FOF 2026 – Conference proceedings

Monday 6 April

Lucas Macri** - ***The Hubble Tension in light of JWST
Abstract: A precise and accurate measurement of the Hubble constant (H0) can serve as a powerful test of the cosmological model. Several independent techniques are yielding estimates of H0 that are ~8% (and ~7 sigma) higher than predictions based on the "Lambda CDM" cosmological model, anchored by observations of the Cosmic Microwave Background.I will review the observational progress in this field over the last decade, including recent results from JWST, and some of the theories that have been proposed to resolve this "Hubble tension", which point towards possible new Physics in the dark sector.

Tomás Hough - ***Cool-core clusters in The Three Hundred Project***
Abstract: Over the past few decades, numerous observational studies have shown that about one third of galaxy clusters exhibit rapidly cooling gas, intense X-ray emission, and an excess of entropy in their inner regions, which leads to a concentration of cold gas in the cluster core. These objects are known as "cool-core clusters". However, there is an ongoing debate in the literature about which are the physical mechanisms responsible for this phenomenon. Within the ThreeHundred Collaboration, we explore the presence of cool-core clusters in the hydrodynamical simulation GadgetX, and study how the dynamical state of the cluster influences the thermodynamical properties of the ICM in the central region of the most massive galaxy clusters.

Nelson Padilla - ***Galactic conformity: a simple two-halo model and its link to assembly bias***
Abstract: Galactic conformity has been the subject of intense study because it probes correlations between the baryon physics of galaxies over very large separations. However, simulations show that removing galaxies near massive halos strongly suppresses the signal. I will show that the same operation also reduces the amplitude of assembly bias, defined as the difference in large-scale bias at fixed halo mass between quenched and star-forming galaxies, and that changes in conformity closely track changes in this assembly-bias amplitude. This points to a tight connection between the two phenomena. I will then present a simple model for the two-halo component of galactic conformity, written entirely in terms of standard galaxy auto- and cross-correlation functions, which accurately reproduces the measured signal down to small separations. In this framework, two-halo conformity is not an independent statistic, but a specific combination of familiar correlation functions weighted by assembly bias.

Hermano Endlich Schneider Velten** - ***Bulk Viscosity from thermalization of cosmic fluids
Abstract: If nonrelativistic dark matter and radiation are allowed to interact, reaching an approximate thermal equilibrium, this interaction induces a bulk viscous pressure changing the effective one-fluid description of the universe dynamics, permitted by the existence of a common temperature. It has been shown that by modelling such components as perfect fluids, a cosmologically relevant bulk viscous pressure, expressed in terms of the Eckart formalism, emerges for dark matter particle masses in the range of 1 eV−10 eV keeping thermal equilibrium with the radiation. Such a transient bulk viscosity introduces significant effects in the expansion rate near the matter-radiation equality redshift, impacting also late times leading to a higher inferred value of the Hubble constant H0. We also speculate on the application of this mechanism to the transition from matter to dark energy dominance.

Enrique Paillas** - ***Fundamental Cosmology with Galaxy Clustering

Abstract: Galaxy clustering provides a precision probe of the expansion rate of the Universe and the growth of structure within it, enabling tests of dark energy and gravity that are highly complementary to other cosmological probes. In this talk, I will review the latest findings of galaxy clustering science with the Dark Energy Spectroscopic Instrument, covering the dynamical dark energy findings from baryon acoustic oscillations, the growth rate measurements from a full-shape analysis of the galaxy power spectrum, and our new prospects for accessing the non-linear, non-Gaussian regime using simulation-based forward models powered by deep learning.

Candela Cerdosino - ***Using multiplicity of Lyman-alpha galaxy multiples to assess star formation activity in dark matter halos***

Abstract: Lyman-Alpha Emitting galaxies (LAEs) are typically young, star-forming galaxies characterized by prominent Lyα emission. They can be efficiently detected with ground-based observations, offering valuable insights into the high-redshift Universe. In particular, LAEs are key to understanding star formation during this epoch and its connection to the properties of their host halos. In this study, we investigate whether multiple LAEs can serve as reliable proxies for dark matter halo masses and other structures. We examine how their radiative properties relate to halo characteristics and multiplicity. Our analysis combines observational data from the One-hundred-deg2 DECam Imaging in Narrowbands (ODIN) survey, which target LAEs in three narrow redshift intervals, with mock catalogs from the IllustrisTNG100 simulation. Furthermore, we introduce a subhalo-based, perturbation-induced star formation model to reproduce the distribution of minimum subhalo masses in simulations. Our results suggest that local gravitational perturbations, rather than the presence of LAE companions, are the primary drivers of star formation activity in these systems.

Julieta Paola Storino - ***Three-Dimensional Segmentation of Cosmological Simulations for Cosmic Void Detection***

Abstract: Cosmic void identification and delimitation remain challenging due to the absence of a unique definition and their intrinsically irregular morphology. Most existing methods rely on simplified, regular geometries and can be highly sensitive to redshift uncertainties, while also becoming computationally expensive at large scales.In this work, we propose a novel void identification approach based on deep-learning image segmentation, using the promptable foundation model Segment Anything Model (SAM) to detect cosmic voids in three-dimensional simulations of the matter distribution. The model is evaluated in a zero-shot setting and its performance is compared with classical algorithms such as the Spherical Void Finder (SVF) and the Popcorn Void Finder (PVF), evaluating its ability to capture subtle density features associated with underdense regions, enabling fast and robust void detection.

Silvio Rodriguez Moncada - ***The connection between surface brightness and satellite systems for central galaxies through Illustris TNG***

Abstract: We analyse different properties of central low-surface-brightness galaxies (LSBGs) and their satellite systems using the simulation Illustris TNG-100, in order to deepen our understanding of the formation mechanism of LSBGs in a ΛCDM cosmology. We find differences in the spin and the concentrations of the LSBGs haloes and the host haloes of high-surface-brightness galaxies (HSBGs), consistent with previous studies. By analysing their spatial and kinematical distribution of satellites, we find that LSBGs tend to have a larger number of satellites than HSBGs and with a larger velocity dispersion. Moreover, we obtain a continuous relation between the number of satellites and surface brightness, particularly for massive central galaxies. We also find a relation between surface brightness and the relative tangential velocity of the satellites. For a given stellar mass, the existence of LSBGs is strongly correlated with their satellite system dominated by rotation. Furthermore, the satellite system is systematically in counter-rotation with respect to the primary disc in LSBGs. We propose that this fact reflects that these galaxies have not experienced a

significantly high rate of mergers, which are more likely associated with radial orbits expected in systems of galaxies with a high surface brightness.

Juan Diego Racker - ***Effects of helium sedimentation on late star formation in galaxy clusters***

Abstract: We will discuss how helium sedimentation in galaxy clusters can affect the history of star formation in the central cluster galaxy. As helium sediments, the gas density in the inner regions of the cluster increases and there is also a non-trivial, radially dependent redistribution of the atomic nuclei and electrons. As a result, the cooling rate in the center increases and this can enhance star formation. On the other hand, there is a slow contraction of the intracluster gas, which may induce gravitational heating and therefore has an opposite effect on star formation. In this talk we will present our latest results about these effects.

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Tuesday 7 April

Claudia Scóccola -** ***Challenges and open directions in CMB B-mode data analysis
Abstract: The search for primordial B-mode polarization in the Cosmic Microwave Background (CMB) is still one of the main problems in observational cosmology. Even with the significant progress of recent years, extracting robust cosmological information from current and upcoming data remains far from straightforward. In this talk, I will discuss some of the key challenges that shape current CMB B-mode analyses and how they affect the interpretation of the data. I will also comment on a few open directions that are currently being explored, with the goal of improving how we extract information from these observations.

Marcelo Rubio - ***Beyond ΛCDM: nonlinear dynamics from self-interacting vector fields***
Abstract: Massive vector fields with nonlinear self-interactions contribute dynamically to cosmic expansion and structure growth beyond the standard ΛCDM paradigm, particularly through modified gravity and dark-sector theories. Such fields can alter the evolution of density perturbations and influence dark-matter halo profiles, being able to even leave observable imprints in galaxy alignments and gravitational lensing. Nonetheless, numerical simulations of the corresponding Cauchy problem often exhibit instabilities interpreted as physical pathologies. In this talk I will show that these issues, instead, arise from a breakdown of the well-posedness of the initial-value problem, similarly to what occurs in scalar-tensor theories with derivative self-interactions. Extending recent methods developed for k-essence theories, I will classify these breakdowns into Tricomi and Keldysh types, showing that stable evolutions can be recovered by appropriately "fixing" the equations. Finally, I will give an example of a class of vector self-interactions in which no breakdown occurs, and explore initial data leading to gravitational collapse and black-hole formation.

