1. **Dissection of a supernova remnant**

   Roberto Raddi (Dr Remeis-Sternwarte)

   We present a spectral atlas of the hypervelocity white dwarf, GD 492, illustrating the ultraviolet (1600-3200 angstrom; Hubble Space Telescope - STIS) and the optical (3200-9000 angstrom; William Herschel Telescope - ISIS) regions.

2. **The origin and distribution of fields in magnetic cataclysmic variables**

   Gordon Briggs (Australian National University), Lilia Ferrario (Australian National University), Christopher Tout (University of Cambridge), Dayal Wickramasinghe (Australian National University)

   In a series of recent papers we have proposed that high field magnetic white dwarfs are the result of close binary interaction and merging during common envelope evolution. We now synthesise a population of binary systems to investigate the hypothesis that the magnetic fields in the accreting magnetic white dwarf in cataclysmic variables also originate during stellar interaction. We have found that those systems that emerge from common envelope more tightly bound form the cataclysmic variables with the strongest magnetic fields. We vary the common envelope efficiency parameter alpha and compare the results of our population syntheses with observations of magnetic cataclysmic variables. We find that common envelope interaction can indeed explain the observed characteristics of these interacting binaries for low values of alpha.

3. **Regimes of Internal Rotation in Differentially-Rotating White Dwarfs**

   J. Craig Wheeler (The University of Texas at Austin), Pranab Ghosh (Tata Institute)

   Most viable models of Type Ia supernovae (SN Ia) require the thermonuclear explosion of a carbon/oxygen white dwarf that has evolved in a binary system. Rotation could be an important aspect of any model for SN Ia, whether single or double degenerate, with the white dwarf mass at, below, or above the Chandrasekhar limit. Differential rotation is specifically invoked in attempts to account for the apparent excess mass in the super-Chandrasekhar events. Some earlier work has suggested that only uniform rotation is consistent with the expected mechanisms of angular momentum transport in white dwarfs, while others have found pronounced differential rotation. We show that if the baroclinic instability is active in degenerate matter and the effects of magnetic fields are neglected, both nearly-uniform and strongly-differential rotation are possible. We discuss the gap in understanding of the behavior at intermediate values of Richardson number, Ri, and how observations may constrain the rotation regimes attained by nature.

4. **Revisiting the white dwarf luminosity function from the Palomar-Green survey**

Antoine Bédard (Université de Montréal), Pierre Bergeron (Université de Montréal), Gilles Fontaine (Université de Montréal)

We present atmospheric parameters for a complete sample of white dwarfs of various spectral types drawn from the Palomar-Green survey. For DA and DB stars, we retrieve effective temperature and surface gravity values published in our latest spectroscopic model atmosphere analyses incorporating the most recent theoretical developments, such as state-of-the-art Stark broadening profiles and 3D hydrodynamical corrections. For DO stars, we present a new set of non-LTE model atmosphere and synthetic spectrum calculations (performed with the codes TLUSTY and SYNSPEC) appropriate for the analysis of these hot, helium-rich white dwarfs. We then derive the effective temperature and the surface gravity of these objects through fits to their optical spectra. Using this updated collection of atmospheric parameters, we compute an improved white dwarf luminosity function of the Palomar-Green sample, including the DO stars for the first time. This allows us to study the variation of the number ratio of helium- to hydrogen-atmosphere white dwarfs as a function of effective temperature along a large part of the cooling sequence. We discuss these results in the framework of the theory of the spectral evolution of white dwarf stars.

5. **Numerical simulations of the convective dilution process in helium-rich white dwarfs**

Pierre Bergeron (Université de Montréal), Benoit Rolland (Université de Montréal), Gilles Fontaine (Université de Montréal)

DB and DBA white dwarfs are generally believed to be the result of a process by which a thin radiative hydrogen atmosphere is convectively diluted with the deeper, and more massive, convective helium envelope. However, the observed hydrogen abundances in these objects exceed by several orders of magnitude the predictions obtained from evolutionary models. We present here the results of new numerical simulations aimed at improving the modelling of this convective dilution process. In particular, we show how DA white dwarfs can be transformed into DB stars below 20,000 K, and more importantly, we propose a model that predicts the correct amount of hydrogen observed in DBA stars without invoking any accretion mechanism.

6. **An analysis of the circumstellar absorption of WD1145+017**

Maude Fortin-Archambault (Université de Montréal), Patrick Dufour (Université de Montréal), Siyi Xu (Gemini Observatory)

We present an analysis of the numerous circumstellar absorption features found in the spectra of the white dwarf star WD 1145+017. We try to reproduce the asymmetric velocity profile observed in both ultraviolet and optical data taken at various epoch with the aim to better understand the physical properties of all the disk components orbiting this white dwarf.

