SOCIEDAD ESPAÑOLA DE ASTRONOMÍA
XIII REUNIÓN CIENTÍFICA / XIII SCIENTIFIC MEETING
SALAMANCA 16-20 JULIO / 16-20 JULY 2018

Libro de resúmenes
Abstract book

Vía Láctea y sus componentes / Milky Way and its components
Sesiones VL1 – VL7 / Sessions VL1 - VL7

Vía Láctea y sus componentes / Milky Way and its components (VL1)
Lunes 16 de julio / Monday 16 July

15:30	**Domingo Aníbal García-Hernández** Fullerene and graphene molecular nanostructures in evolved stars (invitada/invited)
16:00	**Ricardo Dorda Laforet** Investigating the true nature of the red hypergiants
16.15	**Friedrich Anders** Chemodynamics of the Milky Way - The Gaia+APOGEE picture
16:30	**Pep Covas Vidal** All-sky searches of continuous gravitational waves from neutron stars
16:45	**María Luisa García Vargas** MEGARA Early-Science results: The spectral library for MEGARA-GTC
17:00	**Francisco Colomer** What can VLBI do for your research? The EVN and JIVE
17:15	**PÓSTERES**

Fullerene and graphene molecular nanostructures in evolved stars

Domingo Anibal García-Hernández (charla invitada/invited talk)

The detections of fullerenes and (possibly) planar C_{24} (a small fragment of a graphene sheet) in the H-rich circumstellar environments of evolved stars show that formation of these complex species does not require an H-poor environment contrary to general expectation. This together with the very recent identification of the fullerene cation C_{60}+ as a diffuse interstellar band (DIB) carrier (the only DIB carrier known to date) reinforce the idea that these molecular nanostructures are ubiquitous in space. The understanding of the formation route of these complex organic species requires an interdisciplinary research, crossing the boundaries between astronomers, chemists, and physicists, with potential applications in nanotechnology and industry.

Here, I review the main results of the interdisciplinary approach carried out at the IAC in order to learn about complex molecular nanostructures in evolved stars. Finally, I underline the main open questions and future directions like the expected observations on these complex organics in evolved stars from future facilities such as the James Webb Space Telescope.

Investigating the true nature of the red hypergiants

Ricardo Dorda Laforet, Hugo M. Tabernero, Ignacio Negueruela

Red hypergiants (RHG) are stars at the end of their lives, characterized by very low temperatures and high mass-loss rates. Moreover, these stars are so luminous that are close to the empirical upper luminosity boundary, given by their hydrostatic equilibrium.

Classically, these stars have been considered as a peculiar group among red supergiants (RSGs). They are the largest RSGs and their luminosities and mass-loss rates are far above those of typical RSGs. Such differences were considered as a consequence of their masses, supposedly very high (above 30 solar masses), far above the 10 to 25 solar masses expected for most RSGs.

However, evolutionary models do not offer a satisfactory explanation for RHG. On one hand, the evolutionary tracks which predict such high luminosities, those among 25 and 40 solar masses, do not reach so low temperatures, and even at their cooler extreme, the tracks predict a very brief stay before the star dying or coming back to higher temperatures. On the other hand, the RSGs with lower masses become more luminous and reach lower temperatures during their final stages, but according to evolutionary models, none of them should reach the luminosities and temperatures seen for red hypergiants.

In order to understand the true nature of these stars, we have performed a spectroscopic following of some well-known galactic RHGs along two years, covering approximatively one of their variability perdiods. Our results defy the classical vision of these stars.

Chemodynamics of the Milky Way - The Gaia+APOGEE picture

Friedrich Anders, Anna B. Queiroz, Cristina Chiappini,
Basilio Santiago, Ivan Minchev

We combine the Apache Point Observatory Galactic Evolution Experiment (APOGEE) DR14 data with the Gaia DR2 catalogue to obtain high-precision 6D phase-space coordinates, stellar parameters (including masses and ages), as well as chemical abundances for more than 200,000 stars, 115,000 of them being giant stars observed at high resolution and with a high signal-to-noise ratio. With respect to previous SDSS data releases, we especially increase the high-quality sample size towards the bulge and inner disc, and the kinematic precision by about a factor of 100. The stars cover a significant fraction of the Galactic disc, with a much better sampling of the inner parts. By comparing the sample distribution in chemistry space with the solar neighbourhood, we revisit the chemo-dynamic correlations in the inner and outer disc, and the bulge. The unprecedented precision of Gaia-derived orbital parameters enables us to account for stars passing on eccentric orbits with high fidelity, and to effectively constrain the efficiency of radial migration.

All-sky searches of continuous gravitational waves from neutron stars

Pep Covas Vidal

Isolated spinning neutron stars in our galaxy are among the targets of the ground-based interferometric gravitational wave detectors. If these stars are not perfectly symmetric about their axis of rotation, they are expected to emit continuous gravitational waves (CW). We will present the latest results and developments regarding all-sky searches of continuous waves.

MEGARA Early-Science results: The spectral library for MEGARA-GTC

María Luisa García Vargas, Armando Gil de Paz, Esperanza Carrasco Licea, Mercedes Mollá Lorente, Jesús Gallego Maestro, Jorge Iglesias Páramo, and the MEGARA Commissioning Team

MEGARA opens the GTC to a higher and up to now new, spectral resolution domain. The interpretation of the extra-galactic targets in terms of stellar populations demands star observations taken in the same conditions and instrument set-up. We have defined an observational stellar library with MEGARA and the GTC to feed the PopStar new generation evolutionary synthesis models. Both library and models are presented in this talk.

The first on-sky observations of the atlas were taken during MEGARA commissioning in the summer of 2017 (40 field stars in several Low Resolution (LR) gratings, 23 field stars in the High Resolution (HR) VPH centered in 860nm, plus 88 stars in M-15 cluster in all the 18 VPHs). We show the results from these observations. At the time of presenting the contribution we are preparing a "filler" program for the MEGARA-GTC to be requested in the open call for proposals.

What can VLBI do for your research? The EVN and JIVE

Francisco Colomer

Very Long Baseline Interferometry (VLBI) is providing key information to the study of processes in the Universe, in star formation regions and circumstellar envelopes around evolved stars, galactic structure and cosmology through precise astrometry, measuring magnetic fields, etc. The European VLBI Network (EVN) offers superb capabilities and, most importantly, support to users through JIVE, ensuring that the EVN research infrastructure is fully accessible and that the best science always emerges.

Vía Láctea y sus componentes / Milky Way and its components (VL2)
Martes 17 de julio / Tuesday 17 July

9:00	**Jorge Lillo-Box** TROY - The search for exotrojan planets (invitada/invited)
9:30	**Ignacio Mendigutía** Detecting signatures of planet formation in disks around young stars
9:45	**Héctor Cánovas** Photoevaporation in transitional disks
10:00	**Álvaro Ribas** Protoplanetary disks meet artificial neural networks
10:15	**Patricia Chinchilla** Search for common proper motion wide substellar companions to young nearby stars with Vista Hemisphere Survey
10:30	**Jonay I. González Hernández** The two most iron-poor dwarf stars known in the Galactic halo
10:45	**PÓSTERES**

TROY - The search for exotrojan planets

Jorge Lillo-Box (charla invitada/invited talk)

As the field of extrasolar planets evolves with numerous discoveries of new and diverse planets, we can start thinking in more challenging (observationally talking) scientific cases that can bring up new, hidden, pieces of the exoplanetary science puzzle. This is the case of the TROY project, a multi-technique effort to look for the first co-orbital planets and to provide estimates of the occurrence rate of these bodies down to the Earth-mass regime. Despite being missed in our Solar System, where only kilometer-size (or smaller) bodies co-rotate with most of the planets, theory allows even equal-mass planets to co-exist in the same orbit. In this invited talk I will present the news on the TROY project including the last ground-based observations, the results from the first radial velocity search involving 46 planetary systems (Lillo-Box et al., 2018) and the first results from our Kepler/K2 search.