Facundo Toscano - ***The effect of the Local Universe in the CMB***
Abstract: In this talk I will present the most recent results of our group related to the discovery of a systematic effect on the CMB temperature maps when we consider the nearest local structures in the Universe. Being statistically significant results compared to simulations from the Planck Collaboration, I will show how nearby galaxies and filaments have a negative temperature profile while local voids have positive temperatures. Furthermore, I will explore the possibility of obtaining different cosmological parameters taking into account this new extragalactic foreground. Finally, I will show how these galaxies could be a solution for the famous CMB Cold Spot.

Dante Paz - ***Voids as Cosmological and Astrophysical Laboratories***
Abstract: In this talk, I will show how cosmic voids serve as privileged environments for investigating key phenomena in cosmology and astrophysics, including topics as diverse as primordial magnetic fields, primordial non-Gaussianities, modified gravity models and galaxy formation. I will present the main results of the research lines I am involved in highlighting the tools, methodologies, and data we have developed. These resources may also be of interest for collaborative use. I will also describe how the unique dynamics of voids contribute to advancing our understanding of the structure and evolution of the Universe.

Fabio Iocco** – ***Astrophysical unknowns in the search for Dark Matter's nature
Abstract: As an Astroparticle physicist working as a phenomenologist, I often use the results of numerical simulations without fully appreciating the subgrid physics and the underlying assumptions made in the process of simulation. As many colleagues of my branch, I am therefore often left with questions about the generality of some of the results obtained, and the level at which

they should be trusted, challenged, or expected to be sensible to input variables. In this talk I will bring my questions, and their motivations, to the attention of the friends of the simulation community (and their friends as well), in the hope of generating a stimulating dialogue.

Nicolas Augusto Kozameh - ***An optimised Likelihood and Bayesian code for cosmological parameters exploration using ATOM cluster***

Abstract: We have used HPC (high-performance computing) for optimising a bayesian code for cosmological analysis using the popular cosmo code Cobaya (Torrado & Lewis, 2020) to obtain Markov Chain Monte Carlo chains. Our first steps to face this problem were the OpenMP techniques in a supercluster with 48 cores. Our goals were to produce an increase in the chains while we were increasing the number of threads. However, we found the best performance at 12 threads. Thus, consequently, we couldn't get the best use for the available resources. However, we propose a possible solutions for a better utilization of them

Andres Perez -** ***From Smooth to Stochastic: Galactic Supernova Fluxes of MeV Particles and Their Detection

Abstract: New exotic particles with MeV masses, such as axion-like particles or light dark matter, can be emitted from core-collapse supernovae (SNe) with semi-relativistic velocities and reach Earth as an extended packet due to their speed dispersion. It has been argued that the superposition of contributions from past galactic SNe gives rise to a smooth and stationary diffuse flux that could be observable in terrestrial detectors. In this talk, I will review the smooth flux framework and then re-examine this hypothesis by carrying out a numerical simulation of the galactic history of SN explosions. Due to the long time spread of individual SN contributions and the short observational time window, each one contributes only with a very narrow range of energies. As a result, the flux at Earth is not smooth but instead exhibits a stochastic energy spectrum that depends on the spatial and temporal distribution of SNe, as well as on the mass of the new particle. This treatment has important implications for the expected signal, which displays a spectral shape that is not properly described by the smooth approximation, and also allows us to explore sub-MeV particles. Finally, I will revisit existing bounds on axion-like particles and fermionic dark matter using neutrino water Cherenkov detectors and direct detection dark matter experiments, finding weaker constraints than previously reported.

Federico Stasyszyn - ***Magnetic fields as cosmological probes***

Abstract: Cosmic magnetic fields are a pervasive yet still poorly constrained component of the Universe. Their origin, evolution, and impact on structure formation remain open questions, closely linked to fundamental cosmological processes. We explore the potential of magnetic fields as cosmological probes, capable of encoding information about early-Universe physics, large-scale structure growth, and baryonic feedback mechanisms. Using state-of-the-art magnetohydrodynamic simulations, we investigate how a primordial magnetic field evolves in different cosmologies, looking for possible magnetic field observables that will link them with the corresponding cosmological parameters. By connecting simulated magnetic field properties with observable tracers, including Faraday rotation, synchrotron emission, and ultra-high-energy cosmic-ray deflections, we can establish magnetic fields as complementary probes of cosmology. This approach opens a new observational window on the thermal and dynamical state of the cosmic web, providing independent constraints on structure formation and the physical conditions of the early Universe.

Analía Smith Castelli - ***The S-PLUS Fornax Project (S+FP)***

Abstract: The Fornax cluster ($D \approx 20$ Mpc), the nearest rich cluster in the southern sky, is a dynamically young system composed of two merging substructures and embedded in filaments that channel the accretion of gas, galaxies, and groups. Its ongoing assembly makes it an

ideal laboratory for studying environmentally driven galaxy transformation. Despite nearly a century of study, only ~23% of Fornax's candidate members have spectroscopic confirmation, and most previous work has focused on the region within the virial radius. Wide-field photometric surveys such as S-PLUS, which images large sky areas in 12 optical bands, now enable detailed multi-band analyses of the cluster over much larger scales. The S-PLUS Fornax Project (S+FP; Smith Castelli et al. 2024) covers ~208 deg² around NGC 1399 to investigate the evolutionary history of Fornax galaxies. With S-PLUS multi-band photometry, we have mapped Hα+[N II] emission in confirmed members (Lopes et al. 2025), identified globular cluster (Lomelí-Nuñez et al. 2025) and galaxy candidates (Haack et al., submitted) out to ~5 virial radii, and performed spatially resolved stellar-population analyses (Thainá-Batista et al. 2023). Our results reveal a strong radial gradient in star formation, signatures of pre-processing, a substantial population of candidate metal-rich globular clusters in the outskirts, and a set of peculiar blue elliptical galaxies, highlighting the power of S-PLUS for unveiling the assembly and evolution of Fornax. In its final stage, the S+FP will extend its analysis to the Dorado–Fornax–Eridanus connection to investigate how infalling groups and filaments contribute to the build-up of the cluster. In this talk, we will present updated results for Fornax and preliminary findings for the southern portion of this filamentary structure, specifically the Dorado–Fornax connection.

Rodrigo Facundo Haack - ***The Eridanus-Fornax-Doradus Filament: An ideal scenario for studying the formation and evolution of galaxies in diverse environments. Estimating galaxy properties using AI with S-PLUS data***

Abstract: The Fornax cluster, located at a distance of ~20 Mpc, is the closest galaxy cluster after the Virgo cluster. Fornax is particularly interesting for studies on galaxy formation and evolution due to its dynamic structure, with a central concentration dominated by NGC 1399 and a significant population of dwarf galaxies. It also has a secondary substructure centered on NGC 1316 (Fornax A), which is falling toward the main structure. The Fornax cluster and the Eridanus group of groups appear to form a linear structure connected to the more dispersed Doradus group, constituting the Eridanus-Fornax-Doradus complex or filament. Extragalactic observational catalogs covering large areas of the sky are essential for revealing the large-scale structure of the Universe. Among other things, they enable cosmological studies and density analyses that impose strong constraints on models of galaxy formation and evolution. Taking advantage of the wide-field images and 12 optical bands of the Southern Photometric Local Universe Survey (S-PLUS), our goal is to provide a catalog of galaxies located, in projection, toward the Fornax galaxy cluster, within ~ 5 viral radii in right ascension (RA) and ~ 3 viral radii in declination (DEC) around NGC 1399. This catalog will

enable unprecedented large-scale structure studies in this region of the sky. Supervised deep learning algorithms have been developed using neural networks complemented by dimensionality reduction techniques to classify and separate spurious objects, stars, and galaxies in a photometric catalog previously obtained for the S-PLUS Fornax Project (S+FP). The completeness of the catalog was calculated by comparing it with simulated catalogs. Photometric redshifts (zphot), stellar masses, SFR, and D4000 index estimates were obtained using a machine learning approach, combining S-PLUS photometric data with SDSS spectroscopic data. A catalog of 119,580 galaxies in the direction of the Fornax galaxy cluster was obtained, containing photometric information in the 12 optical bands of S-PLUS, complemented by GALEX (UV), VHS-VISTA (NIR), and AllWISE (MIR) data for all these galaxies. Taking into account the zphot estimates, we were able to identify 118,785 background galaxies and find 795 candidates for Fornax members not previously described in the literature. We were also able to classify the galaxies in our catalog as inactive (43%), star-forming (39%), and transitioning (18%), as well as identify 181 emission line galaxy (ELG) candidates in the area covered by S+FP. In this talk, we will also discuss two ongoing parallel projects. On the one hand, one of them aims to provide a new updated estimate of M200 for the Fornax cluster. On the other hand, an analysis of the Pandora cluster (Abell 2744) with DECam data.

Ailen Callen - ***Compact groups of galaxies in DESI***

Abstract: We present a new spectroscopic catalogue of compact groups of galaxies (CGs) identified in the Dark Energy Spectroscopic Instrument (DESI) survey, together with an analysis of their global properties. The sample is constructed from the DESI Data Release 1 main galaxy catalogue using Hickson-like selection criteria. The survey depth and spectroscopic completeness of DESI enable the identification of a statistically significant CG population at intermediate redshifts ($0.01 < z < 0.4$). The resulting catalogue contains several thousand systems, making it one of the largest spectroscopic CG datasets to date and providing a solid basis to investigate the evolution of their galaxy populations and environmental effects.