7. **A new look at magnetic white dwarfs**

   François Hardy (Université de Montréal), Patrick Dufour (Université de Montréal), Stefan Jordan (Universität Heidelberg)

   We present a homogeneous analysis of magnetic white dwarfs based on our new magnetic model atmosphere grid. We discuss the mass distribution and evolution of these objects with a particular emphasis on non-DA stars.

8. **A homogeneous analysis of metal/carbon-polluted white dwarf stars.**

   Coutu S. (Université de Montréal), Dufour P. (Université de Montréal), Bergeron P. (Université de Montréal)

   We present a homogeneous reanalysis of all known DQ and DZ white dwarfs with Gaia data using our newly improved model atmosphere grids for such objects and discuss the implication on our understanding of white dwarf star evolution.

9. **Continued Follow-up of the Variable Gaseous Debris Disk around HE 1349-2305**

   Erik Dennihy (UNC-Chapel Hill; Gemini Observatory), Chris Clemens (UNC-Chapel Hill), Christopher Manser (University of Warwick), Boris Gansicke (University of Warwick), Bart Dunlap (UNC-Chapel Hill), Stephen Fanale (UNC-Chapel Hill), J.J. Hermes (UNC-Chapel Hill), Joshua Fuchs (Texas Lutheran University)

   The double-peaked gaseous emission lines observed in a handful of exoplanetary debris disks around white dwarf stars provide a wealth of dynamical information about the accretion disks which deliver rocky exoplanetary material to the atmospheres of metal polluted white dwarf stars. In this poster, we present results from our continued follow-up of one such system, HE 1349-2305, which has been observed to undergo smooth asymmetric emission profile evolution on a 1.4-year timescale, suggestive of periodic global disk evolution. Similar variations in other gaseous systems occur on timescales of decades, meaning the short timescale of HE 1349-2305 will allow us for the first time to test the periodic nature of these emission profile variations, as well as generate a

detailed Doppler image of the debris disk for comparison with other systems within the next few years.

10. **Testing Asteroseismological Models and Fitting Techniques**

    Beau A. Brooks (Baylor University) Barbara G. Castanheira (Baylor University)

    Beneath the photosphere of every star exists a dynamic, complex structure impossible to directly observe with modern technology, making the subject one of utmost interest to asteroseismology. The internal structure, temperature and chemical makeup of variable stars can be revealed by observing pulsation modes and cross-referencing them with computational model grids. Due to their relatively simplistic structure, white dwarfs are used to measure the effectiveness of different fitting techniques and modelling programs. This work serves to further study the usefulness of WDEC, LPCODE-PUL and MESA and various fitting techniques in predicting the internal structure of synthetic stars. A wide temperature range, extending from the blue edge to the red edge of the instability strip, is also explored to further modify the procedure of linking observational data to computational model grids.

11. **Spectroscopic follow-up of white dwarfs in the era of Gaia**

    Christopher J. Manser (University of Warwick), Boris T. Gaensicke (University of Warwick), Pier-Emmanuel Tremblay (University of Warwick), Nicola Gentile Fusillo (University of Warwick), Matthew Hoskin (University of Warwick), Roberto Raddi (Astronomisches Institut der Universität Erlangen-Nürnberg)

    With the release of Gaia DR2, we now know of several hundred of thousands of white dwarfs, which will require spectroscopic follow-up to unlock their scientific potential. To observe this colossal number of stars, our group at the University of Warwick has become involved in the pipeline and survey design for all four forthcoming major multi-object spectroscopic surveys: DESI, WEAVE, SDSS-V and 4MOST. Within the next few years, these experiments will undergo commissioning, and start collecting spectra. I will discuss the capabilities of these surveys, our involvement in them, and how they will produce an invaluable spectroscopic resource to the white dwarf community. The resulting white dwarf spectra can be used for large statistical studies, as well as to search for peculiar white dwarf systems, such as white dwarfs hosting a gaseous debris disc.

12. **White Dwarfs in the HETDEX survey**

    Barbara Castanheira (Baylor University/UT Austin)

In this poster, we show the first white dwarfs that were observed in the Hobby-Eberly Telescope Dark Energy Experiment (HETDEX) using the Visible Integral-field Replicable Unit Spectrograph (VIRUS). By the completion of HETDEX observations, we expect to have a unique magnitude-limited catalog of as many as 10,000 spectroscopically confirmed stars. Since we will use data from an Integral-field Units (IFU), our survey will be free of the selection biases that plagued the Sloan Digital Sky Survey (SDSS). Our final survey is likely to produce a WD luminosity function five magnitudes fainter than the one derived from the Palomar-Green survey (PG) and with a similar number of faint stars as the one from SDSS.

