Name: Sihao Cheng; s.cheng@jhu.edu

Title: The Delayed Evolution of High-mass White Dwarfs: a Cooling Anomaly and Double-White-Dwarf Mergers

Abstract:

Recently, Gaia DR2 has revealed an enhancement of high-mass WDs on the H-R diagram, called the Q branch. This branch is located at the high-mass end of the recently identified crystallization branch. However, we find that the distribution of photometric ages and velocities of WDs around the branch cannot be explained by crystallization alone, suggesting an extra cooling delay beyond current WD cooling models. To explore the properties of this delay, we statistically compare two age indicators -- the dynamical age reflected by transverse velocity and the photometric ages calculated from WD cooling models -- for more than one thousand high-mass WDs (1.08−1.23M⨀). We show that, in addition to crystallization and merger delays, an extra 8-Gyr cooling delay is required on the Q branch, which affects only about 7% of high-mass WDs. This is a challenge to WD cooling models. We propose that 22Ne settling in previously-metal-rich double-WD merger products may account for this extra delay. On the other hand, our analysis also allows us to use the merger delay to constrain the fraction of double-WD merger products among high-mass WDs. Independent of the explanation for the Q branch, we show that 20±6% of high-mass WDs originate from double-WD mergers, corresponding to a merger rate of (2.1±0.6)×10^−14/M⨀/yr in our mass range. This is a direct observational constraint on the rate of double-WD mergers. In future, our method may be used to constrain the delay-time distribution of double-WD mergers.

Name: Eva Villaver; eva.villaver@uam.es

Title: Planetary Pieces: Putting All the Clues Together Using White Dwarfs

Abstract:

Planetary systems have been found systematically orbiting main sequence stars and red giants. But the detection of planets per se during the white dwarf phase has been more elusive. There is ample observational evidence of the existence of planetary leftovers around these systems in the form of material accreted onto the white dwarf, disks and even planetesimals. In this talk I will review how we can put these pieces together and reconcile what we see in white dwarfs with what we can infer regarding the evolution of planetary systems from the main sequence phase.

Name: Alexandra Doyle; a.doyle@UCLA.edu

Title: Exoplanetary Oxygen Fugacities from Polluted White Dwarf Stars

Abstract:
Rocks are made primarily of oxygen, with O atoms comprising half their mass and roughly 90% of their volume. The oxidation state of a planet, as measured by its bulk oxygen fugacity (fO2), is therefore a critical factor that determines its structure and evolution. The intrinsic oxygen fugacity of a planet will determine the relative size of its metallic core, the geochemistry of its mantle and crust, the composition of its primordial atmosphere, and the forces responsible for mountain building. Indeed, fO2 is thought to be amongst the parameters that determine the habitability of a planet. Most rocky bodies in our solar system formed with oxygen fugacities approximately five orders of magnitude higher than that corresponding to a hydrogen-rich gas of solar composition. However, it is uncertain whether the processes that led to oxidation of rocks in the solar system are typical of other planetary systems. We use the amount of oxidized iron relative to iron metal to derive the first direct measures of oxygen fugacities of extrasolar rocky bodies using the elemental abundances in white dwarf (WD) stars polluted by accretion of rocks. We find that the intrinsic oxygen fugacities of rocks accreted by the WDs are similar to those of terrestrial planets and asteroids in our solar system. This result suggests that at least some rocky exoplanets are geophysically and geochemically similar to Earth.

Name: Trent Dupuy; tdupuy@gemini.edu

Title: Orbit and Dynamical Mass of a White Dwarf in a Planet-Hosting Binary System

Abstract:
Gliese 86 is an early-K dwarf at 11 pc that hosts a massive Jupiter (msini = 4 MJup) on a 15.8-day orbit and a wide white dwarf companion at a projected separation of 20 AU. The nature of this white dwarf has been contentious, with its estimated mass (and corresponding cooling age) ranging from 0.5 MSun (~10 Gyr) to 0.6 MSun (~1.3 Gyr). We present a joint analysis of direct imaging astrometry and radial velocities from the literature along with new high-precision Gaia astrometry. Our cross-calibration of the Hipparcos and Gaia catalogs yields a highly significant acceleration in the form of a change in proper motion between the two space missions separated by 25 years. This results in a precise orbit determination and a very accurate, model-independent mass of 0.59+-0.01 Msun for the white dwarf. The analysis we present is poised to be extended to all white dwarf companions known from direct imaging or radial velocity accelerations. In systems with planets, the orbit and mass information we obtain provides critical information about the progenitor and possible dynamical evolution of the planetary system. Such astrometric accelerations can now point the way to the discovery of new stellar remnants around stars in the solar neighborhood.

Tuesday, October 22

Name: Christopher Manser; christopher.manser@warwick.ac.uk

Title: Remnant planetary systems around white dwarfs

Abstract:
It has been 102 years since the first evidence of a planetary system around a white dwarf was observed: the metal pollution of van Maanen 2. However, it took over half a century before the contamination of white dwarf atmospheres was linked to the presence of planets.

25-50% of white dwarf atmospheres are enhanced in elements other than hydrogen or helium, revealing the remnant planetary systems that have survived the evolution of their host stars. This material is usually accreted via a debris disc formed from the tidal disruption of a planetesimal that was perturbed from an orbit further out in the planetary system. Studying the breakup of these bodies and the material they deposit into the white dwarf atmosphere allows one to determine the composition of exo-planetary material - currently impossible in exoplanet studies around main sequence stars.

In this review talk I will introduce the topic of remnant planetary systems around white dwarfs and cover recent advancements in the field including: (i) the compositional diversity of planetary systems, and (ii) the detection of planetesimals in orbit around two white dwarfs. I will conclude with future prospects in the field of white dwarf planetary systems.

Name: Laura Rogers; lr439@cam.ac.uk

Title: Infrared variability around planetesimal-eating white dwarfs

Abstract:
Evidence for the survival of outer planetary systems to the white dwarf phase comes from observations of planetary material polluting the atmospheres of white dwarfs. These observations are unique in providing the composition of exo-planetary material. Infrared observations of dust very close to white dwarfs reveal how planetary material arrives in the atmospheres of white dwarfs. We expect the scattering of planetary bodies that leads to pollution to be a stochastic process, with the potential for variability on human timescales. Such variability has been found for the white dwarf WDJ0959-0200 among others, where a drop in K band flux of 20% was observed within one year. I present the results from a large scale near-infrared monitoring campaign of ~80% of all known dusty white dwarfs using UKIRT (WFCAM) over a baseline of 3 years. I address the following questions: How often do dust discs vary? In what way do they change? Are all discs capable of varying?

Name: Keaton Bell; keatonbell@utexas.edu

Title: The Search for Transiting Planets and Planetesimals with the Zwicky Transient Facility

Abstract:
Planetary materials orbiting white dwarf stars reveal the ultimate fate of the planets of the Solar System and exoplanet systems. Observed metal pollution and infrared excesses from debris disks support that planetary systems or their remnants are common around white dwarf stars. However, these are difficult to detect since a very high orbital inclination angle is required for a small white dwarf to be transited, and these transits have very short (minute) durations. The miniscule amount of time that these systems spend in transit could be overcome by a sufficiently wide and fast photometric survey. By obtaining over 100 million images of white dwarf stars with 30-second exposures over three years, the Zwicky Transient Facility (ZTF) is likely to record the first exoplanetary transits of white dwarf stars. ZTF will also reveal new systems of transiting, disintegrating planetesimals like WD 1145+017. We demonstrate the promise of ZTF to unveil the population of exoplanets orbiting white dwarf stars and share the early results of our search.

Name: Markus Kissler-Patig; mkissler@esa.int

Title: Planets around white dwarfs as seen by the TESS mission

Abstract:
We have been searching for transiting exoplanets orbiting white dwarf stars, selected from the Gaia Data Release 2, by taking advantage of the unique capability of the Transiting Exoplanet Survey Satellite (TESS) mission.
A number of white dwarfs show periodic signals - in this contribution we discuss the possible causes and the likelihood of the signals stemming from a post-main sequence exoplanet.

Name: Matthew Coleman; truth.is.evolution@gmail.com

Title: White Dwarfs as Accretion disk laboratories

Abstract:
The abundant observations of accreting white dwarfs makes them the ideal systems to confront accretion disk theory with observations. We utilize hydrodynamic simulations to gain insight to physical processes governing accretion disks. This includes the boundary layer, the region of interaction between the disk and star.