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Wednesday 8 April

Vasiliki Fragkou - *Planetary Nebulae Physically Associated with Star Clusters: New Insights into Low-to-Intermediate Mass Stellar Evolution Studies

Abstract: Stellar evolution studies are hindered by the lack of a solid link connecting the initial and final stellar properties, which is crucial for understanding how stars evolve and contribute to the chemical enrichment of galaxies. This key problem can be resolved by studying stars that are both members of well-characterized star clusters and at the final stages of their evolution. In such cases, their final properties can be determined from direct measurements, while the properties of their progenitors can be inferred from independent cluster studies. Here, we focus on the study of planetary nebulae that are confirmed members of Galactic open star clusters. Although such systems are very rare, with only five confirmed to date, they reveal extreme and otherwise undetectable planetary nebula properties and provide new insights into the evolution of low-to-intermediate mass stars.

Tomás Krilich - *Spectroscopic Characterization of Wolf–Rayet Stars in Open Clusters*

Abstract: Wolf–Rayet (WR) stars represent a short and extreme evolutionary phase of massive stars, characterized by strong stellar winds and broad emission lines. Understanding their physical properties and environmental impact is essential for constraining massive star evolution and feedback in young stellar systems. In this work, we present a spectroscopic study of WR stars located in Galactic open clusters. The main goal is to derive their fundamental parameters and investigate their role within their host clusters. We obtained optical integrated spectra of the clusters and individual spectra of the WR using the 2.15-m telescope at CASLEO. These observations are used to perform spectral synthesis, and each individual WR spectrum is compared with synthetic spectra computed with the PoWR atmosphere models in order to constrain stellar temperatures, mass-loss rates, and wind properties.

Olga Maryeva *- Nebulae as footprints of stellar interaction and evolution*

Abstract: Circumstellar nebulae and shells can be found around a variety of astrophysical objects. Their formation may have different origins but, in most cases, is linked to mass ejections at late stages of stellar evolution and to various types of interaction in binary systems. Circumstellar nebulae can therefore be considered indicators of past close interactions and of evolved massive stars in unstable transition phases. In this talk, I will present a few interesting stars with circumstellar nebulae that were recently discovered in infrared images from the WISE all-sky survey. CPD–64° 2731 is a merger product, Wray 15–906 is a blueward-evolving post–red supergiant star and a new Galactic luminous blue variable (LBV) candidate, and HD 215575 is a runaway star.

Susana Beatriz Araujo Furlán - *Giant pulses from a magnetar: a comprehensive study*

Abstract: We observed magnetar XTE J1810−197 between 29 September 2022 and 14 July 2023 with the radio telescopes at the Argentine Institute of Radioastronomy (IAR). We searched for single pulses in time series at a DM range of 100–400 pc cm−3 , with a threshold in signal-to-noise ratio (S/N) of 8. We folded each observation to obtain an integrated pulse profile. We also analyzed archival X-ray observations of the MAXI instrument from the same period, and studied the flux evolution and the magnetar's activity. We found 249 giant pulses at a DM mean value of 178.8 ± 0.1 pc cm−3 . We measured peak flux densities up to 119 Jy, and

fluences up to 58 Jy ms. We fitted a power law distribution to the flux density, obtaining an index of −4.0 ± 0.3. We observed a maximum rate of approximately 15 pulses per hour on 20 February 2023, followed by an abrupt disappearance of transient radio emission, indicating a transition to a less active state. The brightest single pulses are limited to a ~2% of the rotational phase and have similar fluence values to the reported intermediate FRB-like bursts of SGR 1935+2154. No significant X-ray activity in the MAXI data was detected during the radio observing period. This is the first study of single radio pulses of a magnetar using IAR data, showing the potential of the upgraded telescopes for investigating the transient radio sky. The properties of the single pulses detected here show the magnetar transient nature and capability to emit high-luminosity pulses. We compared the detected emission to FRB-like bursts and single pulses emitted by SGR 1935+2154. Even though the mechanism producing all the events should be coherent, the luminosity of the events, features on the dynamic spectra, and the difference between being phase confined or not, indicate that XTE J1810−197 presents GP emission, while SGR 1935+2154 only shows normal single pulses or FRB bursts. This could indicate that the conditions for producing each type of event differ.

Sergio Paron -** ***Probing the interstellar medium via its molecular content

Abstract: Molecular species are fundamental diagnostics for studying the physical and chemical conditions of the interstellar medium (ISM). In this talk, I will explore how molecular transitions allow us to probe the evolution of different ISM structures, particularly within star-forming regions. I will highlight the crucial role of astrochemistry as a multidisciplinary field and present recent results from our research group, in which both simple and complex molecules have been analyzed to characterize the chemistry and physics of various interstellar processes.

Walter Weidmann - ***A Window into Stellar Evolution: Discovery of Two New Members of the Rare O(He) Stellar Class***

Abstract: O(He) stars represent one of the rarest stellar spectral classes known, with only four objects previously identified. In this presentation, I report the discovery of two additional O(He) stars, both of which are central stars of planetary nebulae. Their spectra reveal the characteristic helium-dominated atmospheres and extremely high temperatures that define this peculiar class. The observational data were obtained with the GEMINI telescopes, whose sensitivity and spectral resolution were essential for confirming the nature of these objects. The addition of these two new members significantly enlarges the small sample of known O(He) stars and provides valuable clues about their origin.

Luis Lomeli -** ***Stellar clusters in nearby spiral galaxies

Abstract: Stellar clusters are among the most visible characteristics of galaxies. Studies have shown that late-type galaxies host two distinct populations of stellar clusters (e.g., Simanton et al. 2015a): an older component (globular clusters) and a younger one (open clusters). Investigating these different populations can provide valuable insights into the evolution and current state of galaxies (Pérez et al. 2013). According to the hierarchical model of galaxy formation, the current state of galaxies is shaped by a long history of interactions and mergers of smaller elements. One consequence of this model is the continuous formation of stars, meaning that stellar clusters of all ages should be observed in galaxies. Observational studies have focused primarily on old clusters (e.g., Zepf & Ashman 1993, Ashman & Zepf 1998, Brodie & Strader 2006) and young clusters (e.g., Larsen & Richtler 1999, Bica et al. 2003). More recently, with the aid of the HST, studies have introduced a new class of stellar clusters (e.g., Whitmore et al. 1999 for the Antennae, Mayya et al. 2008 for M82, Santiago-Cortés et al. 2010 for M81, Lomelí-Núñez et al. 2022). These so-called super stellar clusters (SSCs) share characteristics with globular clusters (e.g., mass, compactness) and are considered to be in an intermediate evolutionary stage, preceding the formation of globular clusters. In this seminar, we will discuss the properties of different kinds of stellar clusters.

Alejandra Martinez-Bezoky - ***What integrated spectra reveal about globular clusters?: A spectral synthesis approach.***

Abstract: Globular clusters are among the oldest objects in the Milky Way and constitute privileged laboratories for exploring stellar evolution and the early formation of the Galaxy. However, characterizing their stellar populations from integrated spectra remains challenging, particularly when spatially limited regions are considered. In this work, we present a spectral analysis of five galactic globular clusters (NGC 6316, NGC 7078, NGC 1261, NGC 6864, and NGC 6934), combining integrated spectra from the WAGGS project with our own observations obtained with the Jorge Sahade Telescope at CASLEO, and incorporating data from the Schiavon (2005) spectral library for two of the clusters. Our spectra cover more extended spatial regions than those included in WAGGS, providing a more representative view of the stellar populations. This study highlights the added value of combining proprietary observations with public spectral libraries to deepen our understanding of the oldest stellar populations in the Galaxy.

Romualdo Eleutério - ***A New Perspective to Uncover Cataclysmic Variables***

Abstract: Cataclysmic variables (CVs) have mostly been identified through the detection of their optical outbursts or X-ray emission. These methods favor objects with high variability and frequent outbursts and those with high X-ray luminosities. However, these methods are ineffective for discovering CVs with rare outbursts and low X-ray luminosities, including WZ Sge-type dwarf novae and low-luminosity intermediate polars between magnetic and non-magnetic systems. Overreliance on these techniques can lead to an underestimation of the true population of CVs and biases against certain subclasses, and hence an imperfect understanding of the evolution and physical properties of CVs. Recently, we have developed an alternative approach to optical spectroscopy for revealing CVs that may help to fill the gaps. It takes advantage of color-color diagrams and spectral energy distributions from the 5 broad and 7 narrow-band photometry offered by the Southern Photometric Local Universe Survey (S-PLUS). Our team has recently shown the potential of S-PLUS in revealing CVs while presenting 10 new systems, whose nature was validated through optical spectroscopy obtained with GMOS/Gemini-South. Here, we present the methodology and preliminary results from its application to the S-PLUS as a whole. We highlight not only the discoveries but also the potential of S-PLUS, based on an 83 cm Brazilian robotic telescope in Chile, to contribute to the characterization of CV candidates from other surveys, such as the X-ray survey conducted with the eROSITA and the upcoming Legacy Survey of Space and Time in the optical.