13. **The Discovery, Spectroscopy, and Photometry of a Low-Mass White Dwarf Companion to a Recycled Millisecond Pulsar**

B. C. Kaiser (University of North Carolina), D. L. Kaplan (University of Wisconsin-Milwaukee), J. J. Hermes (University of North Carolina), D. Koester (University of Kiel), E. Dennihy (Gemini Observatory), and J. K. Swiggum (University of WisconsinMilwaukee)

We report the discovery of one of the brightest optical companions (G=17.75) to a recycled millisecond pulsar. We present optical spectroscopy of the companion, which yielded radial velocities confirming its binary membership. We also present time-series photometry of the companion wherein it demonstrates ellipsoidal variations. Using these measurements in combination with parallaxes from Gaia for the companion and orbital parameters for the pulsar from previous radio surveys, we present the absolute masses of the neutron star and its low-mass white dwarf companion in what is now one of the best-constrained MSP-WD binaries ever discovered.

14. **Testing the present models of CV evolution**

Anna Francesca Pala (University of Warwick)

Cataclysmic variables (CVs) are close interacting binaries containing a white dwarf accreting from a low-mass main sequence star. CVs are one of the best classes to test our understanding of the evolution of compact, interacting binaries: they are numerous, relatively bright, and both stellar components are structurally simple. Nonetheless, our recent results from a large HST program (Pala et al. 2017) have highlighted a number of discrepancies between current population models and observations. Only once these discrepancies are resolved we can trust the theoretical models to be sensibly applied to more complex systems, such as black hole binaries, X-ray transients or supernova Ia progenitors. In particular, one of the most striking disagreements is the lack of period bouncers, i.e. old CVs in which the companions have been eroded down to brown dwarf masses. These systems are predicted to make up for $\sim 70\%$ of the observed

CV population, yet very few have been identified so far, suggesting that the physical mechanisms driving CV evolution (such as the mechanisms of angular momentum loss, the common envelope phase and/or the response of the companions to the mass loss) are still not completely understood. For this reason we have started a high cadence photometric survey using JAST/T80Cam aimed to find these elusive systems and we present here the preliminary results from this observing program.

15. **Fast spectrophotometry of WD 1145+017**

Paula Izquierdo (Instituto de Astrof´sica de Canarias, Universidad de La Laguna), Pablo Rodríguez-Gil (Instituto de Astrofísica de Canarias, Universidad de La Laguna), Boris Gänsicke (University of Warwick)

We present fast optical spectrophotometry and simultaneous broad-band photometry of WD1145+017, currently the only white dwarf known to exhibit periodic transits from planetary debris, obtained with the Gran Telescopio Canarias (GTC) and the Liverpool Telescope (LT), respectively. The observations spanned ~ 5.5 h, somewhat longer than the 4.5 h orbital period of the debris. Dividing the GTC spectrophotometry into five wavelength bands reveals no significant colour differences, confirming grey transits in the optical. The longest (~ 90 min) and deepest (~ 50 per cent attenuation) transit we recorded exhibits a complex structure around minimum light, which may be the consequence of multiple overlapping dust and gas clouds. The strongest circumstellar Fe II absorption line at 5169 Å significantly weakens during this transit, with its equivalent width reducing from a mean out-of-transit value of ~ 2 Å to ~ 1 Å in-transit. This result reinforces the hypothesis that part of the gas disc is located between the white dwarf and the transiting material, which therefore blocks a significant fraction of the circumstellar gas, resulting in the observed reduction of the Fe II absorption.

16. **Constraining low-mass white dwarf binary systems from ellipsoidal variation amplitudes**

Keaton J. Bell (MPS), J. J. Hermes (UNC), James Kuszlewicz (MPS)

Stars are stretched by tidal interactions in tight binaries, introducing photometric variations at half the orbital periods as the projected stellar areas change through the orbits. Hermes et al. (2014, ApJ, 792, 39) utilized measurements of these ellipsoidal variations to constrain the radii of low-mass white dwarfs in single-lined spectroscopic binaries. We refine this method here, using Monte Carlo simulations to improve constraints on many orbital and stellar properties of binary systems that exhibit ellipsoidal variations. We revisit the Hermes et al. (2014) sample and also report new detections of ellipsoidal variations in low-mass white dwarf binaries.