Name: David Wilson; djwilson394@gmail.com

Title: Discovery of an Irradiated Brown Dwarf Companion to a White Dwarf

Abstract:
We present the discovery of a new post common envelope binary system consisting of a white dwarf with a brown dwarf companion in a 4.2 hour orbit. The brown dwarf is irradiated and demonstrates phase-dependant emission from both hydrogen and calcium. This is only the second white dwarf-brown dwarf system where emission from metal lines has been detected, and the longest period system with hydrogen emission by a factor two. We present analysis of X-shooter spectroscopy measuring the orbital period and mass ratio of the system, as well as the emission line strength as a function of phase. Additional photometric observations are used to search for eclipses and day/night changes in emission from the brown dwarf. Based on these measurements we infer the atmospheric behavior of the brown dwarf, and discuss the system in the context of similar binaries.

Name: Jerzy Krzesinski; jk@oa.uj.edu.pl

Title: Searching for Low-mass Companions Around White Dwarfs and Subdwarfs from Kepler field.

Abstract:
Knowing the late stages of stellar evolution is crucial for understanding the fate of planets around subdwarfs and white dwarfs. Simulations by Staff et al. (2016) shows, that exoplanets engulfed in the extending stellar envelope will quickly spiral down onto the parent star. Therefore, we do not expect to find planets on close by orbits to subdwarfs (Blokesz et al. 2019) or white dwarfs. However, recent observations of planetary debris around WD 1145+017 white dwarf (Vanderburg and Rappaport 2018) suggests, there might exists planets farther away from these stars. Using binarograms (Ballona 2014), O-C diagrams and FT for Kepler space telescope data, we are investigating problems of missing planets around white dwarfs in binary systems, single white dwarfs and subwarfs type B. The last ones, being the only stars which go through the red giant phase and omit the asymptotic giant phase due to the lack of hydrogen in their envelopes.

Name: Susana Landau; slandau@df.uba.ar

Title: Variation of fundamental constants

Abstract:
The attempt to unify all fundamental interactions resulted in the development of multidimensional theories like string derived field theories and related brane-world theories . Among these theories, there are some in which the gauge coupling constants may vary over cosmological timescales. On the other hand, a theoretical phenomenological framework based on first principles, was developed by Bekenstein and later improved by Barrow, Sandvik and

Magueijo. Different versions of the theories mentioned above predict different time behaviours of the gauge coupling constants. On the other hand, many observational and experimental efforts have been made to establish constraints on such variations. The experimental research can be grouped into astronomical and local methods. The latter ones include geophysical methods such as the natural nuclear reactor that operated about 1.8×10^9 years ago in Oklo, and laboratory measurements with atomic clocks. The astronomical methods are based mainly on the analysis of high-redshift quasar absorption systems. In this talk, we will review the most relevant observational and experimental bounds on the variation of fundamental constants. Besides, we will show the predictions of some of the theories mentioned above and compare them with the observational bounds.

Name: Don Winget; dew@astro.as.utexas.edu

Title: Understanding spectra from white dwarf photospheres: benchmarking the atomic physics

Abstract:
Most stars either are, or will become, white dwarf stars, giving them broad relevance. The astrophysical questions they can help us answer include the age of the universe, the age and history of star formation of our Galaxy's varied morphological components, and the evolution of stars. The compact and dense nature of these stars means that their atomic physics is not well constrained, even in the outermost layers. We briefly describe the astrophysical and physical problems associated with white dwarf photospheres. We establish the work on white dwarf stars in the larger context of the "at-parameter" experiments of the Wootton Center for Astrophysical Plasma Properties (WCAPP). The current suite of experiments are all macroscopic plasmas under the density and temperature conditions we find in the cosmos; we will briefly summarize the results of these experiments to-date and discuss recent results of the White Dwarf Photosphere Experiment (WDPE).

Name: Xuefei CHEN; cxf@ynao.ac.cn

Title: Extremely low-mass white dwarfs in double degenerates: Formation and Significance for LISA

Abstract:
Extremely low-mass white dwarfs (ELM WDs) are helium WDs with a mass less than ~0.3 Msun. Most ELM WDs are found in double degenerates (DDs) in the ELM Survey led by Brown and Kilic. These systems are supposed to be significant gravitational-wave sources in the mHz frequency. In this contribution, we will firstly show our investigation for the formation of ELM WDs in DDs by a combination of detailed binary evolution calculation and binary population synthesis, and then explore the gravitational wave radiation of such systems in the Galaxy, giving some predictions for future space-based gravitational wave detector LISA.

Name: Bart Dunlap; bhdunlap@utexas.edu

Title: Learning about Line Shapes and Masses from Gaia Parallaxes

Abstract:
The mass of a white dwarf star is one of its fundamental properties, and its accurate determination has broad utility, e.g., white dwarf and Galactic age determinations, derivation of the initial-final mass relationship, and the assessment of various progenitor scenarios for type Ia supernovae. Parallaxes from Gaia DR2 have allowed masses to be derived for thousands of white dwarfs with known spectral type. For these stars, spectral models can also be used to infer mass via surface gravity; this method depends sensitively on theoretical line shapes. Here we explore what we can learn about Balmer line profiles from the DAs in this data set, discuss disagreements with theoretical profiles, and place the results in the context of what we are learning from the white dwarf photosphere experiment in the Wootton Center for Astrophysical Plasma Properties.

Name: Lucy McNeill; Lucy.mcneill@monash.edu

Title: Probing white dwarf structure with LISA: using gravitational waves for asteroseismology

Abstract:
We study the effect of tidal forcing on gravitational wave signals from white dwarf (WD) pairs in the Laser Interferometer Space Antenna (LISA), DECi-hertz Interferometer Gravitational wave Observatory (DECIGO) and Big Bang Observer (BBO) frequency band (\$10^{-4}\$--\$10^{-1}\$ Hz). In particular, we show that the end state of tidal circularization is quasi-circular, with the relaxed dynamical tide cyclically forcing the eccentricity at the orbital frequency, while in turn, a non-circular orbit forces the dynamical tide. This coupling produces gravitational wave power in harmonics not present in perfectly circular binaries, with the corresponding strain amplitudes depending directly on the density profiles of the stars.

Gravitational wave astronomy therefore offers a new window on stellar internal structure. We focus on tidally interacting white dwarf binaries in the LISA band (orbital frequencies~1-10mHz), providing general analytic expressions for the dependence of the induced eccentricity and strain amplitudes on the apsidal motion constants of the stars, the ratio of their radii to the binary separation, and the mass ratio. We show that the f-mode produces a measurable effect in Milky Way double white dwarfs, even though the associated mode frequency is far from orbital resonance.

In this talk I will discuss how to maximise matched filter signal-to-noise ratios for tidally interacting binaries, in the context of planned LISA and DECIGO/BBO detectors. I will then show how to relate the signal to the stars thermal structure and spin, and go through the relevance of this new window not only to astrophysics, but degenerate matter in general.

Name: Lydia Tchang-Brillet; lydia.tchang-brillet@obspm.fr

Title: Laboratory studies of VUV emission spectra of heavy element ions

Abstract:
Reliable spectroscopic data are needed for interpretation and modelling of observed astrophysical plasmas. For heavy element ions, which have complex spectra, experimental data are rather incomplete. To provide valuable fundamental quantities, such as precise wavelengths, level energies and semi-empirical transition probabilities, we are carrying on laboratory studies of high-resolution VUV emission spectra of moderately charged ions of transition metals and rare earth elements. Experimental and theoretical methods are summarized. Examples of studies are described.

Name: Patrick Tremblay; patrick@astro.umontreal.ca

Title: Neutral Helium Line Profiles through the Simulation of Local Interactions in White Dwarfs

Abstract:
For the past 25 years, we have been considering the Stark effect for neutral helium lines in DB white dwarfs using the analytical standard Stark broadening in both the impact regime (in the center of the lines) and the quasi-static regime (in the wings) for the electrons, while neglecting the effect of ions in motion. Although this is probably a good approximation based on previous theoretical work, the transition between the two regimes for the electrons and the contribution of the ions very near the core might be poorly represented. To better represent these particularities, we report here the results of a new series of simulations that treat the local dynamics and interactions of both electrons and ions around a neutral helium atom. From these simulations, we produce new improved line profiles, which we compare with our previous analytical results.