Cintia Fernanda Martinez - ***Hα profile variation in HD 119285: a proof of the occurrence of flares***

Abstract: We present a study of the temporal variability of the Hα line profile in the RS CVn–type system HD 119285, aimed at investigating the impact of strong stellar magnetic activity on chromospheric diagnostics and providing evidence for the occurrence of stellar flares. The system consists of a red giant primary star and an unseen main-sequence secondary companion, and the analysis focuses on the chromospheric activity of the primary component. This work is based on a long-term spectroscopic dataset spanning more than 20 years, obtained within the framework of the

HKα Project initiated in 1999 by the Instituto de Astronomía y Física del Espacio (IAFE). The extended temporal coverage enables the characterization of long-term changes in the chromospheric structure of the star through the analysis of Hα line morphology. The observed profiles exhibit significant variability, including changes in emission strength, asymmetric variations in the blue and red wings, and different degrees of line-core filling. These features reveal dynamic chromospheric conditions and enhanced magnetic activity. The most pronounced profile variations, characterized by strong emission and marked asymmetries, are interpreted as signatures of energetic events, providing evidence of flare occurrence in the system. Our results highlight the diagnostic potential of Hα variability for probing flare-related processes and magnetic activity in evolved stars belonging to active binary systems.
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Thursday 9 April

Gustavo Madeira** - ***On the formation of satellites in dense solid-particle disks

Abstract: Single massive satellites are of great observational interest, as they can produce prominent and potentially detectable signatures. For terrestrial planets and super-Earths, giant impacts in the late stages of formation may generate dense self-gravitating disks — favourable environments for the formation of such satellites. Motivated by this, we explore satellite formation in dense solid-particle disks through three-dimensional N-body simulations, focusing on the effects of disk mass and the surface density exponent (β). Our results reveal significant variability in the masses and configurations of satellites formed under identical disk parameters, highlighting the stochastic nature of the process. Higher disk masses and flatter surface density profiles favour the formation of more massive satellites. Disks with masses above 0.03 planetary masses typically yield a single dominant satellite, while those between 0.003 and 0.03 tend to form two-satellite systems. On average, the mass of the largest satellite scales linearly with the initial disk mass, in agreement with analytical predictions. We estimate that a disk with a minimal mass of 0.03 planetary masses around a 1.6 Earth-mass planet orbiting a Sun-like star could form an Earth–Moon-like system detectable by telescopes with a photometric precision of 10 parts per million – a level achievable by the James Webb Space Telescope.

Federico Andrés Zoppetti - ***Equilibrium eccentricity of particles around deformed minor bodies: a natural mechanism for ring confinement***

Abstract: The recent discovery of narrow rings around minor bodies has raised many questions regarding their origin and current dynamics. Sharp ring boundaries seem indicative of shepherding moonlets, but none have been found. The observed ring eccentricity is small but not null, suggesting a rich interaction between the particles in it. Furthermore, in at least one case, the location of the ring is exterior to the Roche radius, adding to the striking differences with respect to giant planets. Theoretical studies suggest that the ring is the last stage of evolution of a primordial disk, but the mechanism of confinement is still a matter of debate. We study the long-term eccentricity evolution of a swarm of particles surrounding a non-spherical mass, which is considered to be either a triaxial ellipsoid or a body with a surface mass anomaly. We analyze the combined effect of the dissipative interaction of the particles with the equilibrium solution imposed by the secular gravitational forcing due to the permanent deformation. By varying key parameters that characterize the particle-particle dissipation and the deformation of the central body, we study the mechanism of confinement of a disk into rings and also try to explain its eccentricity. We construct a secular model for the eccentricity of the particles by means of the Hamiltonian of the restricted 3-body problem, in the general case in which the frequency of the perturber is not necessarily Keplerian. To do this, we perform a classical first-order average, retaining the contribution that the short- and mid-term gravitational perturbing functions exert on the eccentricity of the particles. These terms are usually neglected but are crucial in this case, where classical secular forcing is null. We analytically derive an expression for the equilibrium eccentricity of the

external particles to which particles converge when subjected to dissipation. We compare this analytical expectation with a set of N-body simulations of massless particles orbiting a central deformed body. The deformation of the central body is incorporated as an artificial massive perturber, and the particle-particle interaction is simply modeled with a Stokes-type drag force, in addition to the pure gravitational interaction. The presence of a non-null equilibrium eccentricity for the particles, induced by the deformation of the central body, is shown to be a natural mechanism of disk confinement into rings. Since the particles can not circularize their orbits, they migrate from regions of the disk of high dissipation to a narrow exterior part where the interaction is much smaller. The slope and size of the 'eccentricity slide' are a strong function of the central deformation. Still, our simple model allows us to estimate it by means of the parameters measured in the minor bodies with confirmed rings around. We conclude that the eccentricity of the rings detected in Chariklo can be naturally explained by the excitation that its oblateness induced on a set of external colliding particles, and is probably not related to any spin-orbit resonance. Our model also allows us to estimate and constrain key physical and orbital parameters of the other ringed system, assuming they followed a similar evolutionary pathway.

Jose Luis Gomez - ***Self-consistent orbital migration of low-mass planets in dusty protoplanetary disks***

Abstract: The gravitational interaction between a protoplanet and the gaseous phase of the protoplanetary disk induces rapid inward migration, a phenomenon that represents a central challenge for planetary formation. In contrast, the solid phase of the disk (or dust) exerts a gravitational force capable of slowing down or even reversing this migration. However, traditional analyses often assume fixed orbits, inferring the migration rate from static torque. This simplified approach ignores the feedback between the orbital motion of the forming planet and the changing structure of the disk. In this work, we study for the first time the long-term self-consistent migration of protoplanets in gas and dust disks. To do this, we used multiphase hydrodynamic simulations with the FARGO3D code. We conducted a systematic exploration by varying the degree of coupling between the solid phase and the gas (Stokes number), the density of the gas, the metallicity of the disk, the level of turbulence, and the initial masses and positions of the protoplanets. Our results reveal the existence of migratory behaviors not predicted by static models. The most interesting dynamics observed are rapid outward migration and oscillatory migration that radially confines protoplanets, keeping their semi-major axis approximately constant on average. The resulting migration type strongly depends on the level of gas-dust coupling, the initial position of the embryo, and the metallicity of the disk. In particular, for high-metallicity disks with Stokes numbers $\sim 10^{-1}$, dust substantially modifies orbital evolution (compared to the case without dust), potentially resulting in rapid or slow migration, both outward and inward. In contrast, for small values of the Stokes number, migration is systematically inward. These findings demonstrate that dust has a profound and complex effect on protoplanet migration. Our most important conclusion is that, in order to accurately model the orbital evolution of planets, the solid phase of the disk can no longer be ignored in dynamic simulations. Its inclusion mitigates the problem of rapid migration in a significant portion of the parameter space, constituting a viable retention mechanism for low-mass planets in privileged positions in the disk.

Román Ciro Martin - ***Study of atmospheric escape in multiple exoplanetary systems***

Abstract: This work investigates the properties of planetary winds in exoplanets undergoing atmospheric escape and their observational signatures through synthetic transit modeling, with particular emphasis on an exploration of the stellar coronal temperature as a governing parameter. One-dimensional hydrodynamic simulations were used to characterize the structure of escaping atmospheres, including their density, velocity, and temperature profiles, as well as to estimate planetary mass-loss rates under different stellar irradiation conditions. A parameter exploration of the stellar coronal temperature was carried out to assess how variations in the stellar environment impact the resulting atmospheric outflows. Based on these atmospheric models, synthetic transits

were computed in key spectral lines such as Lyα and the helium triplet. These calculations enabled the derivation of observable quantities, including transit depths and absorption profiles.