17. **An Exploration of Plasma Gradients in the White Dwarf Photosphere Experiment at Sandia National Laboratories Z-machine**

M. Schaeuble (UT Austin, Sandia National Laboratories), T. Nagayama (Sandia National Laboratories), J. E. Bailey (Sandia National Laboratories), T. A. Gomez (Sandia National Laboratories), D. E. Winget (UT Austin), M. H. Montgomery (UT Austin), R. E. Falcon (UT Austin)

We present a detailed investigation of plasma gradients in the White Dwarf Photosphere Experiment (WDPE) platform on Sandia National Laboratories' Z-machine. Observed differences in experimentally derived electron density values from H-beta and H-gamma line profiles provided the initial motivation for this study. We considered all major aspects of the WDPE carefully: from possible inhomogeneities caused by the plasma formation mechanism to gradients resulting from our hardware design and geometry. During our investigation, all manner of experimental data were used to constrain our final estimate of the derived plasma gradients. This final plasma structure is then used to calculate synthetic absorption and emission spectra under conditions that mirror those of our experimental data. We find that plasma gradients, even in their most extreme form, cannot entirely explain the differences we observe in our experimental H-beta and H-gamma line profiles. Potential implications of this finding, ranging from inaccuracies in current White Dwarf fitting methods to uncertainties in modern line-broadening models, are also discussed in this poster.

18. **Parameter Space of Helium-Accreting White Dwarfs with Different Angular Momentum Loss**

E. Ramirez-Ruiz (UCSC), J. Schwarb (UCSC), T. L. S. Wong (UCSC)

We explore the parameter space of the helium donor channel of type Ia supernovae (SN Ia) by performing binary evolution calculations with the one-dimensional stellar evolution code MESA. We examine the time-dependent evolution of a $1.0 - 2.0 M_\odot$ helium star undergoing thermal-timescale mass transfer onto a $0.9 - 1.1 M_\odot$ carbon-oxygen white dwarf for initial orbital periods in the range $0.06 - 1$ day. Our models illustrate a range of possible outcomes – (i) the white dwarf may experience a core carbon ignition which may lead to SN Ia, (ii) nuclear heating in the shell of the white dwarf may outpace compressional heating in the core and lead to a shell carbon ignition and subsequently form a oxygen-neon white dwarf, (iii) the mass transfer rate may fall below the stability regime and induce helium flashes, for which we report the approximate retention efficiency, (iv) the system may experience a mass transfer runaway and merge, or (v) the donor may come out of contact and the system becomes a detached double-degenerate binary. At high mass transfer rates the white dwarf blows an optically thick wind. We demonstrate the importance of properly accounting for the wind angular momentum, since a slow wind may extract extra angular momentum from the orbit. We investigate this effect by expanding the parameter study with different wind

speeds and angular momentum loss prescriptions. Our investigation provides useful results for population synthesis studies of the helium donor channel.

19. **Non-local Thermodynamic Equilibrium Model-Atmosphere Spectra of hot White Dwarf Stars on Demand**

    Thomas Rauch (Eberhard Karls University), Lisa Löbling (ESO, Eberhard Karls University)

    Since more than a decade, spectral energy distributions of hot, compact stars are available on demand from the registered Virtual Observatory service TheoSSA (Theoretical Stellar Spectra Access, `http://dc.g-vo.org/theossa`). It has been created in the framework of a German Astrophysical Virtual Observatory (GAVO) project at Tbingen. We demonstrate TheoSSA's model-SED-on-demand abilities in operation and summarize the development of GAVO services and tools at Tbingen during the past two decades.

20. **Non-LTE spectral analysis of hot, H-rich white dwarfs from the SDSS DR14 using fully metal-line blanketed models atmospheres**

    N. Reindl (University of Leicester), S. O. Kepler (Universidade Federal do Rio Grande do Sul), S. Geier (University of Potsdam), M. A. Barstow (University of Leicester)

    Hot white dwarfs ($T_{\rm eff} > 45\,{\rm kK}$) serve as powerful galactic and cosmological tools. They can be utilized to investigate the properties of weakly interacting particles, to check a possible gravitational field effect on fine structure constant, or to derive the age of the Galactic halo. Because of their relatively short evolutionary time scales, hot white dwarfs are relatively rare objects, requiring large sky surveys to detect them. The spectral analysis of these stars is hindered by the occurrence of non-LTE and metal-line blanketing effects. Both have a significant effect on derived effective temperatures and surface gravity, and consequently on all other parameters obtained from those (e.g., spectroscopic masses, radii, luminosities). We have computed a large grid ($T_{\rm eff} = 45-130\,{\rm kK}$, $\log g = 6.0-8.5$) of fully meal-line blanketed non-LTE models atmospheres including opacities of H, C, N, O, Si, P, S, Ca, Sc, Ti, V, Cr, Mn, Fe, Co, and Ni. We demonstrate the effect of these elements on the resulting Balmer lines when compared to models that include H alone. We apply our models to several hundred hot, H-rich white dwarfs from the SDSS DR14 and present preliminary results of this spectral analysis.