Name: Adela Kawka; adela.kawka@curtin.edu.au

Title: The origin and properties of magnetic white dwarfs

Abstract:
A significant fraction of white dwarfs possess a magnetic field with strengths ranging from a few kG up to about 1000 MG. However, the incidence of magnetism varies when the white dwarf population is broken down into different spectral types providing clues on the formation of magnetic fields in white dwarfs. Several scenarios for the origin of magnetic fields have been proposed. Offset dipoles are often assumed sufficient to model the field structure, however more detailed observations and time variability studies have revealed more complex structures such as magnetic spots or multipoles are required. These field structures combined with measured rotation rates of magnetic white dwarfs also help constrain the origin of the magnetic fields. I will review the diverse observational properties of magnetic white dwarfs

and describe current proposals for their origin. Finally, I will present the current challenges in modelling white dwarf atmospheres in the presence of a magnetic field.

Name: François Hardy; hardy@astro.umontreal.ca

Title: A New Look at Magnetic White Dwarfs

Abstract:
We present a homogeneous analysis of a large sample of magnetic white dwarf stars (SDSS, PanSTARRS and Gaia data) using state-of-the-art magnetic atmosphere models and fitting technique. We discuss the properties of the sample as well as the implication on our understanding of the nature and evolution of such objects.

Name: Surajit Kalita; surajitk@iisc.ac.in

Title: Continuous gravitational wave from magnetized compact objects

Abstract:
Gravitational wave is the ripple in spacetime, formed due to distortion in the curvature of the spacetime, and propagates at the speed of light. It is emitted if the system has a non-zero quadrupole moment. Recent detection of gravitational wave from nine black hole merger events and one neutron star merger event by LIGO and VIRGO shed new light in the field of astrophysics. Apart from this, there is another type of gravitational wave, known as continuous gravitational wave, which is continuously emitted at a certain frequency and amplitude. On the other hand, in the past decades, discoveries of super-Chandrasekhar white dwarfs as well as massive neutron stars were great astrophysical success, although they were inferred indirectly from other observations. Continuous gravitational wave can be one of the prominent alternate ways to detect these compact objects directly. In my presentation, I will show that magnetic field is one of the prominent physics to form super-Chandrasekhar white dwarfs and massive neutron stars. If such compact objects are rotating with a fixed angular frequency following certain conditions, they can efficiently emit gravitational radiation and these gravitational waves can be detected by some of the upcoming detectors, e.g. LISA, BBO, DECIGO, Einstein Telescope etc. This will certainly be a direct detection of super-Chandrasekhar white dwarfs as well as massive neutron stars.

Name: Kevin Burdge; kburdge@caltech.edu

Title: The shortest period eclipsing binary

Abstract:
In this talk we will give an overview of several new LISA gravitational wave sources discovered using ZTF, and in particular highlight recent results on a newly discovered 7-minute orbital period eclipsing double white dwarf binary.

Name: Prasanta Bera; pbera.phy@gmail.com

Title: Quasi-periodic oscillations from post-shock accretion column of strongly magnetized accreting white dwarfs

Abstract:
Polars are a set of strongly magnetized accreting white dwarfs which does not form any accretion disk due to its extended magnetosphere. Quasi-periodic oscillations (QPOs) with frequency about a Hz are detected in many optical observations of a few polars. In these binary systems, the high-frequency QPOs are thought to be generated due to the variation in emitted radiation from the post-shock accretion column. Thermal bremsstrahlung is a significant process to generate Xray radiation from this post-shock region. Local thermal instability due to the efficient cooling from the highly dense region is believed as the primary region behind the temporal variability. We study the structure and the dynamical properties of the post-shock accretion column including the effects of bremsstrahlung and cyclotron radiation. We find that the presence of significant cyclotron emission in optical band reduces the overall variability of the post-shock region. These characteristics of the post-shock region are consistent with the observed properties of V834 Cen and in general with Cataclysmic Variable sources that exhibit QPO frequency of about a Hz.

Wednesday, October 23

Name: Alejandro Hugo Córsico; alejandrocorsico@gmail.com

Title: White dwarf asteroseismology

Abstract:
The relevance of the study of white dwarf stars exceeds by far the scope of the theory of stellar evolution. Examples abound of white-dwarf applications to various areas of astrophysics, such as cosmochronology, evolution of planetary systems along several phases of stellar evolution, and also as laboratories to study exotic physics and crystallization. The last years have witnessed a great progress in the study of white dwarfs. In particular, a wealth of information of these stars from different surveys (e.g., SDSS) has allowed us to make meaningful comparison of evolutionary models with observations. While some information like surface chemical composition, temperature and gravity of isolated white dwarfs can be inferred from spectroscopy, and the total mass and radius can be derived as well when they are in binaries, the internal structure of these compact stars can be unveiled only by means of asteroseismology, an approach based on the comparison between the observed pulsation periods of variable white dwarfs and the periods predicted by appropriate theoretical models.

Indeed, the asteroseismological techniques allow us to “see” the white-dwarf interiors, thus enabling to infer details of the internal chemical stratification, the total mass, and even the stellar rotation profile. In this talk, we first will briefly revise the evolutionary channels currently accepted that lead to the formation of white dwarf stars, and then, we will give an account of the different sub-types of pulsating white dwarfs known so far, emphasizing the recent observational and theoretical advancements in the study of these fascinating variable stars. This progress has been partly boosted with both the advent of observations from space such as the Kepler and K2 missions and the generation of new detailed evolutionary models, along with the development of powerful asteroseismological techniques. With the availability of parallax measurements from the Gaia collaboration, and with the arrival of fresh data from the TESS mission, the field of white-dwarf asteroseismology will surely experience an even greater revolution in a few years. These circumstances force the members of the white-dwarf community to be ready to interpret new and unexpected data, which will ultimately lead to correcting the current theoretical models. Fields such as the dating of stellar populations through cosmochronology, the theory of accretion in WDs, the physics of matter under extreme conditions (such as crystallization), as well as the study of fundamental particles (both hypothetical and real), will ultimately be strongly benefited.

Name: Henry Shipman; harrys@udel.edu

Title: 40 Years of Pulsating White Dwarfs

Abstract:
Asteroseismology of white dwarf stars has led to a number of interesting results pertaining to the long term evolution and present state of white dwarf interiors. I will review recent results and will give a not necessarily comprehensive view of the prospects for further progress in this area. Two – but only two white dwarf stars – have shown the expected cooling as they age. Careful observations of a few white dwarfs with rich pulsational properties reveal interior compositions as well as the thickness of their surface layers. A few very well observed stars have revealed changes in their pulsational spectra which we don't understand yet.

Name: Francisco De Geronimo; degeronimofrancisco@gmail.com

Title: Evolution and asteroseismology of ultra massive white dwarfs.

Abstract:
Ultra-massive white dwarfs are the end product of the isolated evolution of a massive progenitor star (M > 7 Msun) or the merger of two C/O core white dwarfs (WD). The former are expected to harbor One cores as result of the ignition of C in their interiors during the super asymptotic giant branch (SAGB). As evolution proceeds during the white dwarf cooling phase, a crystallization process resulting from Coulomb interactions in very dense plasmas is expected to occur, leading to the formation of a highly crystallized core. In particular, pulsating ultra-massive white dwarfs offer a unique opportunity to study physical processes during the SAGB and test the occurrence of crystallization in white dwarf interiors as well as physical processes related with dense plasmas.

We present the results of the computations of new evolutionary sequences for ultra-massive ONe core WDs and their respective pulsational properties. We take into account for the first time the process of phase separation expected during the crystallization stage of these WDs by relying on the most up-to-date phase diagram of dense oxygen/neon mixtures as well realistic chemical profiles resulting from the full computation of progenitor evolution. We studied the impact of crystallization on the expected period spectrum of pulsating hydrogen-rich ultra-massive WD. We present the main stellar properties and the expected chemical structure (including the percentage of crystallized core) derived by means of asteroseismological analysis performed to several ultra-massive hydrogen-rich WD, in particular, to the well known BPM 37093.