Amaia Razquin Lizarraga** - ***Unveiling the magnetic flux systems involved in the May 2024 solar energetic events via coronal dimming

Abstract: During the first half of May 2024, a series of Earth-directed coronal mass ejections (CMEs) triggered the most intense geomagnetic storm in two decades. The source of the CMEs was active region (AR) 13664 which produced 54~M-class flares and 12~X-class flares, becoming one of the most flare productive AR in recent decades. Coronal dimmings are regions of transiently reduced emission in extreme ultraviolet (EUV) and soft X-ray (SXR) images of the Sun. They are interpreted as the depletion of coronal density and plasma evacuation caused by the liftoff of a CME. As such, they represent the most prominent low corona signature of CMEs, and provide a unique window into CME initiation and the restructuring of the corona. In this talk, we present our study on the coronal dimmings from AR~13664. We identified and analysed 16 on-disc coronal dimmings from AR 13664 using SDO/AIA and HMI observations between May 1-14, 2024. To explore the magnetic environment, we employed high-resolution Potential Field Source Surface (PFSS) and Non-Linear Force-Free (NLFF) extrapolations of the coronal magnetic field. We find strong correlations between dimming properties (area, growth rate, magnetic flux) and flare parameters (flux, fluence, reconnection flux), exceeding those reported in previous statistical studies. In contrast, correlations with CME maximum speed from the SOHO/LASCO coronagraph are weak, suggesting that dimmings are more closely linked to early CME evolution than to later propagation. The dimming morphology changed systematically throughout the AR evolution, with southward-expanding dimmings occurring before May 9 and northward-expanding ones thereafter. This transition coincides with a shift in flare ribbon location between two prominent east-west polarity inversion lines (PILs) of the AR, from the southern to the northern PIL. This transition reveals two distinct magnetic domains participating in the eruptions, and correlates with the differing geoeffectiveness of the associated CMEs. Magnetic field extrapolations further indicate that dimmings map both strapping flux, with field lines vaulting above the PIL and enclosing the erupting flux rope, and exterior flux that becomes involved in the eruption through reconnection. These results demonstrate that coronal dimming observations provide powerful diagnostics to identify the magnetic flux systems involved in solar eruptions, which would otherwise be untraceable, and to better understand the physical processes behind them.

Max McMurdo -** ***The Uniturbulence and Alfven Wave Solar Model: Incorporating Kink Waves into Coronal Models

Abstract: The solar coronal heating problem is one of the longest-standing unsolved challenges in solar physics. However, this phenomenon is not unique to our Sun. Many cool, solar-like stars also possess hot coronae, indicating that similar physical processes may operate across a wide range of stellar environments. Magnetohydrodynamic (MHD) waves, such as Alfvén and kink waves, are key candidates for transporting energy from the star's surface into the corona. Interactions between counterpropagating Alfvén waves can trigger turbulence, resulting in heating, while kink waves self-interact, triggering uniturbulence, efficiently heating the plasma. In this presentation, I will present a novel approach to modelling the effects of the two dominant wave modes in the solar corona by incorporating Alfvén and kink wave energy into the MHD equations, constituting the Uniturbulence and Alfvén Wave Solar Model (UAWSoM). Through this model, we demonstrate that kink waves have a much higher heating rate than Alfvén waves given the same energy injection, suggesting they could be the dominant wave mode responsible for heating the solar corona. I will present the ongoing efforts, focusing on the development of a global 3D model, which we envision will result in a self-consistent 3D model corona that will offer invaluable information for space weather modelling and beyond.

Mariana Cecere - ***Magnetic Confinement of CMEs in Sun-like Stars***

Abstract: Coronal mass ejections (CMEs) are expected to be frequent in magnetically active, Sun-like stars, yet observational evidence remains scarce. This suggests that magnetic confinement may strongly regulate both CME escape and detectability. In this talk, I will present MHD simulations of flux rope eruptions embedded in large-scale stellar magnetic fields. By varying flux rope properties and background field strength, we identify successful, confined, and failed eruptions. We show that the balance between the flux rope magnetic content and the overlying strapping field largely determines the eruption outcome. I will conclude by discussing the implications for EUV and Doppler observables and for the apparent lack of stellar CMEs.

Hebe Cremades - ***Characterization of the source regions of high latitude solar coronal mass ejections***

Abstract: Many questions regarding the nature and evolution of coronal mass ejections (CMEs) persist despite the wealth of solar data with increased spatial, temporal and spectral resolution. We focus on exploring relationships between the three-dimensional characteristics of CMEs and their source region properties. We analyze the sources of a set of CMEs having polar position angles as seen from Earth, for which their morphological 3D characteristics can be estimated with fewer uncertainties than typically possible. We rely on observations of different solar atmospheric regimes, provided by the STEREO, SOHO, and SDO missions. In the chromosphere and low corona, we respectively characterize associated filaments and eruptive phenomena; while in the photosphere we investigate polarity inversion lines. The joint analysis of source regions and CMEs enables studying how the attributes of source regions impact the morphological and dynamical characteristics of CMEs, with potential implications for space weather forecasting and for the understanding of processes involved in the initiation and early evolution of CMEs.

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Friday 10 April

Eva Panetier: *Probing the dynamics of solar-like stars: recent updates from several space mission

Abstract: Stars like our Sun are far from static, they are dynamic, oscillating, rotating, and generating magnetic fields that profoundly influence their structure, evolution, and surrounding environments. Beneath their visible surfaces, these stars harbor an internal radiative zone enveloped by a convective outer layer, each with unique physical processes that shape stellar behavior. Thanks to asteroseismology (the study of stellar pulsations) we can now probe these hidden interiors with remarkable precision. Oscillation modes, including pressure and gravity modes, act as seismic waves that carry information about internal structure, rotation, and magnetism, offering a window into the otherwise inaccessible depths of stars. Over the past decade, space missions such as *Kepler*, K2, and TESS have provided continuous, high-precision photometry. These observations, together with improved stellar models, allow us to test theories of interior dynamics, magnetism, and evolution, and to link physical processes to the observed diversity of stellar behavior. This talk will review the latest advances in asteroseismology of Sun-like stars, emphasizing how models and observations together illuminate the mechanisms driving oscillations, activity cycles, and structural evolution. By placing the Sun in this broader stellar context, we gain a deeper understanding of the processes shaping both stars and their planetary environments.

Dante Minniti - *The Galactic Plane Survey with the Roman Space Telescope

Abstract: CONTEXT: The Milky Way is a unique laboratory to explore the Universe. Even though much progress has been made recently, there are still vast unknown regions in our Galaxy, and many key open questions to answer. In particular, the distant Galactic plane and bulge remain unexplored due to heavy crowding and large reddening. Our VVV/VVVX surveys have mapped these regions in the near-IR down to Ks~18 mag between years 2010 and 2023 (1) (2) (3). The launch of the Roman Space Telescope later this year would allow us to continue and better these surveys.

SURVEY GOALS: We have designed the Galactic Plane Survey with the Roman Space Telescope (hereafter RGPS), that was accepted as the first general astrophysics survey for this NASA mission (4). The RGPS will map the Galactic plane and bulge with much higher resolution and depth. There are multiple scientific goals for the massive survey, including: search for distant star clusters, search for white dwarfs, brown dwarfs, and free-floating planets, search for microlensing events, search for variable stars of different kinds, etc.

UNIQUENESS OF THE SURVEY: With HST-like resolution and reaching >4 mag deeper than previous surveys, the RGPS will cover nearly 700 square degrees. The imaging and spectroscopic products will include deep multicolor photometry in the near-IR, proper motions, and variability. We expect to measure well over 20 billion sources, allowing us to investigate the properties of distant regions of our Galaxy in order to unveil its formation and evolution.

SYNERGIES: Besides the obvious synergy with our VVV/VVVX surveys, the RGPS would complement Rubin/LSST that is also monitoring the Galactic plane in the optical passbands, and would feed targets for the JWST and for the future generation of large ground-based telescopes like the E-ELT and GMT.

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Paula Denise López - ***Drivers of secular evolution: bars and boxy/peanut bulges in cosmological simulations***

Abstract: Understanding the formation and evolution of galactic structures, particularly bars and boxy/peanut (b/p) bulges, is key to comprehending galaxy dynamics. However, it remains unclear why certain galaxies develop a bar structure while others with similar mass and morphology do not. To address this, we use the TNG50 simulation from the IllustrisTNG project to explore the formation of a sample of barred galaxies compared to a similar sample that did not form a bar. We find that the formation of a bar is primarily driven by a higher baryon-to-dark matter mass fraction in the inner regions. Furthermore, we confirm the role of the environment is minor, finding no clear link between mergers and bar triggering in this sample. This strongly suggests the process is predominantly driven by internal secular evolution. Complementary to this, we extend the analysis to b/p bulges using the Auriga zoom-in simulations. We characterize their growth via buckling instabilities, which typically occur ~1.1-1.6 Gyr after bar formation. By tracking these structures across cosmic history, we find that the fraction of barred galaxies hosting a b/p bulge drops from ~45% at z=0 to zero at z~1. These findings provide insights into the internal processes regulating disc galaxy morphology and highlight the power of cosmological simulations for studying galaxy evolution.