Detecting signatures of planet formation in disks around young stars

Ignacio Mendigutía, R.D.Oudmaijer, A. Garufi, J.R. Fairlamb, W.J. de Wit, S.L. Lumsden, N. Huélamo, A. Cheetham, B. Norris, F.A. Olguin, P. Tuthill, A.C. Carciofi, J.D. Ilee, R.G. Vieira, D. Baines, S.D. Brittain, S. Sallum

Despite of the fact that the number of known exoplanets around stars different than the Sun has increased exponentially (thousands in a few decades), the detection of forming planets in protoplanetary disks around young stars remains merely anecdotal, with only a few candidates proposed to date. The pre-main sequence stars HD 100546 and LkCa 15 are two of the most representative candidates, given that their circumstellar disks may host (proto-) planetary systems with several planets each.

In this talk I will summarize some of the main properties of HD 100546 as inferred from spectrometry, spectro-interferometry and high-resolution polarized imaging with X-SHOOTER, AMBER and SPHERE on the VLTs at Cerro Paranal. In particular, we have recently detected a possible radial inflow connecting the outer and the inner disk of HD 100546 along a few au. In case this non-Keplerian stream of material was confirmed, it would be an exceptional structure that may indicate the presence of additional planets in formation (Mendigutía et al. 2017, A&A, 608, A104).

In addition, I will discuss the potential of spectro-astrometry to detect planets in formation based on recently obtained ISIS/WHT data of LkCa 15. Indeed, spectro-astrometry can be particularly useful to detect the signature of accreting planets on angular scales of (sub-) mas without the need of complex instrumentation on 8m-class telescopes, but from less stringent, mid-size telescopes equipped with long-slit spectrographs.

Photoevaporation in Transitional disks

Héctor Cánovas Cabrera, B. Montesinos, M. Schreiber, C. Cieza, C. Eiroa et al.

The dust-depleted inner cavities observed in a group of protoplanetary disks (broadly named as transitional disks) have been the subject of intense study during the last years. There are a few mechanisms that could carve out these cavities, like (stellar) binary companions, planet formation, or photoevaporation. Despite its success in explaining transitional disks and the wealth of detailed models discussing the observational signatures of photoevaporation, there is a lack of objects that can be unambiguously classified as photoevaporating disks.

In this talk I will present our recent work about DZ Cha, a peculiar transitional disk that lies at ~110 pc. The combination of high-contrast imaging polarimetry, multiple epochs of high resolution spectroscopy, and photometry from the near UV up to the sub-mm regime, shows that the disk around DZ Cha hosts a ~8 au dust-depleted cavity with negligible mass accretion, as expected during the early stages of photoevaporation. I will finish by discussing how identifying objects like this one can help to benchmark models of photoevaporation and disk evolution.

Protoplanetary disks meet artificial neural networks

Álvaro Ribas, Catherine C. Espaillat, Enrique Macías,
Luis M. Sarro, Connor Robinson

The properties and evolution of protoplanetary disks play a major role in planet formation, but most of these properties cannot be inferred directly from observations and models are required to estimate them. However, while the increasing number of available data offers a great opportunity to understand these objects from a statistical perspective, detailed models of protoplanetary disks are computationally demanding, and such a statistical study has remained unfeasible.

In this talk, I will discuss our efforts to model a large sample of protoplanetary disks in the Taurus, Ophiuchus, and Chamaeleon I star-forming regions by combining physically-motivated disk models with artificial neural networks. This new approach implies a massive improvement in computing time and can yield robust parameter estimates for hundreds of disks, providing an unprecedented look at their fundamental properties and informing our understanding of the planet formation process.

Search for common proper motion wide substellar companions to young nearby stars with Vista Hemisphere Survey

Patricia Chinchilla, V. J. Sánchez Béjar, N. Lodieu, B. Gauza,
M. R. Zapatero Osorio, R. Rebolo, A. Pérez Garrido

We have performed a search for substellar objects as common proper motion companions to young nearby stars (including Young Moving Groups such as TW Hya, Tuc-Hor, Beta Pic, and associations such as Upper Scorpius) up to separations of 50,000 AU, using the VISTA VHS survey and 2MASS astrometric and photometric data. We have found tens of candidates with spectral types from M to L, and estimated masses from low-mass stars to the deuterium-burning limit. For some of these candidates, we have also obtained optical and/or near-infrared spectroscopy confirming them as true companions.

We will present the preliminary results of our searches and discuss the most outstanding cases. Our results show that the frequency of young companions is higher than the field.

The two most iron-poor dwarf stars known in the Galactic halo

Jonay I. González Hernández, David S. Aguado,
Carlos Allende-Prieto, Rafael Rebolo

The first stars formed about a few hundreds million years after the Big Bang are expected to be very massive stars that exploded as the first supernovae and polluted the pristine matter of the Early Universe. The chemical composition of the most iron-poor low-mass stars that formed right after provides information about that early epoch of the Universe.

During the last years we have identified from SDSS and LAMOST spectroscopic surveys a few tens of stars at [Fe/H] < -3. These iron-poor candidates have been confirmed in follow-up spectroscopic observations with the William Herschel Telescope and the Gran Telescopio Canarias.

These observations have led to the discovery of two dwarf stars with extremely low iron content, SDSS J0815+4729 and SDSS J0023+0307, two extremely primitive dwarf stars with Teff~6200 K, and metallicities [Fe/H] < -6. J0815+4729 is extremely rich in carbon whereas J0023+0307 does not show any detected carbon features.

The discovery of these two stars provides new fundamental constraints on the early stages of the universe, the formation of the first stars, and the properties of the first supernovae. The existence of J0023+0307 may push further down the metallicity threshold for the formation of low-mass stars in the Early Universe.

Vía Láctea y sus componentes / Milky Way and its components (VL3)
Martes 17 de julio / Tuesday 17 July

15:30	**Koraljka Muzic** The transition from star to planet formation: brown dwarfs in young clusters (invitada/invited)
16:00	**Laia Casamiquela** Physical properties of evolved Open Clusters in the Gaia era
16.15	**Alfred Castro-Ginard** Detection of new Open Clusters with Gaia
16:30	**Andressa Ferreira** Galactic disc populations with the GAIA-ESO Survey
16:45	**Hugo Tabernero** An effective temperature scale for red supergiants in the Magellanic clouds
17:00	**Javier Alonso Santiago** Clusters with K Supergiants
17:15	**PÓSTERES**

The transition from star to planet formation: brown dwarfs in young clusters

Koraljka Muzic (charla invitada/invited talk)

With masses below 0.08 Msol, brown dwarfs are the link between stars and planets. Understanding the origin of brown dwarfs has been one of the major motivations for recent deep studies of star forming regions as well as a driver for development of state-of-the-art simulations. While the massive brown dwarfs probably form like stars, the birth mechanism of the lowest mass brown dwarfs is still an unsolved issue, as they might as well be ejected giant planets. Deep surveys show that brown dwarfs are an ubiquitous outcome of star formation, with about 0.2-0.5 substellar objects formed for each star, across a wide range of initial conditions and environments. The number of planetary mass brown dwarfs, however, is much lower than that, at least down to about 5 Jupiter masses, which is the limit imposed by the currently available instrumentation. In this talk I will present the current status of searches for brown dwarfs in nearby star forming regions, as well as the recent efforts to characterize substellar population of massive young galactic clusters.