Name: Agnes Kim; axk55@psu.edu

Title: Validation of Asteroseismic fitting with the new White Dwarf Evolution Code

Abstract:

A new version of the White Dwarf Evolution Code was published (Bischoff-Kim & Montgomery, 2018). It overcomes limitations of earlier versions by utilizing MESA modules, for instance allowing regions of the model with a mix of helium, carbon, and oxygen. This single improvement allows us to almost exactly replicate models output by stellar evolution codes. Armed with this new capability, we use as a star to fit, a hydrogen atmosphere white dwarf model from the La Plata group (using the LPCODE). We present results of fitting different subsets of periods for that model. This allows us some validation of our fitting methods, knowing exactly what properties we should be recovering in our best fit model.

Name: Jacqueline den Hartogh; jacqueline.den.hartogh@gmail.com

Title: Using asteroeseismically obtained core rotation rates of low and intermediate mass stars to investigate slow neutron capture nucleosynthesis

Abstract:

Results from the white dwarf community are used in different astrophysical fields. Here I will present a paper doing exactly that: combining white dwarf rotation rates with s-process nucleosynthesis.

Asteroseismic studies have shown us that the cores of low and intermediate mass stars rotate orders of magnitude slower than the predictions of stellar evolutionary calculations. These results, combined with the white dwarf rotation rates, allow us to map out the core rotation rates of these stars almost completely throughout their evolution. With this information, we can also try to understand better the effect of rotation on the chemical composition of stars.

Here we focus on the AGB phase of 2 M$_{\odot}$ stars, the phase in which the s-process (slow neutron capture process from Fe up to Pb) can take place. We use stellar evolution models including rotation of this initial mass, to find out if there is still s process happening in AGB stars that rotate as fast (slow?) as the asteroseismically obtained rotation rates. We use a

simple trick (adding a constant viscosity) to slow down the core rotation rates to match the asteroseismically obtained values. We will present the nucleosynthesis results of our models as well as the uncertainties of our method.

Name: Paula Szkody; szkody@astro.washington.edu

Title: Accreting, Pulsating WDs: Probing Heating and Rotation

Abstract:
The white dwarfs in close, interacting binaries provide a natural laboratory for exploring the effects of heating from the accreting material and the resulting deposition of angular momentum resulting in the spinuup of the atmosphere. This study is even more fruitful when it involves a pulsating white dwarf, which allows an exploration of the effects of the accretion on the interior as well as the atmosphere. The last decade has seen the accomplishment of UV (HST) and optical (ground) studies of several accreting white dwarfs that have undergone a dwarf nova outburst that has heated the white dwarf and subsequently returned to its optical quiescence. The behavior in these cases has not been identical. The most recent study involves V386 Ser, which underwent its first known outburst in January 2019 after 19 years at quescence. This system is unique in that its well-studied quiescent pulsation shows a triplet, with spacing indicating a rotation of 4.8 days, extremely slow for accreting white dwarfs. The results of an HST observation to compare its atmospheric rotation to that of its interior and how its cooling from the outburst heating compares to the other known accreting, pulsating white dwarfs after outburst will be presented.

Name: Zach Vanderbosch; zvanderbosch@astro.as.utexas.edu

Title: A Ground-Based Detection of an Outbursting DBV White Dwarf

Abstract:
Pulsating white dwarfs are now known to undergo outburst-like phenomena, brief surges in flux lasting 6-24 hours which recur irregularly on 1 to 80+ day timescales. The Kepler/K2 missions provide crucial information on the recurrence and duration timescales and relative flux enhancements for outbursts, but with only a single broadband filter we still lack spectroscopy and multi-color photometry during these events. Such observations are needed for further constraining the physical nature of outbursts and for comparison with the parametric resonance theory thought responsible for these events. We present here multi-color ground-based observations of the first known outburst in a DBV white dwarf that was also observed in three separate K2 campaigns. We obtained Sloan g, r, & i time-series photometry from the McDonald Observatory 2.1m both during and after outburst demonstrating this is the largest outburst yet seen with a mean flux increase exceeding 30% and maximum brightness variations in excess of 80%. In addition, mode frequencies seen at high amplitude during outburst match the high-frequency, low-amplitude modes observed during quiescence throughout each K2 campaign. With this data set we explore in detail the

interactions between interior pulsations and the outer convection zone layer of the star during outburst.

Name: Stephane Charpinet; stephane.charpinet@irap.omp.eu

Title: The chemical structure of the hot pulsating DB white dwarf KIC 08626021 from asteroseismology

Abstract:
Giammichele et al. (2018) proposed for the first a full determination, largely independent of evolution calculations, of the chemical composition and stratification inside a white-dwarf star, with the analysis of the hot pulsating DB white dwarf KIC 08626021. However, Timmes et al. (2018) pointed out that neglecting the effects of neutrino cooling, such as in the static models used in Giammichele et al. study, could impact significantly the derived seismic solution and compromise conclusions drawn upon it. Here we present a reanalysis of KIC 08626021, but using improved static models which now incorporate more realistic luminosity profiles that reflect the still significant energy losses induced by neutrino emission mechanisms in hot DB white dwarfs. We show that this effect has only a limited impact on the derived seismic model properties and, more importantly, that all the important conclusions brought by Giammichele et al. (2018) remain entirely valid.

Name: Barbara Castanheira; barbara_endl@baylor.edu

Title: Asteroseismology of white dwarfs observed by Kepler and K2

Abstract:
In this review, I will present the seismological analysis of all white dwarf stars observed by Kepler and K2. We compared the observed independent pulsation models with our model grid. Our models were calculated using the evolutionary code WDEC, where polytrope functions are cooled, and excited periods are computed. We have calculated millions of models, varying effective temperature, surface gravity, hydrogen mass layer, and helium mass layer. We have also computed self-consistent models using the evolutionary LPcode, where stars are evolved from the zero age main sequence to a certain temperature in the white dwarf cooling sequence. For this model grid, the only quantity that we have varied is the thickness of the hydrogen layer, since all the other parameters depend on the previous evolutionary phases. We will discuss the differences in varying the model grids, as well as the fitting techniques (eg. including the observed amplitudes as weights for the periods). Our goal is to estimate the true external uncertainties in asteroseismology of white dwarfs. Finally, besides the individual fits, we will discuss the ensemble results for white dwarfs. The better understanding of the internal structure of white dwarf stars places important constrains in low-mass stellar evolution.

Thursday, October 24

Name: Michael Tucker; tuckerma@hawaii.edu

Title: Gone But Not Forgotten: A Decade of Archival GALEX Data Reveals a Multitude of Variable White Dwarfs

Abstract:
We search for photometric variability in more than 23 000 known and candidate white dwarfs (WDs), the largest ultraviolet survey compiled for a single study of WDs. We use gPhoton, a publicly available calibration/reduction pipeline, to generate time-series photometry of WDs observed by the Galaxy Evolution Explorer (GALEX) spacecraft. By implementing a system of weighted metrics, we select sources with variability due to pulsations and eclipses. Although GALEX observations have short baselines (<30 min), we identify intrinsic variability in sources as faint as Gaia G = 20 mag. With our ranking algorithm, we identify 48 new variable WDs in archival GALEX observations.We detect 40 new pulsators: 36 have hydrogen-dominated atmospheres (DAVs), including one possible massive DAV, and four are helium-dominated pulsators (DBVs). We also detect eight new eclipsing systems; five are new discoveries, and three were previously known spectroscopic binaries. We perform synthetic injections of the light curve of WD 1145+017, a system with known transiting debris, to test our ability to recover similar systems and place limits on their occurence.

Name: Olivier Vincent; ovincent@astro.umontreal.ca

Title: Searching for ZZ Ceti white dwarfs in the Gaia survey

Abstract:
The Gaia satellite recently released parallax measurements for nearly 400,000 white dwarf stars, allowing for precise measurements of their physical parameters. By combining these parallaxes with Pan-STARRS and CFIS-u photometry, we measured the effective temperatures and surface gravities for all white dwarfs within 100 pc, and identified a sample of ZZ Ceti white dwarf candidates within the instability strip. Here we report the results of our ongoing photometric follow-up survey aimed at identifying new ZZ Ceti stars among this sample using the PESTO camera attached to the 1.6-m telescope at the Mont-Mégantic Observatory. Our goal is to verify that ZZ Ceti stars occupy a region in the log g - Teff plane where no nonvariable stars are found, supporting the idea that ZZ Ceti pulsators represent a phase through which all hydrogen-line (DA) white dwarfs must evolve.