Arianna Dolfi - ***Coupling between stellar and HI lopsidedness as a tracer of galaxy evolution and environment***

Abstract: Disk galaxies often display asymmetric mass/light distributions (lopsidedness). Observational studies have shown that, both in the local Universe and at high-redshift (i.e. $0 < z < 3$), at least 30% of disk galaxies are lopsided. In Dolfi et al. (2023, 2025), we characterized lopsidedness in disk galaxies using the IllustrisTNG simulations. We find a high fraction of lopsided galaxies (~60%) at $z > 1$, decreasing to ~40% at $z = 0$, in agreement with observations. Interestingly, Dolfi et al. (2023), showed that present-day lopsided galaxies exhibit distinct star formation histories compared to symmetric ones: symmetric disks assembled early through short and intense central starbursts, whereas lopsided disks assembled more gradually until $z = 0$. Using the high-resolution Auriga Superstars zoom-in simulations of Milky Way-type galaxies (stellar mass resolution: $m^* = 800$ Msun, snapshot cadence: DT = 5 Myr), we investigate how different dynamical processes influence the structure and properties of galactic disks over time, with unprecedented details in a fully cosmological context. We find a strong correlation between stellar and HI asymmetries, indicating that both components respond coherently to external perturbations from massive satellites via tidal interactions. In contrast, an excess HI asymmetry relative to stellar asymmetry traces recent gas accretion from mergers or the cosmic web. We also find an anti-correlation between stellar asymmetries in the outer disks and the presence of stellar bars in the central regions. These results demonstrate that lopsidedness is not merely a morphological feature,

but a powerful tracer of the coupling between internal disk evolution, gas accretion, and environmental interactions across cosmic time.

Horacio Dottori - ***The MIR/FIR Emission of the Nuclear Starburst in NGC 6221***

Abstract: Compact nuclear starbursts can play an important role in the energy budget and evolution of galaxies, although their physical properties are often hidden by large amounts of dust. NGC 6221 is a well-known composite starburst/AGN system, providing an excellent laboratory to study the interplay between nuclear star formation, dust obscuration, and energetic feedback. In this work we investigate the MIR/FIR emission of the obscured nuclear starburst in NGC 6221 as part of a broader study of its nuclear region. We model the infrared emission using the radiative-transfer code DUSTY, assuming a central stellar source with a Salpeter distribution and a maximum temperature of 60,000 K embedded in a dusty cocoon. The radial density distribution follows power laws with indices 2, 1, and 0 in the regions ($1<R/R_i<10$), ($10<R/R_i<100$), and ($100<R/R_i<1000$). Dust composition and grain-size distributions follow the prescriptions of Draine & Lee (1984) and Mathis et al. (1977). A χ^2 fit to observational data between 2 and 1000 μm yields a best-fit inner dust temperature ($T_i \approx 400$) K and optical depth ($2<\tau_{22}<4$). Photons with wavelengths shorter than 2 μm are efficiently reprocessed within the dust shell. Radiation pressure exceeds gravity by a factor of ~200 at the inner radius and approaches equality at ~500 (R_i). The inferred luminosity implies a compact nuclear starburst at least two orders of magnitude more intense than that in the central 5 pc of R136 in the Large Magellanic Cloud, indicating extreme conditions for star formation in galactic nuclei and highlighting the importance of compact starbursts in the baryonic cycle of galaxies.

Matheus Daniel Koren - ***Mapping the galaxy morphological continuum: an interpretable unsupervised manifold learning approach***

Abstract: We propose an unsupervised framework to map galaxy morphology onto a continuous manifold of morphometric parameters and characterize its structure through latent space clustering. Analyzing the EFIGI catalogue, we bridge two distinct domains: direct r-band pixel space and a morphometric space derived from structural variables measured with Morfometryka. Our pipeline utilizes Principal Component Analysis (PCA) to extract Eigengalaxies---eigenvectors that physically represent fundamental components such as bulges, disks, and spiral arms---followed by Uniform Manifold Approximation and Projection (UMAP) to define a low-dimensional topological structure. By applying Bayesian Gaussian Mixture Models (BGMM) to this latent space, we identify distinct clusters that correspond to physical regimes. We perform statistical inference within these clusters, using morphometric averages to quantify the structural properties of each group. Our results show a strong convergence between pixel-based reconstructions and quantitative morphometry, demonstrating that the classical Comprehensive de Vaucouleurs Revised Hubble-Sandage (CVRHS) classification stages emerge as high-density regions within a transition-rich continuum. This approach offers a transparent, interpretable metric for galaxy evolution, providing a robust alternative to ``black-box" deep learning models for next-generation large-scale surveys. With this method we can detect at least two main populations with similar diversity, thus allowing our future analysis on passive/spheroidal and star forming/disk galaxies, for example.

Virginia Cuomo - ***A first direct measurement of bar pattern speed at the dawn of bar formation with NIRSpec@JWST***

Abstract: The secular evolution of barred galaxies is governed by the rotation speed of their bars, the bar pattern speed, which is expected to be influenced by the inner dark matter content through dynamical friction. In the local Universe, observations indicate that bars rotate rapidly, in apparent tension with cosmological simulations that predict bar slowing in the presence of dense dark matter halos. This

tension reflects a major gap in our understanding of bar dynamics across cosmic time, driven by the lack of direct measurements of bar pattern speeds beyond $z = 0.1$. The advent of JWST has revealed a rich population of barred galaxies out to redshifts as high as $z \approx 3$, revolutionizing our view of disk stability and structure formation in the early Universe. Leveraging this breakthrough, I present the first application of the Tremaine-Weinberg method at high redshift, using proprietary NIRSpec@JWST spectroscopic observations of two recently discovered barred galaxies at $z \approx 1.2$ to derive their bar pattern speed. These unique data enable, for the first time, a comprehensive characterization of bars at the dawn of their formation, combining measurements of stellar kinematics, ionized gas kinematics, and stellar population properties within the same systems. Remarkably, we report the exceptional case of a very fast bar at $z \approx 1.2$ hosting a powerful AGN, offering new observational evidence for a close connection between bar dynamics and nuclear activity at early epochs. These results provide the first direct constraints on the cosmic evolution of bar pattern speeds and deliver new insights into the interplay between baryons and dark matter in shaping galactic dynamics, as well as into the role of bars in fueling AGN activity. Looking ahead, this innovative analysis naturally opens the door to future radioastronomy studies, which will be essential for probing the cold gas reservoirs of high-redshift barred galaxies and for fully understanding the complex interaction between bars, gas inflows, and AGN fueling.

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POSTERS

Alacoria, José - Probing λ Bötis formation models using multiple systems

Abstract: Our aim is to test the accretion scenario of λ Boötis stars. This model predicts that a binary system with two early-type stars passing through a diffuse cloud should both display the same superficial peculiarity. We carried out a detailed abundance determination of three multiple systems hosting a candidate λ Boö star: the remarkable triple system HD 15164/65/65C and the binary systems HD 193256/281 and HD 198160/161. The abundance analysis of HD 15164/65/65C shows a clear λ Boö object (HD 15165) and two objects with near solar composition (HD 15164 and 15165C). Notably, the presence of a λ Boö star (HD 15165) together with a near solar early-type object (HD 15164) is difficult to explain under the accretion scenario. Also, the solar-like composition derived for the late-type star of the system (HD 15165C) could be used, for the first time, as a proxy for the initial composition of the λ Boötis stars. Then, by reviewing abundance analysis of all known binary systems with candidate λ Boö stars from literature and including the systems analyzed here, we find no binary/multiple system having two clear "bonafide" λ Boö stars, as expected from the accretion scenario. The closer candidates to show two λ Boötis-like stars are HD 84948, HD 171948 and HD 198160; however, in our opinion they show mild rather than clear λ Boö patterns. Our results brings little support to the accretion scenario. Then, there is an urgent need of additional binary and multiple systems to be analyzed through a detailed abundance analysis.

Arnijas, Brayan Nicolas - Determination of astrophysical parameters of small angular diameter open clusters using GAIA photometry

Abstract: As part of the 'General Astrophysics' course, from the fourth year of the Astronomy Degree, we present results on reddening, distance, age, and metallicity for five open clusters. These parameters were derived from color-magnitude diagrams constructed using data from the Gaia DR3 catalog, through the detailed fitting of theoretical isochrones. The results are compared with values available in the literature. We highlight that Kronberger 57 shows a higher-than-solar metallicity (Z=0.03), while Pismis 23 is the object with the highest extinction in the sample ($E(G_{BP} - G_{RP}) = 2.55$). Furthermore, a significant discrepancy is found in the age determined for [FSR2007] 1025 compared to the literature.

Baleriano, Christian Alex Iván - Planetary Transit

Abstract: This study evaluates the feasibility of using a smartphone's ambient light sensor to reproduce the transit method for exoplanet detection through a small-scale laboratory model. A high-intensity LED lamp served as the "model star," while five black-coated Styrofoam spheres of different diameters (2.04 to 6.01 cm) represented "exoplanets." The spheres were mounted on a motorized rotating support to simulate planetary transits. Light curves were simultaneously recorded using a smartphone (with Physics Toolbox application) and a high-sensitivity Pasco light sensor as reference. Planetary radii were calculated from transit depths using the relation $\Delta F/Fe \approx (Rp/Re)^2$ and compared with direct caliper measurements. Results showed systematic overestimation of radii by both sensors (30-47% for smartphone, 9-30% for Pasco), primarily attributed to the penumbra effect from the extended light source. Statistical analysis (t-test, 90% confidence) revealed no significant difference between sensors for the largest planet, demonstrating comparable precision under favorable signal conditions. This work validates the smartphone's viability as an accessible scientific instrument for educational applications in observational astronomy. This work was conducted by students as part of the Thermodynamics and Electromagnetism Laboratories course, in the context of astronomy education.