Physical properties of evolved Open Clusters in the Gaia era

Laia Casamiquela, Caroline Soubiran, Hervé Bouy

Evolved Open Clusters (OCs) are excellent tracers of the formation and evolution of the galaxy, as well as an ideal laboratory to test theories of star formation and evolution. In particular, nearby OCs are commonly used as benchmark objects to assess the determination of physical properties of field stars.

We have designed a project to perform an in-depth study of the physical properties of a sample of nearby clusters: 13 OCs at 500 pc around the Sun. We determine shape, radii, extinction, galactic velocity, age and chemical composition, using recent data from Gaia DR2, asteroseismic information from K2, ground-based spectroscopic surveys and other complementary high resolution spectroscopic data.

This project has many applications, including validation of stellar evolution theories and calibration of parametrization methods. Also it has the potential to answer many questions: how do the structural properties correlate with the age of the OC and the environment?, what is the formation mecanism of tidal tails?, what is the influence of density, age and galactic environment in the disruption process of Ocs.

We will present the first results of this project short after the release of Gaia DR2.

Detection of new Open Clusters with Gaia

Alfred Castro-Ginard, Xavier Luri, Carme Jordi

The publication of the Gaia Data Release 2 includes precise astrometric data (positions, proper motions and parallaxes) for more than 1.3 bilion sources, mostly stars. This such a vast amount of new data requires the use of Machine Learning and Data Mining techniques to handle its analysis. In particular, the search for Open Clusters, groups of stars that were born and move together, located in the disk, is a great example for the application of these techniques.

We explore the performance of a density based clustering algorithm, DBSCAN, to find clusters in the data together with a supervised learning method such as an Artificial Neural Network (ANN) to automatically distinguish between true and false positives. The development and implementation of this method to a 5-Dimensional space (l, b, parallax and proper motions) of the Tycho-Gaia Astrometric Solution (TGAS) lead to the proposal of a list of new nearby Open Cluster candidates. This contribution shows the validation of the candidates with Gaia Data Release 2 data and a framework being applied to the full Gaia DR2 archive.

Galactic disc populations with the GAIA-ESO Survey

Andressa Ferreira,Vardan Adibekyan, Sérgio Sousa

The capability to distinguish the different stellar populations and subsystems in our Galaxy is fundamental to understand its formation and evolution. The stars in the solar vicinity can be grouped into thin disc, thick disc, and halo populations by their chemical and/or kinematic properties. In addition to these separations, Adibekyan et al. (2011,2013) identified possibly a new population of stars when using a sample of 1111 FGK dwarfs in the solar neighborhood. In the [α/Fe] vs [Fe/H] diagram they found a gap at [α/Fe] ~0.17 dex and [Fe/H]~ -0.2 dex for the α-enhanced stars. The metal-poor part of these stars corresponds to the Galactic thick disk, while the metal-rich groups was called high alpha metal rich (HAMR). The kinematics of the HAMR stars are compatible with the thin disc stars but they are on average older than their thin disc counterparts. In contrast, Bensby et al. (2014) suggested that the HAMR are just the metal rich extension of the thick disk. It is still not well understood the relation between the HAMR stars and the stars from the thick and thin disc. To better characterize this group and understand their origin we take advantage of a large and homogeneous sample with derived chemical abundances data as offered by the GAIA-ESO Survey (GES). In this talk we will present our last results obtained for the HAMR stars using the internal Data Release 5 of GES.

An effective temperature scale for red supergiants in the Magellanic clouds

Hugo Tabernero, R. Dorda, I. Negueruela, and C. González-Fernández

We present a self-consistent study of cool supergiants (CSGs) belonging to the Magellanic clouds. We derived stellar atmospheric parameters (Teff and [M/H]) using KURUCZ and MARCS atmospheric models for more than 400 stars by fitting a careful selection of weak metallic lines. We explore the significance of the temperature scale in two different metallicity environments (each Magellanic cloud). Critical and in-depth tests have been performed to assess the reliability of our calculated stellar parameters (i.e. internal error budget, any tentative systematic offset, ...). In addition, several robust statistical tests have been carried out to infer the significance of the Teff scale found. Our results point towards a unique Temperature scale that does not depend on the environment.

Clusters with K supergiants

Javier Alonso Santiago, I. Negueruela, A. Marco, H. M. Tabernero

Young open clusters are the natural laboratories to constrain the stellar evolution models. During my PhD thesis we studied the red (super)giants hosted in six open clusters with the aim of exploring the boundary between AGB stars and RSGs. These clusters (NGC 2345, NGC 3105, NGC 6067, NGC 6649, NGC 6664 and Trumpler 35) were selected taking into account that their evolved stars, K (super)giants, covered the mass transition (5.5-9.5 M_{Sun}) around the minimum mass which produces a SN explosion.

By combining photometry and low/moderate-resolution spectroscopy we studied the clusters in order to obtain accurate ages (and masses) for their evolved stars. From FEROS spectra of the FGK (super)giants contained in the clusters we derived their stellar atmospheric parameters as well as their chemical abundances.

Besides the characterization of each cluster (the most complete to date) some remarkable results of this thesis are:

- The over-abundance of Ba found in young clusters (30-90 Ma), which supports the enhanced s-process and the role of i-process.

- The relationship between spectral type and evolutionary stage of stars in open clusters: the AGB/SN boundary could be related to the presence or lack in the cluster of K/M supergiants.

- The detection of Li in mid-K supergiants contained in these clusters might be the first evidence of E-AGB stars in Galactic clusters.

Vía Láctea y sus componentes / Milky Way and its components (VL4)
Miércoles 18 de julio / Wednesday 18 July

9:00	**Izaskun Jiménez-Serra** Prebiotic chemistry in the ISM: from cold cores to Galactic center clouds (invitada)
9:30	**David Navarro Almaida** The formation of H2S in dark clouds
9:45	**Susana Iglesias-Groth** Fullerenos y PAHs en el medio interestelar
10:00	**Diego de la Fuente** Cuando la línea de visión nos engaña: el cúmulo embebido [DB2001] CL05 como caso piloto
10:15	**Pedro Palmeirim** Star formation and ionized regions in the Inner Galactic Plane
10:30	**Amparo Marco** How do massive stars form?
10:45	**Jesús Maíz Apellániz** GALANTE: encontrando las estrellas O+B+WR en todo el plano Galáctico

Prebiotic Chemistry in the ISM: from Cold Cores to Galactic Center Clouds

Izaskun Jiménez-Serra

In the past decade Complex Organic Molecules (or COMs, defined as carbon-based species with more than 6 atoms) have attracted much attention due to their link to prebiotic molecules or species involved in the processes leading to the origin of life. Thanks to the advent of higher-sensitivity instrumentation, we now know that these complex organics are ubiquitous in the interstellar medium (ISM), even appearing in harsh environments such as the nuclei of galaxies. In this talk I will review the dominant formation/destruction routes of COMs in the ISM, putting special emphasis on the chemistry of molecules of prebiotic interest such as formamide (NH_2CHO) and the recently discovered methyl isocyanate (CH_3NCO), with peptide-like bonds.

The formation of H_2S in dark clouds

David Navarro Almaida, Asunción Fuente, Pablo Rivière-Marichalar, Sandra Treviño-Morales, Tomás Alonso-Albi, José Cernicharo, Carsten Kramer, Maryvonne Gerin, Evelyne Roueff, Valentine Wakelam, Paola Caselli, Jaime Pineda, Valerio Lattanzi

Sulfur is one of the most abundant elements in the Universe (S/H~$1.5 \cdot 10^5$) and plays a crucial role in biological systems on Earth, so it is important to follow its chemical history in space. Surprisingly, sulfurated molecules are not as abundant as expected in the interstellar medium. Sulfur is thought to be depleted in molecular clouds by a factor of 1000 compared to its estimated cosmic abundance.