Name: Judith Provencal; jlp@udel.edu

Title: White Dwarfs and Convection

Abstract:
Convection is a highly turbulent, three dimensional process that is traditionally treated using a simple, local, time independent description. Convection remains one of the largest sources of theoretical uncertainty in stellar modeling. We outline recent progress in studies using pulsating white dwarfs to constrain convection and calibrate mixing length theory.

Name: Paola Marigo; paola.marigo@unipd.it

Title: What can we learn from the initial-final mass relation of white dwarfs?

Abstract:
The initial-final mass relation (IFMR) of white dwarfs plays a key role across astrophysics. Once the initial mass is known, the IFMR fixes the mass of the metal-enriched gas returned to the interstellar medium, thus putting constraints to the efficiencies of mixing events and stellar winds during the previous evolution. The high-mass end of the IFMR provides an empirical test to determine the maximum initial mass for stars that develop degenerate Ne-O-Mg cores and proceed through the super-AGB phase without exploding as electron-capture supernovae. The IFMR is also relevant in a wider framework as a key ingredient in chemical evolution models of galaxies; at the same time it sets a lower limit to the nuclear fuel burnt during the asymptotic giant branch phase, therefore constraining the contribution of this phase to the integrated light of galaxies. In my contribution I will review the current state of the semi-empirical IFMR, and provide an update on theoretical studies aimed to decipher the IFMR in terms of the physical properties of the progenitor stars.

Name: Marcin Hajduk; marcin.hajduk@uwm.edu.pl

Title: Real time evolution of post-AGB stars

Abstract:
Evolution of post-AGB stars is extremely fast. They cross the HR diagram vertically on a timescale of thousand of years to reach maximum temperature in their lifetime. Once the star is hot enough, the ionization front expands throughout the nebula. We observed increase of the excitation of many young planetary nebulae on a timescale of years and decades. The changes are most prominent when nebulae remain optically thick for ionizing radiation. In one case we observed decrease of the excitation, which could be the result of a late thermal pulse. We studied objects located in different enviromnents, including the Galaxy and the Magellanic Clouds. Since evolutionary timescale of post-AGB stars is very sensitive to their mass, observed changes can be used to determine central star masses from evolutionary models. If additional observable is determined (e.g. luminosity or dynamic age), the method can be utilized for observational verification of theoretical models. We studied objects with different

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surface composition, representing different evolutionary scenarios, which ultimately lead to different types of white dwarfs.

Name: Lisa Löbling; loebling@astro.uni-tuebingen.de

Title: Spectral analysis of a white dwarf-main sequence star binary

Abstract:
We present a detailed spectral analysis by means of non-local thermodynamical equilibirum (non-LTE) model-atmosphere techniques and LTE ATLAS12 models of ultraviolet HST/COS and optical SDSS spectra of the hot white dwarf primary and the main sequence secondary star in a close binary system, respectively.

Name: Jordi Isern; isern@ice.cat

Title: White dwarfs as Advanced Physics laboratories: the axion case

Abstract:
The shape of the luminosity function of white dwarfs (WDLF) is sensitive to the characteristic cooling time and, therefore, it can be used to test the existence of additional sources or sinks of energy such as those predicted by alternative physical theories. However, because of the degeneracy between the physical properties of white dwarfs and the properties of the Galaxy, the star formation history (SFH) and the IMF, its almost always possible to explain any anomaly as an artifact introduced by the star formation rate. To circumvent there are at least two possibilities, the analysis of the WDLF in populations with different stories, like disc and halo, and the search of effects not correlated with the SFH. These procedures are illustrated with the case of axions.

Name: Terry Oswalt; wdman48@aol.com

Title: The Completeness of Gaia-Selected Samples of White Dwarfs—Are We There Yet?

Abstract:
The Gaia DR2 has drama]cally increased the ability to detect faint nearby white dwarfs. The census of the local white dwarf popula]on has recently been extended from 25 pc to 50 pc, effec]vely increasing the sample by roughly an order of magnitude. Here we examine the completeness of this new sample as a func]on of variables such as apparent magnitude, distance, proper mo]on, photometric color index, unresolved components, etc.

Name: Kurtis Williams; kurtis.williams@tamuc.edu

Title: Ensemble Evolutionary Studies of White Dwarfs

Abstract:
We will discuss our newly expanded program to identify a large sample of white dwarfs in open star clusters through Gaia mission data and multi-epoch surveys. Follow-up studies allow us to use this large sample to address several open questions in a range of astrophysical areas including: variability in total mass lost by stars during post main sequence evolution, the lower mass of supernova progenitors, the evolution of close multiple star systems, and the fate of planetary systems.

Name: Nadege Lagarde; Nadege.Lagarde@utinam.cnrs.fr

Title: New population synthesis approach : the golden path to constrain

Abstract:
The cornerstone mission of the European Space Agency, Gaia has revealed properties of 14 000 white dwarfs in the Galaxy, allowing for the first time to constrain the evolution of white dwarfs with a large sample. On the other hand, the observational context with complementary surveys (CoRoT, Kepler, K2, APOGEE and Gaia-ESO), will revolutionize our understanding of the formation and history of our Galaxy, providing accurate stellar masses, radii, ages, distances, as well as chemical properties for very large samples of stars across different Galactic stellar populations.

To exploit all potential of the combination between spectroscopic, seismic and astrometric observations, the population synthesis approach will be a very crucial and efficient tool. We develop the Besançon Galaxy model (Lagarde et al 2017) for which stellar evolution predictions are included, providing the global asteroseismic properties and the surface chemical abundances along the evolution of low- and intermediate-mass stars. For the first time, the BGM can explore the effects of an extra-mixing occurring in red-giant stars (Lagarde et al. 2018), changing their stellar properties. The next step is to take into account in the Besançon Galaxy model a consistent traitment of giant stars and their remnants (e.g., white dwarfs). This kind of improvment would help us to constrain stellar and Galactic evolutions.

Name: Ted von Hippel; ted.vonhippel@erau.edu

Title: White Dwarfs, Gaia, and the Age of the Galactic Disk

Abstract:
We employ Pan-STARRS photometry, Gaia astrometry, modern stellar evolution and atmosphere models, and our Bayesian fitting approach to determine cooling and total ages for ~10^5 white dwarfs. In many cases we are able to derive precise ages (within 2%-5%)

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for individual white dwarfs. We use these ages to recover the star-formation history of the Milky Way disk.

Name: Elizabeth Jeffery; ejjeffer@calpoly.edu

Title: A Bayesian Analysis of White Dwarfs in Open Clusters Observed with Gaia

Abstract:
We analyze white dwarfs, both individually and as an ensemble, in open clusters observed by Gaia. In particular, we determine the age of each cluster, as well as individual white dwarf ages when different model ingredients are used. We also explore the initial final mass relation of these clusters.

Name: Nick Fantin; nfantin@uvic.ca

Title: Measuring the Star Formation of the Milky Way Using its Stellar Graveyard

Abstract:
As the remnants of stars with initial masses less than ~8-10 solar masses, white dwarfs contain valuable information regarding the formation history of stellar populations as a whole. In this talk, I will present a newly developed white dwarf population synthesis code which returns mock observations of a white dwarf population given a prescription for the star formation history, while simultaneously taking Milky Way geometry, observational constraints, and selection effects into account. We use photometric data from the Canada France Imaging Survey (CFIS), Pan-STARRS DR1, as well as astrometry from Gaia DR2 to select ~30,000 white dwarf candidates in order to simultaneously fit the star formation history for the thin disc, thick disc, and halo of the Milky Way using an Approximate Bayesian Computation MCMC routine. The resulting star formation history shows a burst of star formation from ~11.8- 9.8 Gyr in the thick disc, followed by a period of relative inactivity before the thin disc begins forming stars at a roughly constant rate for 7.4 Gyr. I will finish the talk by presenting preliminary results on our follow-up observations using the Gemini Observatory to measure the mass and age distribution of halo white dwarfs within the CFIS footprint, a population which has been notoriously difficult to study.