Borrego Cortez, Hannah Gloria - Untangling the study of overlapping open clusters using Gaia DR3

Abstract: Open clusters are star systems formed in the same astrophysical environment, sharing distance, age, and initial chemical composition, although with different masses. These objects are fundamental to understanding the structure and evolution of the Milky Way. However, their traditional study using two-dimensional observations has made it difficult to distinguish between physically related clusters and groupings that appear to overlap in the plane of the sky.

This work analyzes three pairs of open clusters that exhibit apparent overlap: NGC 1750–NGC 1758, NGC 2422–NGC 2423, and Ruprecht 26–Clusterix 1, using astrometric and photometric data from Gaia DR3. The TOPCAT software is used to separate each cluster by means of its parallaxes and proper motions, allowing each cluster to be characterized independently and its possible physical relationship to be evaluated.

The region encompassing NGC 1750, NGC 1758, and NGC 1746—the latter previously questioned as a physical cluster—is also reviewed to reassess its existence using current astrometric tools. Finally, the characterization of the recently identified Clusterix 1 cluster is presented.

The results allow us to determine, using multiple observational criteria, whether the analyzed clusters are physically associated or if their overlap is merely a projection effect, providing new evidence about their nature and contributing to the study of the dynamics and evolution of open clusters in the Galaxy.

Bustos Fierro, Iván - Detection of the Coolest Brown Dwarfs in the Solar Neighborhood

Abstract: The commissioning of high-sensitivity, wide-field telescopes —specifically the Vera C. Rubin Observatory in the optical (0.32 – 1.06 μm) and the Nancy Grace Roman Space Telescope in the near-infrared (0.48 – 2.3 μm)— is expected to enable the detection of the coldest and faintest brown dwarfs, specifically those of late-T and Y spectral types. In this contribution, we use synthetic spectra of ultracool dwarfs to compute the maximum distance at which these objects will be detected in each filter of the aforementioned surveys, depending on their temperatures. These results constitute the first stage of a larger work intended to use machine learning techniques to identify and characterize cool dwarfs in large datasets. Due to the lack of known real objects, particularly Y-type dwarfs, we are establishing the synthetic models that will be employed for algorithm training.

Canaparo, Nicolás - Brown dwarfs in stellar clusters and associations

Abstract: Brown dwarfs are compact substellar objects characterized by interiors dominated by electron-degenerate gas. With masses ranging from 13 to 80 Mjup , they fail to reach the threshold internal temperatures required for sustained hydrogen fusion, distinguishing them from main-sequence stars. Lacking stable nuclear energy sources, these objects undergo continuous cooling, resulting in a progressive shift toward fainter magnitudes and redder colors. Consequently, most cataloged brown dwarfs are located within the solar neighborhood. In recent years, however, an increasing number of these objects have been identified within stellar associations and star clusters, particularly young ones. This study provides a global analysis of brown dwarfs in open clusters and stellar associations, focusing on their physical properties relative to those in the solar neighborhood, as well as the environmental characteristics of their host clusters.

Carballo, Lara - Determination of the speed of the International Space Station - ISS

Abstract: The orbital velocity of the International Space Station (ISS) was determined experimentally through ground-based observations and the use of smartphones. Two independent methods were applied. The FOV method, calculating the apparent angular velocity of the station through the field of view of a camera, resulted in a velocity of (8.1±0.8) km/s. The azimuth method,

based on measuring its angular displacement, provided estimates of (8.2±0.8) km/s and (7.7±0.8) km/s in two independent events. The results obtained are consistent with the theoretical orbital velocity of the ISS (7.66 km/s) within the experimental uncertainties. The experiment demonstrates that, using simple tools, it is possible to perform astronomical measurements with great precision. This work was conducted by students as part of the Thermodynamics and Electromagnetism Laboratories course, in the context of astronomy education.

Chanampa, Camila Valentina - Detailed chemical analysis of Herbig AeBe stars using ESPADONS

Abstract: Herbig AeBe stars are considered the pre-main-sequence progenitors of early-type stars. There are many important questions to answer for this group of young stars, such as the age at which diffusion processes begin to operate and the abnormally high fraction of peculiar lambda Boo stars among them. We have compiled a sample of Herbig AeBe spectra obtained with the ESPADONS spectrograph to determine their detailed chemical composition and compare their pattern with that of chemically peculiar stars. On this occasion, we present the fundamental parameters of the stars as preliminary results, along with the search for spectroscopic variation of intense lines.

Cremades, Hebe - *Automatic Detection of CMEs Using Synthetically-Trained Mask R-CNN*

Abstract: Coronal mass ejections (CMEs) are a major driver of space weather. To assess CME geoeffectiveness, among other scientific goals, it is necessary to reliably identify and characterize their morphology and kinematics in coronagraph images. Current methods of CME identification are either subjected to human biases or perform a poor identification due to deficiencies in the automatic detection. In this approach, we have trained the deep convolutional neural model Mask R-CNN to automatically segment the outer envelope of one or multiple CMEs present in a single difference coronagraph image. The empirical training dataset is composed of 1.13×10^5 synthetic coronagraph images with known pixel-level CME segmentation masks. It is obtained by combining quiet (no CME) coronagraph observations, with synthetic white-light CMEs produced using the Graduated Cylindrical Shell geometric model and ray-tracing technique. To filter the different instances found by Mask R-CNN, we use the temporal consistency of mask properties such as the intersection over union (IoU). We found that our model-based trained Mask R-CNN infers segmentation masks that are smooth and topologically connected (without holes or isolated patches). While the inferred masks are not representative of the detailed outer envelope of complex CMEs, the neural model can better differentiate a CME from other radially moving background/foreground features, segment multiple simultaneous CMEs that are close to each other, and work with images from different instruments. This is accomplished without relying on kinematic information, i.e. only the included in the single input difference image. We obtain a median IoU = 0.98 for 1.6×10^4 synthetic validation images, and IoU = 0.77 when compared with two independent manual segmentations of 115 observations acquired by the COR2-A, COR2-B, and LASCO C2 coronagraphs. The methodology presented in this work can be used with other CME models to produce more realistic synthetic brightness images while preserving desired morphological features, and obtain more robust and/or tailored segmentations.

Díaz, Anna Paula - Measurement of the geomagnetic field with a mobile phone magnetometer and dipolar estimation

Abstract: The aim of this study was to characterize the Earth's magnetic field in different regions of Argentina using the magnetometer integrated into a smartphone, employing the Physics Toolbox Magnetometer application. Measurements were carried out at five locations, recording time series of the three magnetic field components over intervals ranging from 12 to 18 seconds. The experimental protocol applied is described in detail, including considerations regarding sensor orientation, leveling, and calibration. From the recorded data, the total field intensity and the magnetic inclination were calculated, allowing the estimation of the local magnetic latitude and the

associated dipole moment within the framework of the first-order geomagnetic approximation. Statistical analysis of the time series showed low and stable dispersion, with standard deviations below 0.30 μT, indicating good repeatability and reliability of the measurements obtained with the device.

Ferrero, Leticia V. - Infrared Jets and Submillimeter Observations: Unveiling the Nature of HH 138 and HH 137

Abstract: Infrared Dark Clouds (IRDC) are dense (> 10^5 cm^3), cool (T< 25 K), massive (~ 10^2 - 10^5 M☉) structures that are usually identified as opaque, extended silhouettes, seen in contrast to the brightness of the mid-IR emission from the galactic background. Their physical properties have been shown to make them the most favorable environments for the formation of high-mass stars, and promising candidates for studying their initial conditions. One of the features that helps to reveal star formation in these dark environments is the detection of stellar jets or outflows. In this contribution, we present a preliminary analysis of high-resolution IR images of the HH 138 jet, and submillimeter (sub-mm) data from its excitatory source region, taken with GSAOI+GeMS/Gemini and ALMA, respectively. Previous studies would indicate that a second jet, HH 137 (MHO 1629), would also be associated with the same source that gives rise to HH 138, suggesting that the source is binary or multiple. In addition, two pairs of outflows in CO(3-2) were detected in the system. In this work, the H2 infrared emissions of HH 138 and the sub-mm data from the region of the likely excitatory source(s) are analyzed to investigate the relationship between the infrared jets, the sub-mm outflows, and to explore the binarity/multiplicity of the emitting source(s).