Because of the high hydrogen abundances and the mobility of hydrogen in the ice matrix, sulfur atoms impinging in interstellar ice mantles are expected to form H_2S preferentially. By now, OCS is the only S-bearing molecule unambiguously detected in ice mantles [1, 2] and, tentatively, SO_2 [3]. Upper limits of the solid H_2S abundance could be derived by [4]. Gas phase and gas-grain chemical models have increased in complexity and now we can have a hint of the composition of the ice mantles from the comparison of high sensitivity molecular data with state-of-the-art chemical models [5]. Particularly important is the study of the 2-10 mag visual extinction range where the icy mantles are formed.

We present systematic H_2S observations in seven molecular filaments in Taurus and Perseus. these filaments are selected to include regions with different environment conditions (incident UV field, turbulence, dust temperature). For Av < 10 mag, the H_2S abundance changes by more than an order of magnitude from one region to the other. Based on our data, the possible correlation between the H_2S abundance and the UV field and non-thermal line widths is investigated. These results are discussed in the context of state-of-the-art gas-phase and surface chemistry.

[1] Geballe et al. 1985, ApJ, 292, 500
[2] Palumbo et al. 1995, ApJ 449, 674
[3] Boogert et al. 1997, A&A, 317, 929
[4] Jiménez-Escobar et al. 2011, A&A, 536, 91
[5] Holdship et al. 2016, arXiv:1608.01983

Fullerenos y PAHs en el medio interestelar

Susana Iglesias-Groth

I present here my research in astrochemistry. We will review theoretical work, astronomical observations and measurements in laboratory of the new form of carbon known as fullerenes and their hydrogenated forms (fulleranes). These molecules can be responsible for diffuse interstellar bands, the UV "bump", main feature in the extinction curves observed in many lines of vision of our Galaxy and other galaxies and the anomalous microwave emission discovered in several regions of star formation, in molecular clouds and HII regions.

Recent detections of C_{60} and C_{70} fullerenes in planetary nebulae in our Galaxy and in the Magellanic cloud reinforce the hypothesis that fullerenes and fulleranes are common in the interstellar medium and could contribute significantly to these processes. Other potential agents of anomalous microwave emission processes and interstellar extinction bands are polycyclic aromatic hydrocarbons (PAHs). We will summarize the efforts made to achieve the identification of the simplest PAHs, naphthalene and anthracene, in regions of anomalous microwave emission and the new results or discoveries obtained in this search.

Cuando la línea de visión nos engaña: el cúmulo embebido [DB2001] CL05 como caso piloto

Diego de la Fuente, Carlos Román-Zúñiga, Elena Jiménez-Bailón

Cygnus-X es el más cercano de los grandes complejos de formación estelar masiva que se hallan en la Vía Láctea. Gracias al gran detalle con que lo podemos observar, Cygnus-X suele contemplarse como un laboratorio ideal para conectar los procesos a pequeña y a gran escala involucrados en la formación estelar masiva. Esto último incluye procesos de retroalimentación que pueden ser fundamentales para comprender el funcionamiento de grandes regiones extragalácticas. Sin embargo, esta utilidad de Cygnus-X como banco de pruebas se ve comprometida si se usa a la ligera la suposición de que sus componentes se hallan a la misma distancia. Sobre todo cuando ya se han publicado evidencias en contra de ello.

En esta contribución, presentamos un estudio multi-longitud de onda de uno de los múltiples componentes de Cygnus-X: el cúmulo joven [DB2001] CL05. En investigaciones previas del mismo campo de cielo, simplemente se asumió la misma distancia, 1.2 kpc, para todas las poblaciones estelares jóvenes y regiones H II, incluyendo aquella en que [DB2001] CL05 está embebido. Sin embargo, gracias a nuestro cuidadoso tratamiento de la extinción que nos permite separar componentes a diferentes distancias, nuestro estudio concluye que [DB2001] CL05 está situado aproximadamente 3 veces más lejos que otras poblaciones jóvenes del mismo campo. Tal corrección en distancia altera radicalmente las conclusiones sobre los procesos de formación estelar que están teniendo lugar en esa región. Tras comparar el caso de [DB2001] CL05 con otros casos de superposición fortuita, discutimos hasta dónde pueden llegar las consecuencias de estar asumiendo erroneamente distancias similares para objetos a lo largo de la misma línea de visión.

Star formation and ionized regions in the Inner Galactic Plane

Pedro Palmeirim

Star formation is a fundamental process for the enrichment of the InterStellar Medium (ISM), having driven the evolution of matter from the primordial conditions to the complex and chemically diverse conditions essential for life. This ongoing recycling process that continuously enriches the ISM is mainly regulated by the feedback from massive stars and supernovae blasts, that generates bubble-like structures in the ISM and triggers star formation.

This presentation will focus on an unprecedented statistical analysis of star-forming objects located in the vicinity of 1360 bubble structures throughout the Inner Galactic Plane and their local environments will be shown. The compilation of nearly 70 000 star-forming sources, detected in both Hi-GAL and GLIMPSE surveys, revealed a clear evolutionary trend where more evolved sources are found spatially located near the center, while younger sources are found at the edge of the bubbles. A higher ratio of protostellar vs prestellar clumps is found inside the collected shells of the bubbles which could be a signature of acceleration of the star-formation process caused by the feedback. Moreover, comparison between fragmentation time of the shells and the dynamic ages of the bubbles advocates for the pre-existence of clumps in the medium prior to the bubble expansion.

How do massive stars form?

Amparo Marco, Ignacio Negueruela, Stephen Eikenberry, Artemio Herrero

High mass stars (M> 8 Msolar) are crucial agents in the evolution of galaxies and have a disproportionate effect upon their environment. They provide most of the mechanical energy input into the interstellar medium through stellar winds and supernovae, and most of the UV ionizing radiation of galaxies.However, we still know very little about their formation, structure, evolution and death.

How do massive stars form? This is a fundamental question in astrophysics to clarify nowdays. At present, two main theories are invoked: (a) monolithic core accretion, basically a scaled-up version of classical low-mass formation theories, where very high opacities allow infalling material to overcome the radiation pressure and (b) competitive accretion, where massive stars are formed in cluster cores, benefiting from the gravitational potential of the whole cluster to accrete more material. One of the key observations that may help clarify theories of massive star formation is the degree of isolation under which massive stars can be formed.

HII regions are places of very recent massive star formation. OB stars within an HII region have recently formed in it, and are thus ideal targets to test this hypothesis. We present a photometric and spectroscopic survey of HII regions and characterize the whole population associated with them.

GALANTE: encontrando las estrellas O+B+WR en todo el plano Galáctico

Jesús Maíz Apellániz, equipo de GALANTE

GALANTE es un sondeo de siete filtros de banda estrecha e intermedia que está cubriendo desde 2016 todo el plano Galáctico con el telescopio T80 de Javalambre y su gemelo chileno. El detector tiene un campo continuo de 2 grados cuadrados con una resolución de 0,55"/píxel y los siete filtros han sido elegidos para optimizar la detección de estrellas tempranas obscurecidas.

El sondeo incluye tiempos de exposición largos, intermedios, cortos y ultracortos para alcanzar un rango dinámico cercano a las 20 magnitudes, algo inigualado hasta la fecha desde tierra. Las características de GALANTE permiten un mecanismo de calibración novedoso mediante comparación con datos externos como Gaia, Tycho-2 y 2MASS que ya han llevado a la verificación y corrección de la sensibilidad del filtro G de Gaia.