Name: S. O. Kepler; kepler@if.ufrgs.br

Title: Mass distribution of white dwarfs

Abstract:
We studied the spectroscopic mass distribution of SDSS white dwarfs, corrected by volume using Gaia parallax detertmination.

Name: Tyler Heintz; tmheintz@bu.edu

Title: Comparing the Total Ages of Wide Double White Dwarfs in Gaia DR2

Abstract:
White dwarfs provide a unique opportunity to age various populations in the Galaxy. Current white dwarf aging methods involve fitting a cooling age of the white dwarf using estimates of its atmospheric parameters and then adding main sequence lifetimes calculated through initial-final mass relations. We present an empirical study into current white dwarf aging methods by comparing the derived total ages of more than 500 wide white dwarf binaries using various initial-final mass relations. We compiled the sample of wide white dwarf binaries by comparing positions, proper motions, and distances in the Gaia DR2 white dwarf catalog constructed by Gentile Fusillo et al. 2019. It is believed that stars in binary systems are formed around the same time, and thus, the two components should have similar total ages. We look specifically at wide binaries because interaction with a binary companion causes dramatic changes in the evolution and lifecycle of a star which invalidates the derived main sequence lifetimes. We report how often there is agreement in the total ages of what should be coeval, wide double white dwarfs.

Friday, October 25

Name: Valery Suleimanov; suleimanov@astro.uni-tuebingen.de

Title: Statistics of white dwarf properties in intermediate polars.

Abstract:
We present two numerical X-ray spectra models for intermediate polars accreting at high (short accretion columns), and low (tall accretion columns) accretion rates. Both models are defined by two input parameters, the white dwarf mass (from 0.3 to 1.4 solar masses) and relative magnetospheric radius (from 1.5 to 60 white dwarf radii). The models have been applied to describe hard X-ray spectra of 35 intermediate polars observed by NuSTAR and Swift/BAT observatories, which allowed to study distribution of white dwarf masses within the sample. We find that the resulting distribution is roughly normal with mean and dispersion of 0.79 and 0.16 solar masses, respectively. Using the distances from GAIA DR2, the magnetic field strength on the white dwarf surfaces and mass accretion rates in the sources were also evaluated. We find that most objects in the sample have magnetic fields in the range 1-10 MG, with typical mass accretion rates of about 10^{-9} solar masses per year. Finally, we report a revised luminosity function for intermediate polars using objects from the same sample.

Name: Pavana Muralimohan; pavana@iiap.res.in

Title: Geometry of nova ejecta

Abstract:
We present the results of photo-ionization and morpho-kinematic analyses of the outburst ejecta of a few novae based on spectroscopic data obtained from Vainu Bappu Observatory (VBO) and the Indian Astronomical Observatory (IAO) in the range of 380 to 900 nm. Physical conditions such as temperature, source luminosity, density and elemental abundances in the ejecta are estimated using the 1D photonioization code, CLOUDY. The best-fit modelled parameters such as elemental abundance values, effective blackbody temperature, source luminosity, density and filling factor are used to obtain the 3D ionized structure of the ejecta using pyCloudy. The 3D morphokinematic structure is obtained using the observed H-alpha velocity profile using SHAPE. The Fe II and hybrid novae in the sample have bipolar cone-like structures with or without equatorial rings while the single He/N nova in the sample has a bullet-nose curve along with bipolar cone-like structures and equatorial rings. The cause for the presence of different components like cones, equatorial rings and others observed in the geometry of the ejecta of different novae will also be presented.

Name: Nicolle Finch; nlf7@le.ac.uk

Title: What can ISM and non-photospheric highly ionised lines in WD spectra reveal about the beta CMa tunnel?

Abstract:
Strong continuum sources have long been used to study intervening matter, be that of accretion disks, intergalactic medium or interstellar medium (ISM). In the case of the latter, it is important to place constraints on the ISM composition in order to understand how this gas feeds back into the star formation process. White dwarfs are particularly useful in the study of the local ISM, due to their intrinsic brightness and higher spatial distribution than OB type stars. Also, the low ionisation gas lines can easily be separated from high ionisation photospheric lines. However, recently lines with high ionisation states, but not consistent velocities with the photosphere, have been detected in a number of stars. Suggested origins of these lines include past supernovae, stellar winds, circumstellar disks, photoionisation from nearby hots stars or also from the white dwarf itself. We present results from the analysis of these non-photospheric highly ionised (NPHIS) lines in two stars towards a rarefied region of the galaxy known as the extended beta CMa tunnel. We are using the thermal contribution to the doppler widths of the spectral lines to rule out or pin down certain scenarios, and will discuss our results regarding the likely origins of the gas causing these lines.

Name: Antoine Bedard; bedard@astro.umontreal.ca

Title: The spectral evolution of hot white dwarfs

Abstract:
As they evolve, white dwarf stars undergo major changes in their surface chemical composition, a phenomenon referred to as spectral evolution. The most striking feature of the spectral evolution is the existence of the DB gap, a range in effective temperature (45,000 K > Teff > 30,000 K) where a significant deficit of helium-atmosphere white dwarfs is observed. This suggests that most hot helium-rich (DO) stars must transform into hydrogen-rich (DA) stars as they cool off. Since this DO-to-DA transition remains poorly investigated, we tackle the spectral evolution of hot (Teff > 30,000 K) white dwarfs by taking advantage of the extensive spectroscopic dataset provided by the Sloan Digital Sky Survey (SDSS). First, we introduce new state-of-the-art model atmospheres and evolutionary sequences appropriate to the study of these objects. Then, we present the results of a spectroscopic analysis of close to 2000 hot white dwarfs identified in the SDSS. Finally, we discuss the variations in surface composition along the white dwarf cooling sequence, with a particular focus on the spectral evolution of DO stars into DA stars.

Name: Thomas Rauch; rauch@astro.uni-tuebingen.de

Title: Heavy-metal white dwarfs

Abstract:
During their asymptotic-giant-branch (AGB) phase, stars with intermediate initial mass synthesize trans-iron elements (TIEs) in the slow neutron-capture process. After their descend from the AGB, yields of this may be found in their ambient planetary nebulae as well as in the stars, establishing constraints for the AGB nucleosynthesis. In addition, just before entering the white-dwarf (WD) cooling sequence, going along with decreasing stellar wind, radiative levitation still dominates over gravitational settling and, thus, diffusion strongly enhances the photospheric TIE abundances and makes these WDs ideal stellar laboratories to perform high-precision atomic physics.

Name: Nicola Gentile Fusillo; n.gentile-fusillo@warwick.ac.uk

Title: Cool white dwarfs as standards for infrared observations

Abstract:
Even in the era of modern digital sky surveys, uncertainties in the flux of our stellar standards are often the dominant systematic error in photometric calibration and propagate into the higher-level analysis of several experiments. Currently, the most precise and internally consistent flux calibration is the Hubble Space Telescope (HST) spectrophotometry which is based on computed model atmospheres for three hot (Teff > 30,000 K) pure-hydrogen (DA) white dwarfs. However the modelling of hot white dwarfs suffers from uncertainties due to

non-local thermal equilibrium (NLTE) effects and the presence of trace metals which leads to UV line blanketing. These stars also have a low sky density (~0.75 per sq. deg at G<20); a challenging aspect for observations. Furthermore, many of next generation facilities which will see first light in the next decade (e.g. Harmoni on E-ELT, Euclid and JWST) will focus on IR observations, a regime in which white dwarf calibration has not yet been robustly tested. Cool DA white dwarfs have energy distributions that peak in the optical or near-IR do not have shortcomings from NLTE effects or UV metal line blanketing, and have a large sky density (~4 per sq. deg at G<20), making them, potentially, excellent calibrators. I will present a pilot study based on STIS+WFC3 observations of a small sample of bright DA white dwarfs to test whether targets cooler than current hot primary standards (Teff< 20, 000K) are consistent with the HST flux scale. I will also discuss the robustness of white dwarf models in the IR regime from the analysis of white dwarf observations obtained with X-shooter, 2MASS, UKIDSS, VHS, and WISE.