21. **Cooling timescales for accreting WD in post-nova and post-dwarf nova phases**

Spencer A. Caldwell (University of Alabama), Dean M. Townsley (University of Alabama), Boris T. Gaensicke (University of Warwick), Anna F. Pala (University of Warwick)

The evolution of cataclysmic variables (CVs) is regulated by the accretion process that results from angular momentum loss. The rate of angular momentum loss is well-constrained by the effective temperature (Teff) of the CV white dwarf (WD). The Teff is governed by accretion heating and is therefore used to gauge CV evolutionary theories. SDSS J153817.35+5123238.0 is a CV containing a WD much hotter, ($T_{\rm eff} = 33855\,{\rm K}$), than predicted by standard CV evolution models for its short orbital period ($P_{\rm orb} = 93.1$ minutes). CVs with $P_{\rm orb} < 2$ hr should have a $T_{\rm eff} = 15000\,{\rm K}$, indicating this system may conflict with current evolutionary theories. Motivated by SDSS J153817.35+5123238.0, we explore post nova/dwarf nova cooling rates using MESA for CV WDs of various initial parameters. We use these simulation scenarios to identify cooling timescales of different masses and accretion rates representative of the observed CV population. The novae cooling simulations help determine the frequency of CVs that possess outlier characteristics resulting from their evolution. Follow-up Teff measurements of SDSS J153817.35+5123238.0 will constrain its cooling rate. A comparison between computed and observed cooling timescales facilitates understanding of how outlier systems such as this fit into broader CV evolution.

22. **Effect of General Relativistic Corrections to White Dwarf Pulsations**

S Reece Boston (UNC), Charles E Evans (UNC), J.J. Hermes (UNC), Bart Dunlap (UNC)

The newest astronomical data from NASA's Kepler Second Light mission (K2) contains unprecedented long-time observations of stellar objects. For variable white dwarfs, the continuous, long time baseline results in significantly enhanced precision in normal mode frequencies, with widths $\lesssim 10^{-4}$. At this precision, general relativity (GR) is expected to become relevant. Thus far, asteroseismic studies have used code premised on Newtonian fluids. At the current levels of precision, we expect that pulsation modes should be calculated in the Post-Newtonian (1PN) scheme, to properly correct for GR effects. We will calculate the normal mode frequencies for simple polytropic models of white dwarfs in the Newtonian, 1PN, and full GR formulations of stellar dynamics and compare, to investigate whether it is necessary to include 1PN corrections in future calculations of normal modes for white dwarfs, and whether the 1PN correction is sufficient to account for GR effects at current observational precisions. Finally, we will recommend how to modify exisiting community code to include these effects.

23. **Interesting Objects Found while Searching for Hot DAs**

J.A. Smith (APSU), D.J. Gulledge (APSU), J.M. Robertson (COMPASS Science Communication), M.B. Fix (STScI), S. Charbonnier (Ecole Polytechnique), D.L. Tucker (Fermilab), W. Wester (Fermilab), S.S. Allam (Fermilab), P-E. Tremblay (U. Warwick), G. Narayan (STScI), J. Marriner (Fermilab)

We have been searching for southern hemisphere hot DA white dwarfs for the past ~ 10 years. These stars will be used to assist the absolute calibration steps for the Dark Energy Survey (DES). Along the way, we have run across an assortment of interesting objects which include quasars, magnetic DAs, coolish DAs, a CV (or two), and several non-DAs. We present them here; some with results. Some of these we are still following ourselves.

24. **A Network of Faint DA White Dwarfs Standard Stars as Astrophysical Flux Standards**

J. B. Holberg (University of Arizona), Gautham Narayan (STScI), Tim Axelrod (University of Arizona), Annalisa Calamida (STScI), Abhijit Saha (NOAO), Thomas Matheson (NOAO), Edward Olszewski (University of Arizona), Ralph Bohlin (STScI), Susana Deustua (STScI)

We have established a network of faint ($16.5 < V < 19$) hot DA white dwarfs as spectrophotometric standards for present and future wide-field observatories. Our standards are accessible from both hemispheres and suitable for ground and space-based covering the UV to the near IR. The network is tied directly to the most precise astrophysical reference presently available - the CALSPEC standards - through a multi-cycle program imaging using the Wide-Field Camera 3 (WFC3) on the Hubble Space Telescope (HST). We have developed two independent analyses to forward model all the observed photometry and ground-based spectroscopy and infer a spectral energy distribution for each source using a non-local-thermodynamic-equilibrium (NLTE) DA white dwarf atmosphere extincted by interstellar dust. The models are in excellent agreement with each other and agree with the observations to better than 0.01 mag in all passbands, and better than 0.005 mag in the optical. We show that they are also consistent with external sources of data. The high-precision of these faint sources, tied directly to the most accurate flux standards presently available, make our network of standards ideally suited for any experiments that have very stringent requirements on absolute flux calibration, such as studies of dark energy using the Large Synoptic Survey Telescope (LSST) and the Wide-Field Infrared Survey Telescope (WFIRST).