En esta charla presentaré los resultados preliminares del proyecto y mostraré algunas de las espectaculares imágenes que usaremos para difundir GALANTE. El sondeo permitirá identificar todas las estrellas masivas tempranas del entorno solar hasta un radio de varios kpc y medir tanto su cantidad como su tipo de extinción. También realizará un mapa de la emisión nebular de H alfa, identificará las estrellas con emisión y permitirá un gran número de estudios sobre las estrellas de masa baja e intermedia.

Vía Láctea y sus componentes / Milky Way and its components (VL5)
Miércoles 18 de julio / Wednesday 18 July

15:30	**Javier Alonso-García** VVV and VVV-X surveys: unveiling the innermost Galaxy
15:45	**Banafsheh Shahzamanian** Near-Infrared Observations of Galactic Centre
16:00	**Eulalia Gallego Cano** The stellar cusp around the Milky Way's central black hole
16.15	**Julio Alberto Carballo Bello** The origin of the Galactic halo as traced by its globular clusters
16:30	**Merce Romero-Gomez** The complexity and richness of the Galactic disc velocity field unveiled by Gaia DR2
16:45	**Pau Ramos Ramírez** Kinematic structure in the Solar Neighborhood and surroundings with Gaia: a vast richness to explore
17:00	**César Esteban** Improving the determination of Galactic abundance gradients
17:15	**Héctor Estellés Estrella** Lensed gravitational waves from spinning neutron stars by SgA* and globular clusters

VVV and VVV-X surveys: unveiling the innermost Galaxy

Javier Alonso-García

Our knowledge of the innermost Milky Way is seriously hampered by the dust and gas present at low latitude lines of sight. The VVV and the VVV-X surveys can beat these difficulties by observing the Galactic Bulge and inner Disk at near-infrared wavelengths were extinction is highly diminished. Using the 4m VISTA telescope located in Cerro Paranal, the VVV and VVV-X surveys provide wide-field high-resolution images of the highly reddened inner Galaxy in the Z, Y, J, H and Ks near infrared filters.

In my talk I will present a new photometric catalog that we have built with nearly one billion sources from the inner Galactic regions surveyed by the VVV, and the CMDs we were able to build and that allows a detailed description of the inner Galactic stellar populations. I will also report on the proper characterization of the extinction law towards the inner Milky Way that we have obtained. Finally, I will describe VVV-X, the extended VVV survey, that we are currently running over a much bigger area in the inner Galaxy.

Near-Infrared Observations of Galactic Centre

Banafsheh Shahzamanian

Near-infrared polarimetry observation is a powerful tool to study the central sources of the Galactic Center. I will present our results on analyzing the polarized emission present in the central few light years of the Galactic Center region, in particular the non-thermal polarized emission of Sgr A* and the polarized emission of an infrared excess source in the literature referred to as DSO/G2 close to Sgr A* position.

We obtain typical polarization degrees on the order of 20% and a preferred polarization angle of 13 degree. Since the emission is most likely due to optically thin synchrotron radiation, the preferred polarization angle we find is very likely coupled to the intrinsic orientation of the Sgr A* system, i.e. a disk or jet/wind scenario associated with the super-massive black hole. I also investigate the DSO/G2 moving on a highly eccentric orbit around Sgr A*. I use for the first time the near-infrared polarimetric imaging data to determine the nature and properties of this source. I obtain the K-band identification of DSO/G2 in median polarimetry images of different years of observation. We find out that DSO/G2 is an intrinsically polarized source, based on the significance analysis of polarization parameters, with the degree of the polarization of ∼30% and an alternating polarization angle as it approaches the position of Sgr A*. Since the DSO/G2 exhibits a near-infrared excess of Ks-L > 3 and remains rather compact in emission-line maps, its main characteristics may be explained with the model of a pre-main-sequence star embedded in a non-spherical dusty envelope.

The stellar cusp around the Milky Way's central black hole

Eulalia Gallego Cano, R. Schödel, H.Dong, F. Nogueras-Lara,
A. T. Gallego-Calvente, P. Amaro-Seoane, H. Baumgardt

Theoretical stellar dynamics firmly predicts the formation of a stellar cusp in a dense cluster around a massive black hole after a relaxation time. Contrary to expectations, this cusp has not yet been found at the center of the Milky Way. Instead, a core-like structure, indicating a relative lack of red giants, has been found in the surroundings of Sagittarius A*. We have taken on this problem again with improved data analysis techniques to push the limit of completeness due to crowding about one magnitude deeper. We show that K ~ 18 mag stars, which can be expected to be old and therefore dynamically relaxed, show a single power-law density distribution similar to the expected cusp. We conclude that there is good evidence for a stellar cusp at the center of the Milky Way. As a corollary, the lack of red giants may have been caused by collisions, which remove the envelope of the giants and render them invisible.

The origin of the Galactic halo as traced by its globular clusters

Julio Alberto Carballo Bello

Globular clusters have played an important role in the study of the processes that led to the formation of our Galaxy. Moreover, the dual Galactic globular cluster system is considered a manifestation of its hierarchical formation in the context of the Lambda-CDM scenario. Wide-field imaging and spectroscopy are crucial tools to unveil the remnants of their progenitor dwarf galaxies, already assimilated by the Milky Way.

In this talk, I will present our detections of the Sagittarius tidal stream around the globular clusters Whiting1 and NGC7492. Our results confirm that both clusters are inmersed in the stream but only Whiting1 was formed in the interior of the Sagittarius dwarf spheroidal and later accreted. These detections in the southern hemisphere might help us to better understand the orbit of that remarkable halo substructure. The presence of unexpected stellar populations in the direction of massive clusters proves that the surroundings of globulars are among the best places to find disrupted dwarf galaxies in the Galactic halo.

The complexity and richness of the Galactic disc velocity field unveiled by Gaia DR2

Mercè Romero-Gómez, David Katz, Teresa Antoja, et al.

In this talk, we summarise the main results from the Gaia data release (GDR2) science demonstration paper on the Milky Way disc kinematics. GDR2 provides the largest existing full 6D phase-space coordinates catalogue. We benefit for the first time from a sample of 4.9 million stars with full 6-D phase-space coordinates, precise parallaxes (with a relative error less than 20%) and precise Galactic cylindrical velocities (median uncertainties of 0.9-1.4 km/s and 36% of the stars with uncertainties smaller than 1 km/s on all 3 components). The 2.4 million giant stars from this sample map the velocity field of the galactic disc from about 5 to 13 kpc from the galactic centre. We also study the distribution of 0.3 million solar neighbourhood stars (r < 200 pc), with impressive median velocity uncertainties of 0.4 km/s. The maps show the complexity and richness of the velocity field of the galactic disc.

Kinematic structure in the Solar Neighborhood and surroundings with Gaia: a vast richness to explore

Pau Ramos Ramírez, Teresa Antoja, Francesca Figueras

The local distribution of velocities has long been known to contain a wealth of kinematic substructure with different possible origins, from young moving groups and disrupted open clusters, to accretion events or even dynamical resonances with the spiral arms and bar. Therefore, the detection and study of these substructures give us clues on important dynamical mechanisms that affected the Galaxy formation and evolution.

The outstanding quality, homogeneity and size of Gaia DR2 allows for a detailed study of the kinematic substructures with an unprecedented resolution. Here the results of this exploration in the Solar Neighborhood and surroundings as revealed by the Wavelet Transformation will be shown. A rigorous statistical study is performed to assign a robust significance to each substructure found.