Name: Simon Bloiun; sblouin@astro.umontreal.ca

Title: The Spectral Evolution of Cool White Dwarfs

Abstract:
Empirically characterizing the spectral evolution of cool white dwarfs is a prerequisite to understanding the physical processes that shape the evolution of these old objects. This task seems simple on the face of it: one only has to determine the ratio of hydrogen- to helium-rich objects in different effective temperature bins. In reality, two phenomena conspire to make this task very delicate. First, cool, helium-rich white dwarfs are characterized by high photospheric densities that give rise to nonideal effects that are challenging to model. We have invested a lot of effort in improving the constitutive physics of our models in order to account for these effects and, except for a few carbon-polluted objects, we now obtain excellent spectroscopic and photometric fits. The second issue is that the coolest objects (Teff<5000K) never show hydrogen or helium lines in the visible, which seriously complicates our ability to distinguish between hydrogen- and helium-rich atmospheres. We discuss to which extent photometric fits can be used to infer the atmospheric parameters of cool DC stars. Our detailed analysis of some 500 cool objects leads to a complex, nonmonotonic picture of the chemical evolution of cool white dwarfs, which highlights the presence of unknown physical mechanisms that affect the atmospheric composition of those objects.

Name: Patrick Dufour; dufourpa@astro.umontreal.ca

Title: Origin and evolution of carbon atmosphere white dwarf stars

Abstract: The vast majority of white dwarf stars uncovered to this day have been found to possess either a hydrogen or a helium-rich surface composition. Surprisingly, it was realized in 2007 that a few rare exceptional objects, the so-called Hot DQs, had a surface composition consisting mainly of carbon and oxygen. We present an updated analysis of known white dwarfs with carbon dominated (or highly polluted) atmosphere and discuss the implication on our understanding of their origin and evolution.

Name: Harvey Richer; richer@astro.ubc.ca

Title: The White Dwarf That Has Everything

Abstract:
In a Gaia search for massive white dwarfs in young clusters, a remarkable white dwarf was discovered. Gemini spectra followup has shown that it is 1) massive 2) magnetic 3) of spectral type DB and 4) probably a binary. We will present the observations that resulted in these conclusions, some very recent observations and plans for further .study of this remarkable star

Name: Kento Masuda; kmasuda@astro.princeton.edu

Title: Discovery of four white dwarfs in self-lensing binaries

Abstract:
The precise and long-term photometric data from the Kepler spacecraft provide a new means to find and characterize binaries consisting of a white dwarf (WD) and a star. When such a binary is eclipsing and has a sufficiently wide orbit (periods >~50 days), the WD causes periodic in-eclipse brightening of the companion star due to gravitational microlensing - hence they are called "self-lensing" binaries. Such self-lensing events allow us to precisely determine the system parameters including the WD mass and radius, thus providing direct evidence for the compact nature of the WD and potentially providing insight into the WD mass-radius relation. In addition, self-lensing is sensitive to the WD binaries in unexplored regions of the parameter space, particularly the ones that have experienced mass transfer from the WD progenitor - a process that is essential for various astrophysical objects but is not yet well understood. Because the detection of self-lensing binaries requires continuous, high-precision photometry for a large number of stars, the first detection was made only in 2014 using the Kepler data - this was a 88-day binary consisting of a 0.5 solar-mass WD and a Sun-like star. Here we report the detection of four new systems with longer orbital periods ranging from 419 to 728 days, and discuss their astrophysical implications. Three of the systems have ~0.6 solar-mass WDs and their orbits are roughly consistent with AGB mass transfer as has been proposed to explain blue straggler stars. The other one has an extremely low-mass (0.2 solar mass) WD and its orbit is more than ten times wider than any other known binaries containing extremely low-mass WDs; this property does not fit into the standard formation scenario of low-mass WD via RGB mass transfer, and suggests that there is something missing in our understanding of low-mass WD formation and/or binary interactions.

Name: Bhusan Kayastha; kayastha@nao.cas.cn

Title: Dynamical Evolution of Globular Clusters with White Dwarfs, Neutron Stars and Black Holes using the GPU supercomputer.

Abstract:
We will introduce the Silk Road Project of the National Astronomical Observatories, Chinese Academy of Sciences (NAOC). We will present some results from the Dragon simulations, a set of four direct N-body simulations of globular clusters (GCs) with a million stars and five percent initial (primordial) binaries. These simulations were undertaken with the NBODY6++GPU code, which allowed us to follow dynamical and stellar evolution of individual stars and binaries, formation and evolution of white dwarfs, neutron stars, and black holes, and the effect of a galactic tidal field. The simulations are the largest existing models of a realistic globular cluster over its full lifetime of 12 billion years. In particular we will show here an investigation of the population of binaries including compact objects (such as white dwarfs - cataclysmic variables and merging black hole binaries in the model as counterparts of LIGO/Virgo sources); their distribution in the cluster and evolution with time. Some "gravitational wave events" observed in the Dragon simulations are in fair agreement with real LIGO/Virgo detections. Unfortunately, comparison with faster, but more approximate Monte Carlo (MOCCA) dynamical models and with a population synthesis model for galactic field binary populations shows that we cannot yet distinguish the origin of LIGO/Virgo sources (clusters or field). More simulations are required for that goal.

Name: Mark Hollands; M.Hollands.1@warwick.ac.uk

Title: A white dwarf with peculiar chemistry and kinematics

Abstract:
In the last few years a myriad of white dwarfs with peculiar compositions have been discovered, such as those with oxygen or neon dominated atmospheres.

Here I will report our observations of an additional white dwarf with a peculiar composition and kinematics. The atmosphere is dominated by a near equal C/O mixture, but with Ne and Si also comprising several percent of the atmospheric abundances, and with several other metals detected above 10^-4 number abundance. Kinematically the star has a large redshift of 400km/s, and though its Gaia parallax is measured to less than 1-sigma precision, we will show the proper-motion statistically constrains this star to the white dwarf sequence in the HR-diagram.

Name: Elena Cukanovaite; e.cukanovaite@warwick.ac.uk

Title: Calibration of the mixing length parameter for DB and DBA white dwarf based on 3D atmospheric models

Abstract:
A major uncertainty plaguing 1D white dwarf models arises from the treatment of convective energy transport. Convective mixing is a 3D process, but it is simplified in 1D by the mixing length approximation, which depends on a free parameter called the mixing length. This parameter must be calibrated from observations as it is not predicted by the approximation. When modelling DB and DBA white dwarfs, the value of ML2/alpha = 1.25 is often used, determined from spectroscopic observations. However, it is uncertain whether this value is applicable to the entirety of the convection zone or just its top layers, where the photosphere usually lies. Recently, 3D atmospheric models have been used to calibrate the mixing length parameter for the bottom of the convection zone of pure-hydrogen white dwarf atmospheres. This has resulted in a better understanding of the conditions at the bottom of the convection zone and its bulk properties, such as the mass of the convection zone. I will present a similar calibration based on 3D DB and DBA models for $7.5 < \log(g) < 9.0$, $-10.0 < \log(H/He) < -2.0$ and 12 000 K < Teff < 34 000 K. Overall, the mixing length is found to be lower than the frequently used value of 1.25. I will conclude with how this smaller mixing length, and therefore smaller convection zone sizes affect studies of white dwarf pulsations and remnant planetary systems.

Name: Tim Cunningham; t.cunningham@warwick.ac.uk

Title: From hydrogen to helium: the convectively driven spectral evolution of white dwarfs

Abstract:
Photometry from the Sloan Digital Sky Survey has revealed that the ratio of He- to H-rich white dwarfs increases by at least 20% as they cool between 20000 and 9000 K. The most probable explanation for this is convective mixing – the scenario which occurs in DA white dwarfs when their surface (hydrogen) convection zone grows sufficiently to reach the deeper helium layer. At this point helium is mixed into the hydrogen convection zone in a runaway process, rapidly turning the H-rich object into a He-rich one.

High-precision photometry and astrometry from Gaia provides the most robust determinations of effective temperature for this sample and using statistical methods, we infer the number of objects that experience convective mixing as a function of effective temperature. We use this result to quantify the mass distribution of thin hydrogen shells ($\log M_H < -10$) in white dwarfs, which could have implications for population synthesis and asteroseismological studies. This also provides an independent constraint on a recent theoretical model of convective overshoot from 3D simulations.