25. **Rotation and dynamo action in SN progenitors in the double detonation scenario**

P. Neunteufel (Bonn University), N. Langer (Bonn University), S.-C. Yoon (Seoul National University)

Binary systems composed of a carbon-oxygen white dwarf and a helium star are considered promising candidate progenitors for a number of explosive transients, including classical type Ia and others. It has been shown in past studies, that induction of a helium detonation, which may then lead to an explosive transient via the single or double detonation mechanism, on an accreting white dwarf calls for stable mass accretion at low rates over a significant time span. The parameter space of systems meeting this requirement is still insufficiently well resolved. A Lagrangian 1-D hydrodynamical stellar evolution code, fully considering the effects of rotation as well as magnetic instabilities, is used to simulate the evolution of mass-accretion in a binary system consisting of a CO WD and a non-degenerate He star. This poster will present a grid of initial parameters centering in the most likely part of the parameter space where detonations may be expected. The initial conditions required for the potential outcomes of the model sequences direct detonation, he flashes, formation double degenerate system could be established. Neglecting biases in the formation of the system, He flashes will be the dominant outcome, with detonation and formation of a double WD system being less likely. The state of a system at the point of He detonations is commented upon, as is its viability as a source of hypothetical high velocity He stars.

26. **Toward Ensemble Astroseismology in the Open Star Cluster Messier 67**

K. Williams (Texas A&M University-Commerce)

Asteroseismology is a proven tool for probing the properties of white dwarfs, including star masses, internal composition and rotational profiles, atmospheric layer thicknesses, and surface rotation rates. One difficulty in comparing asteroseismic results is that the progenitor masses and metallicities are generally unknown or only derivable through uncertain relations such as the semiempirical initial-final mass relation. White dwarfs in open star clusters offer the opportunity to determine what, if any, stochasticity these properties may exhibit given nearly-identical progenitor stars. We present initial results of a search for pulsations in the WD population of Messier 67, an old, solar metallicity open cluster. Targets are identified via photometry and spectroscopy, with cluster membership confirmed by proper motions. We detail the success rate for DAV and DBV candidates and discuss required follow-up observations.

27. **Light variability of white dwarfs and subdwarfs due to surface abundance spots**

J. Krticka (Masaryk University), M. Prvak (Masaryk University), I. Krtickova (Masaryk University), Z. Mikulasek (Masaryk University), A. Kawka (Curtin University)

Classical main-sequence chemically peculiar stars show light variability that originates in surface abundance spots. In the spots, the flux redistribution due to line (bound-bound) and bound-free transitions is modulated by the stellar rotation and leads to the light variability. White dwarfs and subdwarfs may also have surface abundance spots either owing to the elemental diffusion or as a result of accretion of debris. We model the light variability of typical white dwarfs and subdwarfs that results from putative surface abundance spots. We estimate what level of overabundance is needed to cause observable light variability. We apply our model to the helium star HD 144941 and study whether the spot model is able to explain the observed light variations of this star.

28. **The evolutionary and pulsational properties of ultramassive white dwarfs with Oxygen-Neon cores**

F. C. De Geronimo (CONICET-UNLP), M. E. Camisassa (CONICET-UNLP), L. G. Althaus (CONICET-UNLP), A. H. Córsico (CONICET-UNLP), F. C. Wachlin (CONICET-UNLP), M. M. Miller Bertolami (CONICET-UNLP)

We present new fully evolutionary sequences representative of ultramassive ($M_\star \gtrsim 1.10 M_\odot$) white dwarf stars with oxygen/neon cores resulting from progenitor stars that were evolved through the complete Super Asymptotic Giant Branch (SAGB) phase. The sequences have been computed using the LPCODE evolutionary code. We take into account relevant processes during crystallization such as latent heat release and chemical re-distribution due to phase separation. We examine the cooling ages of our sequences. We also explore the pulsational properties of these objects using the LP-PUL pulsation code. We found that both the physical processes occuring during the SAGB phase and the chemical redistribution due to phase separation during crystallization have strong impact on the pulsational and evolutionary properties of massive white dwarfs.

29. **Search for pulsating white dwarfs with the LAMOST survey**

J. Su (Yunnan Observatories, Chinese Academy of Sciences)

The spectroscopic survey carried out by the Large Sky Area Multi-Object Fiber Spectroscopic Telescope (LAMOST) provides the largest stellar spectra library in the world until now. Based on the LAMOST spectra, a large number of new white dwarfs had been identified and the atmospheric parameters of them had been determined. From these new white dwarfs, we have identified four ZZ Ceti stars. These stars were selected by considering whether their effective temperatures are situated in the ZZ Ceti instability strip. We performed time-series photometric observations on them and finally verified their variability. As the LAMOST project progresses, we look forward

to continue searching for more pulsating white dwarfs using the new LAMOST data.