One of the first consequences of this exploration will be the assessment of the pattern speed of the bar through the measurement of the location of the Outer Lindblad Resonance that creates the Hercules stream. This, in turn, is key to understanding whether the bar is slow and long or fast and short, which is currently under debate.

Improving the determination of Galactic abundance gradients

César Esteban, Jorge García-Rojas

We present results from very deep spectroscopy of 35 Galactic HII regions taken with GTC and VLT. The objects are located along the Galactic disc, with Galactocentric distances from 5.1 to 17 kpc. We determine the electron temperature for all of them. This is the largest collection of precise determinations of abundances in Galactic HII regions. We obtain - for the first time - the radial abundance gradient of N without assuming an ionization correction factor. We find a flat radial distribution of the N/O ratio, indicating that standard secondary processes do not form the bulk of N. We have made a reassessment of the shape of the radial O abundance gradient using our homogeneous dataset. We confirm the absence of flattening of the O gradient in the outer Galactic disc but, in contrast, we report the possible presence of a drop of the O abundance in the inner part of the Milky Way. This result confirms previous findings from abundance distributions based on Cepheids. Finally, we find that the scatter of the N and O abundances of HII regions with respect to the gradient fittings is not substantially larger than the observational uncertainties, indicating that both chemical elements seem to be well mixed in the interstellar gas at a given distance along the Galactic disc.

Lensed gravitational waves from spinning neutron stars by SgA* and globular clusters

Héctor Estellés Estrella, Pep Covas Vidal

Gravitational waves from astrophysical sources can be gravitationally focused if they propagate near massive objects. For continuous quasi-monochromatic waves (such as those emitted by a rotating neutron star), a characteristic interference pattern may appear at the "observer's plane", with magnifications of the wave amplitude that can reach three orders of magnitude. Since the source can have a relative velocity with respect to us, the pattern is moving respect to the detectors leading to a time-dependent modulation of the signal at the detector, that can help to the identification of these signals.

We study the supermassive black hole Sagittarius A* at the centre of our galaxy and several globular clusters as gravitational lenses for this kind of signals, focusing on their characterization at the detectors and on the optimal search method for the detection. We also discuss the expected rates for these events at current and future detectors.

Vía Láctea y sus componentes / Milky Way and its components (VL6)
Jueves 19 de julio / Thursday 19 July

9:00	**Manuel Linares** A 2.3 solar-mass neutron star
9:15	**Josep Martí Ribas** The first winged microquasar
9:30	**Montserrat Armas Padilla** Broad-band X-ray analysis of neutron star X-ray binaries
[9:45]	**CANCELADA** **Jesús M. Corral-Santana** Long-term study of MAXI J1659-152: the black hole with the shortest orbital period
9:45	**Teo Muñoz-Darias** Wind outflows from accreting stellar-mass black holes
10:00	**Alicia Rouco Escorial** An insight into the low level accretion in Be/X-ray transients
10:15	**Julia Alfonso-Garzón** Optical and X-ray observations of the microquasar V 404 Cyg during its June 2015 outburst
10:30	**Antonia Morales-Garoffolo** On the Nature of OGLE-2013-SN-100: A Peculiar Optical Transient with a Double-Peaked Light Curve and Stripped-Envelope Supernova Spectra
10:45	**PÓSTERES**

A 2.3 solar-mass neutron star

Manuel Linares,Tariq Shahbaz, Jorge Casares

The macroscopic properties of neutron stars depend on how sub-atomic particles interact in their interiors. These interactions, encoded in the equation of state, are specially uncertain in the central regions, where densities exceed that of an atomic nucleus. The maximum mass of a neutron star can discriminate between proposed equations of state. New millisecond pulsars in compact binaries provide a good opportunity to search for the most massive neutron stars.

We present observations and detailed modeling of an extremely irradiated companion to a millisecond pulsar using the Gran Telescopio Canarias. We develop and apply a new method to measure the velocity of both sides of the companion star, and find that the binary hosts one of the most massive neutron stars known to date, with a mass of $2.27^{+0.17}_{-0.15}$ M_{Sun}. A 2.3 solar-mass neutron star would rule out most currently proposed equations of state, casting doubt on the existence of exotic forms of matter in the core.

The first winged microquasar

Josep Martí Ribas, Pedro L. Luque-Escamilla,
Valentí Bosch-Ramon, Josep M. Paredes

Microquasars are stellar binary systems that share strong physical and morphological analogies with extragalactic sources of relativistic jets. In this work, we report very deep radio images of the microquasar GRS 1758-258 in the Galactic Centre vicinity. At sensitivities down to the few microJy level, GRS 1758-258 broadens these already known analogies by including the same 'wing' phenomenon observed in some radio galaxies.

The so called winged radio galaxies display secondary radio lobes, with Z or X-shaped morphologies, whose physical interpretation often invokes the merger of super-massive black holes with spin-flip. GRS 1758-258 remarkably displays Z-type wings too, extending on parsec linear scales as long as the main jet flow. Owing to its stellar nature, the most physically conceivable explanation is based on hydrodynamic backflow when the relativistic ejecta interacts with a nearby cloud. Moreover, CO emission line surveys of the region do confirm the existence of such a cloud at a kinematic distance consistent with that of GRS 1758-258. By extrapolating these findings to the extragalactic case, we conclude that not all winged radio galaxies are to be considered as secure sites of previous black hole coalescence as the alternative backflow scenario could also be at work in many cases.

Broad-band X-ray analysis of neutron star X-ray binaries

Montserrat Armas Padilla

Since the dawn of X-ray astronomy many efforts have been made to model the X-ray spectra of neutron star Low Mass X-ray Binaries. In particular, how the neutron star surface contributes to the different components of the X-ray spectra has been a topic of debate for decades. However, model degeneracy stands in the way of elucidate its specific role.

I will review the state-of-the-art of this problem and present a detailed study of the spectral evolution of the classical neutron star X-ray transient 4U 1608−52 using broad-band X-ray data from the X-ray space observatory Suzaku. Here, we test the proposed, "universal" 3-component model for neutron star low-mass X-ray binaries, which aims to solve the degeneracy problem and naturally explains the properties of the fast variability. I will report on a comprehensive spectral study covering all the classical spectral states. Our results support the idea that black hole and neutron star low-mass X-ray binaries undergo a very similar state evolution during their accretion episodes.

CANCELADA

Long-term study of MAXI J1659-152:
the black hole with the shortest orbital period

Jesús M. Corral-Santana, M.A.P. Torres, T. Shahbaz, E.S. Bartlett, D.M. Russel, A.K.H. Kong, J. Casares, T. Muñoz-Darias, F.E. Bauer, J. Homan, P.G. Jonker, D. Mata-Sánchez, T. Wevers, P. Rodríguez-Gil, F. Lewis, L. Schreuder

In this communication we show 5 years of optical and infrared data of MAXI J1659−152: a black hole candidate in an X-ray binary system. Combining optical data taken during the outburst decay, we obtain an orbital period of 2.414 ± 0.005 h, in perfect agreement with the value previously measured from X-ray dips, being the first optical evidence of this modulation and confirming that this is the black hole with the shortest orbital period ever reported. We also detect the quiescent optical counterpart at r' = 24.20 ± 0.08, I = 23.32 ± 0.02, and H = 20.7 ± 0.1. These magnitudes provide colour indices implying an M2-M5 donor star assuming 60 per cent contribution from a disc component in the r'-band.

Wind outflows from accreting stellar-mass black holes

Teo Muñoz-Darias

X-ray observations performed during the last few decades have provided a rich data base on accreting black holes X-ray binaries. A strong coupling between the properties of the accretion flow and the presence of outflows, such as radio-jets and hot X-ray winds, has been found to be a fundamental characteristic of black hole systems.