Poster Contributions

Name: Thomas Rauch; rauch@astro.uni-tuebingen.de

Title: Chronology of Tübingen's Contributions to the Virtual Observatory

Abstract:
Within the framework of the German Astrophysical Virtual Observatory, the Tübingen project is closely related to spectral analysis and provides a number of tools and services that, e.g., allow the easy access of Virtual Observatory users to theoretical stellar spectral energy distributions.

We summarize the developments at Tübingen during the past two decades.

Name: Scot Kleinman; kleinman@gemini.edu

Title: Looking for variable white dwarfs in M4

Abstract:
Identifying a population of variable white dwarf stars in stellar clusters offers distinct advantages for asteroseismological investigations of white dwarf stars. We can use known cluster distances to help in the model fitting and can explore the role of metallicty in the pulsation spectrum. With a half night of time-series data from Subaru's Hyper Suprime-Cam on M4, we have a lot of data to analyze and report on our initial findings here.

Name: Siyi Xu; sxu@gemini.edu

Title: Polluted White Dwarfs: The Disparity Between Optical and UV

Abstract:
It is now widely accepted that polluted white dwarfs are accreting from planetary debris. As a result, high-resolution spectroscopic observations of polluted white dwarfs uniquely measure the chemical compositions of extrasolar minor planets, which is not possible with any other technique. However, one major hurdle is the large uncertainty in the abundance determinations, particularly the discrepancy between optical and UV abundances. In the most extreme case, a factor of 10 difference has been reported using the exact same technique. Understanding the origin of this will be crucial to push the boundaries of the current study of polluted white dwarfs and connect with geochemistry of solar system bodies.

Name: Thomas Rauch; rauch@astro.uni-tuebingen.de

Title: Spectral analysis of a white dwarf-main sequence star binary

Abstract:
We present a detailed spectral analysis by means of non-local thermodynamical equilibirum (non-LTE) model-atmosphere techniques and LTE ATLAS 12 models of ultraviolet HST/COS and optical SDSS spectra of the hot white dwarf primary and the main sequence secondary star in a close binary system, respectively.

Name: Kenneth Hinkle; hinkle@noao.edu

Title: Masses of White Dwarfs in Symbiotic Binaries

Abstract:
Symbiotic binaries are white dwarf - K/M III binary systems where mass loss from the late-type star accretes onto the white dwarf. Some systems are possibly SN progenitors with white dwarfs near the Chandrasekhar limit. In two series of papers we have measured the late-type star single-lined spectroscopic orbits and abundances. The spectral type and luminosity of the late-type star allow its initial mass to be derived from stellar evolution models. The progenitor of the white dwarf was the more massive member of the binary. The main sequence mass of the late-type star sets a lower limit on the white dwarf progenitor mass. One of the elements of a single-line spectroscopic orbit is a mass function that relates the primary and secondary mass and the inclination. The large diameter of the giant star in symbiotic binaries results in a high fraction of eclipsing systems. In our sample of 30 symbiotic binary orbits 13 eclipse. For eclipsing systems the inclination is known. Then the mass function plus the mass of the late-type star yield the mass of the white dwarf. We examine the initial mass - final mass relation of the symbiotic white dwarfs to explore setting limits on symbiotic white dwarf mass accretion.

Name: Lisa Löbling; loebling@astro.uni-tuebingen.de

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Name: Mark Hollands; M.Hollands.1@warwick.ac.uk

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Name: Zach Vanderbosch; zvanderbosch@astro.as.utexas.edu

Title: New Evidence from ZTF for Transiting Circumstellar Debris around a White Dwarf

Abstract:
We present the discovery of a white dwarf exhibiting deep, irregularly shaped transits in the Zwicky Transient Facility (ZTF) public light curve data. Two prominent transits are seen in its 210 day long ZTF lightcurve, each lasting about 25 days and causing 45-60% dips in flux. The asymmetric transit profiles exhibit sharp declines and gradual rises, reminiscent of the transits seen in WD1145+017 which are attributed to small rocky bodies with a cometary tail of dusty material. The two transits are separated by about 110 days, a much longer period relative to the 4.5 and 2.0 hour dip recurrence timescales reported for WD1145+017 and SDSS J1228+1040 respectively, the only other known white dwarfs with orbiting rocky debris. We suspect the circumstellar material to be on a highly eccentric orbit which brings it within the tidal disruption radius of the white dwarf long enough to be broken up. We present the photometric and spectroscopic data acquired post-discovery to monitor for additional transit events and look for atmospheric metal pollution.

Name: Nicolle Finch; nlf7@le.ac.uk

Title: Analysing the first eclipsing double hot-subdwarf system

Abstract:
Binary systems provide us with an excellent laboratory for studying stellar evolution. In particular, systems with two evolved stars are rare and intriguing, as they have to undergo multiple mass transfer events to form. As well as this, double degenerate systems with short enough orbits and high enough system masses are candidates for type Ia supernovae, via the proposed double degenerate merger channel. There are ~100 double white dwarf binaries with

orbital periods less than 1 day, as well as ~50 known white dwarf-hot subdwarf binaries; however, there are only a few double hot subdwarf systems. Of these double degenerates, only a handful are of sufficient mass to be considered type Ia candidate systems. We provide here the analysis of the first known eclipsing, double hot subdwarf binary system. By using synthetic spectra from state-of-the-art non-LTE models, and the information derived from the light curve, we constrain the radial velocities and mass ratio, and thus calculate dynamical masses. We also obtain the atmospheric parameters of the two stars, and the stellar radii. Based on these results, we discuss the possible evolutionary path for the hot subdwarfs in this system.

Name: Keaton Bell; keatonbell@utexas.edu

Title: The TESS View of Pulsating White Dwarfs in the Southern Hemisphere

Abstract:
The TESS Asteroseismic Science Consortium Working Group 8 (TASC WG8) has proposed for all known and likely bright white dwarfs to be observed by TESS at the short two-minute cadence. TASC WG8.2 is coordinating the analysis of TESS light curves of pulsating white dwarf stars. We present an overview of our studies of the pulsating white dwarfs in the southern hemisphere that have been observed by TESS in its first 13 Sectors.

Name: Patricia Cho; patricia.cho@utexas.edu

Title: DA Model Atmospheres with Stark Broadened Line Profiles

Abstract:
White Dwarf model atmosphere codes have long relied on line profiles calculated using the model of Vidal, Cooper & Smith (1970), known as the Unified Theory of line broadening (VCS), to compute radiative transfer and emergent stellar spectra. These model atmospheres are used to derive fundamental parameters of DA White Dwarfs via the spectroscopic and photometric methods. There have been indications of inaccuracies in the VCS (1970) theory including discrepancies in mean mass estimates obtained using different mass determination techniques. Additionally, fits performed using individual spectral lines as opposed to combinations of the lines Hβ-H8 also yield discrepant inferred values for mass and temperature. In an update to the VCS formalism, Tremblay & Bergeron (2009) applied an analytic prescription for the truncation of the electric microfield distribution responsible for the dissociation of the upper state of high-n transitions in their line profile calculations. This analytic approach is known as the Hummer & Mihalas (1988) Occupation Probability Formalism. They obtained better agreement in spectroscopic fits performed using different combinations of Balmer lines. More recently, Gomez et al. (2016) laid out a new theoretical treatment of Stark broadening not based on VCS theory. We present initial findings from incorporating these new line profiles in DA White Dwarf model atmospheres including changes in continuum levels of the emergent synthetic spectra.

Name: Erik Dennihy; edennihy@gemini.edu

Title: A Word to the WISE: Confusion is unavoidable for WISE-selected infrared excesses

Abstract:
Like so many other subfields, the increase in the number of known white dwarfs from Gaia is enabling rapid growth in the sample size of White Dwarfs with observable accretion disks of remnant exoplanetary debris. These compact, dusty accretion disks emit strongly in the near-infrared, enabling simple candidate identification via a bump in the spectral energy distribution, which can be quickly constructed from publicly available imaging survey data. However, these searches rely heavily on the WISE survey, where the dust disks are most prominent, and often suffer from high levels of contamination due to source confusion. We present a sample of twenty-two WISE-selected infrared excess candidates followed-up with Spitzer to demonstrate this issue. We find that even with the careful filtering of candidates using astrometric information and ground-based imaging, the issue of source confusion in WISE data leading to false infrared excesses cannot be avoided.