30. **Gaia DR2 Classification of the Full Giclas White Dwarf (GD) Catalog**

J.J. Hermes (UNC Chapel Hill), R. Raddi (Dr Remeis-Sternwarte), B. Gaensicke (University of Warwick), E. Dennihy (UNC Chapel Hill; Gemini Observatory), B. Kaiser (UNC Chapel Hill), I. Pelisoli (UFRGS, University of Potsdam), P. Izquierdo (Instituto de Astrofisica de Canarias, Universidad de La Laguna), P. Rodrguez-Gil (Instituto de Astrofisica de Canarias, Universidad de La Laguna), P.-E. Tremblay (University of Warwick), J. Farihi (University College London)

GD objects in the list of white dwarf suspects curated by Giclas et al. account for some of the most famous white dwarfs known. They were identified as white dwarf candidates as part of the Lowell proper motion survey initiated in 1957. More than a dozen GD objects have >100 citations, including the first DBV (GD 358), white dwarfs polluted with rocky debris (GD 40 and GD 362), and HST flux standards (GD 71, GD 153, and GD 50). However, of the 1712 white dwarf candidates comprising the full GD catalog, fewer than 600 ($< 35\%$) have spectroscopic classification in the literature. Utilizing the exceptional photometry and distance determinations of Gaia DR2 we construct a color-magnitude diagram of the full GD list of white dwarf suspects. We identify 61 new high-probability white dwarfs from the Gaia DR2 color-magnitude diagram, and have confirmed spectroscopically that 13/13 of these high-probability white dwarfs are in fact degenerate stellar remnants. We conclude that the full GD catalog has fewer than 400 bona fide white dwarfs; the vast majority ($> 73\%$) are high-velocity and/or halo non-degenerate stars.

31. **Double-Degenerate Carbon-Oxygen and Oxygen-Neon White Dwarf Mergers: A New Mechanism for Faint and Rapid Type Iax Supernovae**

R. Kashyap (UMass Dartmouth, International Centre for Theoretical Sciences), P. Loren-Aguilar (University of Exeter), E. Garcia-Berro (Universitat Politecnica de Catalunya, Institut d'Estudis Espacials de Catalunya), R. Fisher (UMass Dartmouth), T. Haque (UMass Dartmouth)

Type Ia supernovae (SNe Ia) originate from the thermonuclear explosion of carbon-oxygen white dwarfs (CO WDs), giving rise to luminous, common optical transients. A relatively common variety of subluminous SNe Ia events, referred to as SNe Iax, are not fully accommodated by current theoretical models. In this poster, we explore SNe Iax in the context of the double-degenerate channel of merging white dwarfs for the first time. In particular, we have carried out a fully three-dimensional simulation of the merger of a 1.2 solar mass ONe WD with a 1.1 solar mass CO WD. While the hot, tidally-disrupted carbon-rich disk material originating from the CO WD secondary

is readily susceptible to detonation in such a merger, the ONe primary core is not. This merger yields a failed detonation, resulting in the ejection of a small amount of mass, and leaving behind a kicked, super-Chandrasekhar ONe WD remnant enriched by the fallback of the products of nuclear burning. The resulting outburst is a rapidly-fading optical transient with a small amount of radioactive Ni56 powering the light curve. The simulation produces a very faint and rapidly-fading transient, even fainter than the faintest Type Iax event to date, SN 2008ha. Massive ONe primaries than considered here may produce brighter and longer-duration transients.

32. **Pre-Cataclysmic Variables: Their Past, Future, and Minimum Orbital Period**

L. Nelson (Bishop's University), S. Rappaport (Department of Physics and Kavli Institute for Astrophysics and Space Research, M.I.T.), M. Ristic (Northeastern University), J. Schwab (University of California, Santa Cruz)

In recent years more than ten pre-cataclysmic variable systems have been discovered with short orbital periods ranging from 250 min down to 68 min. We define a pre-cataclysmic variable (pre-CV) to be a system consisting of a white dwarf or hot subdwarf primary with a low-mass unevolved companion star, where the companion star has successfully ejected the common envelope of the primary progenitor, but mass transfer from the companion star back to the primary has not yet commenced. In this short-period range, the companion stars found thus far are predominantly brown dwarfs with masses $< 0.07\,M_\odot$. The discoveries of these short-period pre-CVs containing brown dwarf companions raise the question – what is the shortest possible orbital period of such systems? We run 500 brown dwarf/low-mass main sequence models with MESA that cover the mass range from 0.002 to 0.1 $M_\odot$. We find the shortest possible orbital period is 40 min with a corresponding brown dwarf mass of $0.07\,M_\odot$ for an age equal to a Hubble time. We discuss the past evolution of these systems through the common envelope and suggest that many of the systems with present day white dwarf primaries may have exited the common envelope with the primary as a helium burning hot subdwarf. We also characterize the future evolution of the observed systems, which includes a phase as CVs below the conventional period minimum.