In 2015 we discover a sustained optical accretion disc wind, simultaneous with the radio jet, in the prototypical black hole transient V404 Cyg (Muñoz-Darias et al. 2016, Nature / 2017 MNRAS). Here, I will present new VLT and GTC spectroscopic observations of several black hole systems in outburst, which reveal that optical wind outflows with terminal velocities above 1000 km/s and indeed a common feature in these objects. I will discuss the nature these winds as well as their impact in the general context of black hole accretion.

An insight into the low level accretion in Be/X-ray transients

Alicia Rouco Escorial, Rudy Wijnands, Laura Ootes, Aastha Parikh, Nathalie Degenaar, Juan V. Hernández, Alessandro Patruno

I will present the results of several Be/X-ray transients (i.e., GRO J1750-237, 4U 0115+63, GRO J1008-57, GX 304-1, KS 1947+300) after the end of their outbursts when the sources are thought to transit to quiescence. Our monitoring campaigns are focused on studying low-level accretion processes onto the magnetized neutron stars (10^{12}-10^{13} G) present in these systems. We find that some sources decay directly to quiescence, a few systems settle in a decaying low luminosity state during which very short (timescales of only a few days), enhanced accretion episodes occur, while several other systems always stay in an intermediate accretion-rate level with X-ray luminosities of 10^{34}-10^{35} erg/s and never appear to reach quiescence. I will discuss these results in the context of physical processes that could produce the observed phenomena, such as low-level direct accretion onto the neutron star (e.g., due to leakage of matter to the surface or accretion through a cold disk), accretion down to the magnetospheric boundary, or emission associated with the propeller effect that might be active in some systems.

Optical and X-ray observations of the microquasar V 404 Cyg during its June 2015 outburst

Julia Alfonso-Garzón, Phil Charles, Celia Sánchez-Fernández, Miguel Mas-Hesse, Jari Kajava, Mariko Kimura, Jerome Rodriguez, Poshak Gandhi

V404 Cygni is a microquasar that contains a black hole with a mass of about 9 M\sun and an early K giant star. After 26 years of quiescence, this system underwent a very bright outburst in June 2015. During this outburst, multiwavelength observations were performed from ground and space. Here we present the results of an analysis comparing the optical an X-ray emission using data from the INTEGRAL satellite (including observations in the optical band from OMC, in the soft X-ray energy band from JEM-X and in the hard X-ray band from IBIS). We also added some public optical data from the AAVSO and VSNET. From our analysis we observed very different behaviours which we attribute to the different components which emit in the different bands (accretion disc, wind, and jets).

On the Nature of OGLE-2013-SN-100: A Peculiar Optical Transient with a Double-Peaked Light Curve and Stripped-Envelope Supernova Spectra

Antonia Morales-Garoffolo

In this talk, I present optical observations of the peculiar transient OGLE-2013-SN-100. Our photometric I-band data cover ∼ 225 d of its evolution and are complemented by late-time BVR-band photometry and optical spectroscopy collected by the Public ESO Survey for Optical Transients (PESSTO). The object shows a very peculiar double-peaked I-band light curve (LC), with a first peak that reached −17.62 ± 0.30 mag followed by a second one ∼ 85 d later at −18.77± 0.30 mag. The spectra, taken after the second I-band LC peak, show little evolution and similarities to spectra of the stripped-envelope type Ic SN 2005az .

I will discuss several possible scenarios to try to explain the observable characteristics of OGLE-2013-SN-100: a) the progenitor of OGLE-2013-SN-100 suffered an eruption that produced the first peak of the LC followed by a supernova (SN) explosion that gave rise to the second one, b) the transient is the result of a SN explosion and interaction of its ejecta with circumstellar material, c) the first peak of the LC is due to a SN explosion and the second one is powered by a compact remnant (magnetar).

Vía Láctea y sus componentes / Milky Way and its components (VL7)
Viernes 20 de julio / Friday 20 July

9:00	**David Jones** Estrellas binarias centrales de nebulosas planetarias
9:15	**Miguel Santander-García** The missing mass conundrum of post-common-envelope planetary nebulae
9:30	**Elena Manjavacas** Cloud Atlas: HST/WFC3 library spectra of brown dwarfs, low-mass companions and hot Jupiters
9:45	**Pedro Sarmento** iSpec as a new method for spectroscopic parameter determination in the H-band
10:00	**Zaira Berdiñas** Do M dwarfs pulsate? The search with the Beating Red Dots project using HARPS
10:15	**Pere L. Pallé** High precision radial velocity and continuous long-term monitoring of Arcturus with the Hertzsprung SONG echelle-spectrograph
10:30	**Antonio García Hernández** Precise surface gravities of A-type stars from asteroseismology
10:45	**Laura María Sampedro Hernández** A new methodology to calibrate the new generation of wide-field multi-band photometric surveys

Binary central stars of planetary nebulae

David Jones

Planetary nebulae are some of the most strikingly beautiful astrophysical phenomena known, featuring in many glossy coffee-table books and earning them the nickname "cosmic butterflies". It has long been believed that binarity could play an important role in the formation of aspherical planetary nebulae, but it is only now becoming clear how significant binarity may be with observational evidence of a large fraction of surviving binaries inside planetary nebulae.

Recent work has demonstrated that many planetary nebulae host post-common-envelope central stars, with indications that many more might host wider binaries that have avoided the common-envelope spiral in - all of which have had a significant impact on the mass loss evolution of the primary star and therefore on the formation of the planetary nebula. In this talk, I will review the properties of the currently known sample of binary central stars and of their host nebulae, focussing on some of the most important cases and what they tell us about formation of planetary nebulae and binary evolution, in general. Furthermore, I will highlight the importance of these systems in our understanding of other astrophysical phenomena, such as chemically peculiar stars, novae and even the cosmologically important supernovae type Ia.

The missing mass conundrum of post-common-envelope planetary nebulae

Miguel Santander-García, Javier Alcolea, David Jones, Valentín Bujarrabal

Stars of 0.7 to 8 M_{Sun} end their lives as planetary nebulae (PNe), by exposing their inert cores and ejecting their gaseous envelopes into the interstellar medium (ISM). Most PNe show beautiful, aspherical morphologies with high degrees of symmetry, despite their progenitor stars being essentially spherical. Angular momentum provided by a close binary companion has been widely invoked as the main shaping agent that would eject the nebula along preferred axes and planes: the engulfment of the companion by the Asymptotic Giant Branch (AGB) star into a common envelope (CE) would trigger a very brief phase (1-10 years) in which the orbit would shrink substantially due to drag forces, thus providing gravitational energy and angular momentum to eject this CE into a bipolar PN. The evolution of the AGB would be thus interrupted abruptly, its (still quite) massive envelope fully ejected to form the PN. In other words, PNe ejected through this process should be substantially more massive than those coming from single AGB stars, where most of that material was deployed into the ISM long ago, and is now too diluted to be detectable.

Even though models succesfully predict the equator of these PNe to coincide with the orbital plane of the binary star -as occurs in every single case analysed so far- they mostly fail on achieving escape velocities for the ejected material with the assumed angular momentum and gravitational energy reservoirs.

We present observations of a pilot sample of confirmed post-CE PNe in the molecular regime, together with estimates of their total (atomic+molecular) mass content and linear momenta, in order to better understand their nature, and constrain models of formation. We find the nebular mass of our sample to be significantly lower than expected for an AGB envelope, leading us to wonder if models actually work for the actual masses involved, and also to raise some doubts on our understanding of the formation of these intriguing beasts.

Cloud Atlas: HST/WFC3 library spectra of brown dwarfs, low-mass companions and hot Jupiters

Elena Manjavacas, Dániel Apai, Yifan Zhou, Theodora Karalidi, Ben W. P. Lew, Glenn Schneider, Nicolas Cowan, Stan Metchev, Paulo A. Miles-Páez, Adam J. Burgasser, Jacqueline Radigan, Luigi R. Bedin, Patrick J. Lowrance

We present a collection of uniform, hight quality HST/WFC3 near infrared spectra (1.1-1.69 microns) of brown dwarfs, low-mass companions and Hot Jupiters. In our work, we provide a detailed characterization of those spectra to study the potential peculiarities of each of them including: uniform spectral classification in the near infrared, search of potential young brown dwarfs and potential composite spectra brown dwarfs, determination of effective temperatures, surface gravities and metallicies using Marley et al. (2015) atmospheric models, and comparison of brown dwarfs and Hot Jupiter spectra.

The goal of our study is to provide a very high quality, uniform dataset on a broad range of ultracool atmospheres, allowing quantitative comparisons and parameter studies as well as a spectral library of high legacy value in the era of the James Webb Space Telescope.

iSpec as a new method for spectroscopic parameter determination in the H-band

Pedro Sarmento, Elisa Delgado Mena,
Bárbara Rojas-Ayala, Sergi Blanco Cuaresma

Spectra in the near-infrared wavelength range are becoming alternatives to observations in the optical for spectroscopic parameter determination. Examples such as CARMENES and APOGEE are providing better resolution spectra in these wavelengths, and as such a method to provide reliable parameters from these spectra will be an important tool for the future.

Using iSpec package as a base, we modified the code to automatically generate synthetic spectra to match APOGEE observations, as well as high-resolution Sun and Arcturus H-band spectra.

We created an optimized line list for the code combining both VALD (Vienna Atomic Line Database) and a line list from APOGEE to match the dwarf star features in the H-band. Three different codes (Turbospectrum, SYNTHE, SPECTRUM) were tested, with Turbospectrum emerging as the best one for deriving stellar parameters, as it provides the smallest errors and best synthetic spectra.

We will present our new method to determine effective temperature, metallicity and surface gravity for FGKM dwarfs in the APOGEE survey using the spectrum synthesis capabilities of iSpec, that can be useful for other high-resolution spectrographs covering the same wavelength range.

It was concluded that iSpec can be used to derive parameters within a degree of error from measurements in the optical (100K for effective temperature, 0.1 dex for metallicity, and 0.2 dex for surface gravity) for FGKM dwarfs.

Do M dwarfs pulsate? The search with the Beating Red Dots project using HARPS

Zaira Berdiñas

Only a few decades have been necessary to change our picture of a lonely Universe. Nowadays, red stars have become one of the most exciting hosts of exoplanets (e.g. Proxima b or Trappist-1, Anglada-Escudé et al. 2016, Gillon et al. 2017). However, the most popular techniques used to detect exoplanets (i.e. the radial velocities and transit methods) are indirect. As a consequence, the exoplanet parameters obtained are always relative to the stellar parameters. The study of stellar pulsations has demonstrated to be able to give some of the stellar parameters with typical precisions down to 5%, thus accordingly decreasing the uncertainties of the mass and radii estimated for the exoplanets. Theoretical studies predict that M dwarfs can pulsate, i.e. they can drive and maintain stellar oscillations, but no observational confirmation has been reported yet. The Beating Red Dots project uses the HARPS and HARPS-N high-resolution spectrographs with the aim of detecting M dwarfs pulsations for the first time. In this talk I will summarise our results and present our promising candidates.

High precision radial velocity and continuous long-term monitoring of Arcturus with the Hertzsprung SONG echelle-spectrograph

Pere L. Pallé, C. Régulo, T. Roca Cortés, J.A. Belmonte,
F. Pérez Hernández, F. Grundahl, M.A. Andersen
and the SONG Team

The successful operation of the first robotic node of the SONG (Stellar Observations Network Group) at the Observatorio del Teide, has allowed an unprecedented observing campaign over 3 consecutive years (2016-2018) and on a daily basis, of the high-precision radial velocity of the "reference" star Arcturus (α Boo), and evolved red giant similar to our future Sun. Although this star has been observed over the past decades, many basics questions remain open concerning its nature (simple or multiple system), its location at the H-R diagram (RGB or AGB) and global parameters (mass, age) as a consequence of the lack of a proper asteroseismic characterization (i.e., determine the parameters $\Delta\nu$ and ν_{max}) that allows a very precise determination of its mass, radius and age as we learnt from the analysis of many observed Kepler targets.

The analysis of the exquisite data gathered over 3-year consecutive and continuous measurements of its radial velocity with a precision below 1.2 m/s per point, has allowed to firmly stablish its long-term variation (period about 170 days and amplitude of ~200 m/s) -interpreted in terms of its magnetic activity- and the characteristics of its spectrum of normal modes of oscillation (periods around 2-days) including proper identification of individual modes. From this asteroseismic inference, a better determination of its mass become possible and further (with support of ad-hoc modelling) to derive strong constraints of its location at the HR diagram (most likely at the AGB phase).

In this presentation, a full review on the analysis performed in this unique set of data will be presented as well as updated inferences concerning the global properties of Arcturus: a non-yet well understood (as commonly thought) star, the brightest in the Northern hemisphere.

Precise surface gravities of A-type stars from asteroseismology

Antonio García Hernández, J. C. Suárez, A. Moya, M. J. P. F. G. Monteiro, Z. Guo, D. R. Reese, J. Pascual-Granado, S. Barceló Forteza, S. Martín-Ruiz, R. Garrido, J. Nieto

In this work we demonstrate that it is possible to accurately determine surface gravities of pulsating A-type stars (Delta Scuti stars) just using their oscillation frequencies. From a sample of 10 eclipsing binary systems and the unique Delta Scuti discovered with a transiting planet, WASP-33, we were able to refine the large separation-mean density relation. A-type stars are knwon to be usually fast rotators but we have demonstrated in previous works that this relation is independent of the stellar rotation rate. We used high-precision photometry (MOST, CoRoT & Kepler) and a measurement of the parallaxes (Hipparcos & Gaia). With all these ingredients, we have obtained independent values for the masses and radii. This allowed us to calculate the surface gravities without any constraints from spectroscopic or binary analysis. A remarkably good agreement was found between our results and those published, extracted from the analysis of the systems' radial velocities and light curves. This result reinforces the potential of the large separation as a valuable observable for Delta Scuti stars and settles the degeneracy problem for the surface gravity determination through spectroscopy.

A new methodology to calibrate the new generation of wide-field multi-band photometric surveys

Laura María Sampedro Hernández, Alberto Molino, Marcus Duarte

We present an alternative calibration strategy for the new generation of wide-field photometric surveys with non-standard filter systems. Taking advantage of the tremendous effort undertaken by other previous surveys which derived absolute photometric calibrations of millions of stars in the sky, it is feasible to derive quick and robust zero-point calibrations (up to a few percent error level) without needing to devote large campaigns to the repetitive observation of standard fields. Rather than relying on complicated theoretical transformation equation among filter systems, the methodology aims at retrieving on-the-fly empirical library of stellar models to be used as if they were spectro-photometric stars with which to automatically calibrate different filter systems. Realistic simulations, considering different observational scenarios, show the reliability of this technique.

The methodology can be applied to photometric surveys such as the S-PLUS (Mendes de Oliveira et al. in prep.), J-PLUS (Cenarro et al., submitted) and J-PAS (Benitez et al., 2014).