33. **A Method to Select Variable White Dwarfs from Gaia DR2**

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We have developed a technique to select candidate variable white dwarfs from Gaia DR2 by selecting white dwarfs with anomalously large mean G-band flux errors at a given mean G-band magnitude. We demonstrate the technique with the Gaia DR2 sample of white dwarfs within 200 pc. We have followed up many objects with the 2.1 m at McDonald Observatory and the 0.9 m at CTIO, and confirmed that several are new high-amplitude pulsating white dwarfs. Two of these new pulsating white dwarfs are brighter than $G < 13.8$ mag, and are excellent targets for extended study from space by TESS.

34. **A Precise Radial Velocity Search for Giant Planets orbiting Polluted White Dwarfs**

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We present a feasibility study for applying the well-known radial velocity (RV) technique to search for planetary companions around white dwarfs (WDs). It is still under debate what the ultimate fate is of Jupiter-analogs in the post-planetary nebula phase. Some models suggest that they migrate inward and could orbit at smaller orbital distances than they did on the main sequence. We have compelling photospheric evidence for planetary material in the proximity of some white dwarfs. We suggest to search these "polluted" white dwarfs for possible giant planets using the Doppler reflex motion technique. We face two major challenges: (1) WDs are typically too faint for current precise RV instruments and (2) they lack the sufficient line densities for precise Doppler measurements. The former can be overcome with the use of a large aperture telescope (e.g. the 10 m Hobby Eberly Telescope) and the latter can be mitigated by focusing on WDs with an abundance of metal lines. We show here first results from simulated WD spectra, processed with our McDonald Observatory planet search pipeline.

35. **The Atmospheres and Interiors of White Dwarf Stars Revealed in the Gaia DR2 Color-Magnitude Diagram**

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The precise photometry and distance determinations enabled by the second Gaia data release reveal a white dwarf color-magnitude diagram with a rich structure. Here we provide a map of this diagram in light of the considerable complementary data and modeling work on white dwarf stars and highlight instances where the data will enable improvements to existing white dwarf models.

36. **Mg line profiles for cool WD and their application in the UV**

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Since last decade there have been great advances and extremely exciting results in the search and interpretation for cool white dwarfs. In the formation of their spectra, the far wings of alkaline earth metal like Ca and Mg, play an extraordinary role. Model atmospheres are necessary in order to calculate synthetic spectra and to derive reliable parameters and the atmospheric composition for such objects. Using the new stellar atmosphere code of Blouin et al. 2018, atmosphere models have been constructed for a range of effective temperatures and surface gravities typical for cool DZ white dwarfs. In this poster we present synthetic spectra tracing the behavior of the Mg resonance line profiles under the low temperatures and high gas pressures prevalent in these atmospheres. In the atmospheres of cool WD, pressure broadening by helium is prevalent. In continuation of previous work on $Mg^{+}He$ lines in the UV we present theoretical profiles of the resonance line of neutral Mg perturbed by He using a unified theory of spectral line broadening and high quality ab initio potentials. We show that a line satellite band located in the blue wing of the neutral Mg line has a blanketing effect at low temperature $T = 6000\,\mathrm{K}$. At higher temperatures there is a large contribution of the red wing of ionized magnesium at longer wavelength.

37. **Follow-up photometry of Eclipsing Double White Dwarf Binary SDSS J0822**

A. Kosakowski (University of Oklahoma), M. Kilic (University of Oklahoma), W. Brown (Smithsonian Astrophysical Observatory)

Eclipsing binary systems provide a rare opportunity to obtain precise physical parameters of the individual stars within the system. Here we present the results of APO 3.5-meter follow-up photometry of detached eclipsing double white dwarf binary SDSS J082239.546+304857.19. We use JKTEBOP to analyze all three epochs covering 14 eclipses and obtain estimates for the system parameters such as period, inclination, and stellar radii and masses. We compare these estimates with those of the discovery paper, which contain only two eclipses.

38. **MESA Models for Surface Mixing Regions in Hydrogen and Helium WD Atmospheres**

E. Bauer (University of California, Santa Barbara)

White dwarf pollution models require accurate understanding of surface convection zones. The depth of a surface convection zone determines the relevant location for

evaluating any other mixing that ultimately governs the timescale over which heavy elements leave the observable surface of the star. We compare atmospheres in MESA white dwarf models to other standard results for convection zone depths. These comparisons establish that MESA capabilities are in line with the state of the art for 1D hydrogen dominated atmospheres, but there is room for further progress in MESA for the case of cool, helium dominated white dwarf atmospheres.