Jofré, Emiliano - Detailed spectroscopic and photometric analysis of the remarkable planet-hosting wide binary system HD 202772A/B

Abstract: In this contribution we present a detailed spectroscopic and photometric characterization of the planet-hosting wide binary HD 202772A/B. No planet has been detected around HD 202772B, whereas HD 202772A, more evolved than its companion and near the end of its main-sequence (MS) phase, hosts a transiting hot Jupiter. The system has one of the hottest components (Teff~6440 K) and one of the largest surface gravity differences between components (~0.4 dex) among MS planet-hosting wide binaries. Using a global fit including our stellar parameters, radial velocities, and new data from the Transiting Exoplanet Survey Satellite (TESS), we derive refined properties of the planet orbiting HD 202772A. We also constrain the presence of additional transiting planets around HD 202772A and new transiting planets around HD 202772B using TESS photometry. We derive high-precision, strictly differential abundances for 27 species based on Gemini-GRACES spectra. HD 202772A shows lower lithium abundance (by 0.45 dex) relative to B, consistent with their stellar parameter differences. We also detect a small but significant enhancement in refractory elements in HD 202772A. We explored several scenarios to explain the observed chemical anomalies. Our analysis suggests that rocky planet engulfment, primordial inhomogeneities, and Delta Scuti related effects are unlikely to fully account for the chemical pattern. Instead, the differences observed in certain refractory elements might support atomic diffusion as the most plausible explanation (Jofré et al. 2025; MNRAS 544, 3994).

Macaroff, Tadeo Ignacio - MHD simulations of CMEs in Sun-like stars: conditions for ejection and EUV signatures

Abstract: Given the current paradigm of the absence of coronal mass ejections (CMEs) detections in magnetically active stars, we seek a better understanding of the physical processes involved in the formation, dynamics, and emission of these eruptive events. To this end, the ideal 2.5D MHD equations under the influence of gravity were numerically solved to study the possible outcomes of the evolution and emission of flux ropes immersed in a Helmet Streamer (HS), varying local conditions. For a Sun-like star, we explored the EUV (304, 171, and 94 Å) emission associated with events in which the CME source either erupts, erodes, or falls back as coronal rain. We found that only the coronal rain cases exhibit a peak in EUV emission.

Monsú Petiti, Paulina Zoe - From Pixels to Parsecs: A Classroom-Scale Demonstration of Stellar Parallax

Abstract: A scaled reproduction of the stellar parallax method was carried out using a smartphone camera and a simple setup consisting of a printed representation of Earth's orbit and a point-like light source acting as a "star." The plate scale of the camera was calibrated, and pairs of photographs were taken at distances of 70, 100, and 130 cm. From the apparent displacement in the images, the parallax angles were determined, and the distances were calculated using the relation $d=r/\tan(p)$, where r is the baseline and p is the parallax angle, with full uncertainty propagation. The obtained values were consistent with the real distances, as verified through Student's t-tests at a 95% confidence level. The experiment shows that the parallax effect can be visualized and quantified using everyday materials, providing an accessible educational tool for introducing the measurement of astronomical distances. This work was conducted by students as part of the Thermodynamics and Electromagnetism Laboratories course, in the context of astronomy education.

Oddone, Mónica Alejandra - The Search for Exoplanets in Unusual Environments

Abstract: The search for exoplanets has revealed an astonishing diversity of worlds beyond our Solar System. While many of these planets orbit stars similar to the Sun, a particularly fascinating subset consists of those found in extreme or unusual environments. These cases not only challenge conventional notions of planetary formation and evolution, but also significantly broaden the range of conditions under which planets can exist and potentially harbor life. Some exoplanets reside in binary or multiple stellar systems, stellar associations, streams, or star clusters. In other cases, they orbit stars that have evolved off the main sequence; specifically, planets have been detected around giant stars, pulsars, and white dwarfs, among other stellar types. This contribution examines planets in such unusual environments by assessing their occurrence rates, physical properties, and the potential influence of their surroundings. This line of research is essential for achieving a comprehensive understanding of the full diversity of planetary formation and evolutionary pathways.

Oio, Gabriel Andrés - Environmental influence on the mass–metallicity relation for galaxies with AGN

Abstract: Galaxy evolution is driven by the synergy between internal Active Galactic Nucleus (AGN) feedback and the external large-scale environment. This study investigates the physical properties of AGNs as a function of their proximity to cosmic web filaments using a sample of SDSS galaxies at $0.04 < z < 0.3$. Here, we explore whether the filamentary structure of the universe leaves a distinct signature on the mass–metallicity relation (MZR). The goal of this study is to contribute to the understanding of the role of the environment in the chemical evolution of galaxies. This work is part of a broader effort to understand how the large-scale structure of the universe influences galaxy evolution.

Palma, Tali - Characterization of young star clusters in the VVV region: membership determination and fundamental parameters

Abstract: Young stellar clusters are crucial for understanding star formation and the early dynamical evolution in the Galactic disk. In this work, we analyze a sample of young open clusters located in the same Galactic region, previously explored in the near-infrared VVV survey, using data from Gaia DR3. We perform a robust cluster membership determination using the unsupervised algorithm pyUPMASK. For the selected high-probability members, we analyze decontaminated color–magnitude diagrams and perform isochrone fitting using PARSEC models. In parallel, we apply the automated framework implemented in ASteCA as an independent approach to derive the fundamental parameters and to estimate the binary fraction within each cluster. This dual strategy allows us to compare direct isochrone fitting results with synthetic cluster modeling, providing a consistency check on the derived parameters. Our results provide a homogeneous characterization of the selected sample.

Parisi, Celeste - The VISCACHA survey. Study of stellar clusters in the SMC wing/bridge
Abstract: The structure of the Small Magellanic Cloud (SMC) outside of its main body is characterized by tidal branches resulting from its interactions mainly with the Large Magellanic Cloud (LMC). Characterizing the stellar populations in these tidal components helps to understand the dynamical history of this galaxy and of the Magellanic system in general. We provide full phase-space vector information for SMC wing/bridge star clusters. We use photometric (SAMI/SOAR) and spectroscopic (GMOS/Gemini-S) data from the VISCACHA Survey to analyze the kinematics and chemical characteristics of clusters in this tidal component of the SMC. In this work, we will summarize the preliminary obtained results.

Pereyra Redondo, Dharma - Gas spectroscopy: determination of the Rydberg constant
Abstract: The Balmer series' spectral analysis provides a method to determine the proportionality ® between the wave number and the energy difference between two electronic levels from a hydrogenic atom. With the use of everyday elements (such as cellphones, digital cameras, pasteboard, electrical tape and diffraction gratings) and spectral lamps we can study the luminosity profile of the emission spectrum from different gases. Through the analysis of the lines of a Hydrogen lamp, the Rydberg constant was determined as R=(1.09±0.02)×10^7 m−1, which was proven equal to the universally accepted value of R_H = 1.097373156816 × 10^7 m−1 for a 0.05 significance level. The obtained results experimentally validate the relationship between the electronic transitions and the hydrogen's wave number, demonstrating the applicability for low-cost spectroscopy as a tool to verify the quantum model. This work was conducted by students as part of the Thermodynamics and Electromagnetism Laboratories course, in the context of astronomy education.

Puddu, Julieta Magalí - Spectroscopic Characterization of X-ray Emitting Galaxies in the LEGA-C Survey
Abstract: In this study, 7 X-ray–emitting galaxies from the LEGA-C survey were characterized through spectroscopic analysis and diagnostic diagrams. The classification of ionization sources was performed using the Mass–Excitation (MEx) diagram and the Hardness Ratio versus X-ray Luminosity diagram, while stellar populations and morphology were determined from the Dn4000 versus Sérsic index diagram. Additionally, the σ* versus Lick H index diagram provides an approximate estimate of the galaxies' ages. The combination of

these methods shows that the Active Galactic Nuclei (AGN) in the sample are found in systems spanning a wide range of morphologies and stellar ages — from young, disk-dominated galaxies to more evolved systems. Furthermore, discrepancies between X-ray and optical AGN classifications were identified in some objects, suggesting the presence of optically obscured AGN or AGN whose emission lines are masked by intense star formation.

Rivera Tabilo, Alvaro Javier - Barred galaxy fraction in interacting and non-interacting clusters: a visual phase-space analysis of Abell 3376 and Abell 85 out to 5 R200

Abstract: Bars play a central role in the secular evolution of disk galaxies, acting as efficient mechanisms for angular momentum redistribution and structural transformation. While bar formation can emerge from internal dynamical instabilities, environmental effects — particularly large-scale tidal perturbations — are expected to influence both their triggering and survival. In this context, Yoon+ (2019) reported an enhanced barred galaxy fraction in interacting cluster environments, suggesting that cluster–cluster interactions may provide favorable conditions for bar formation. Motivated by this scenario, we present a comparative analysis of two galaxy clusters from the CHANCES catalog with contrasting dynamical states: Abell 85, a dynamically relaxed and non-interacting system, and Abell 3376, a well-known interacting cluster undergoing merger activity. We performed an independent visual morphological classification of confirmed cluster members, identifying barred spirals (SB, SAB) and barred lenticular galaxies, the latter treated explicitly as barred systems rather than included within disk-dominated populations. Our analysis extends radially out to 5 R200, allowing us to probe environmental dependencies from cluster cores to infall regions. Bar fractions are evaluated at 1–5 R200 and further explored in projected phase-space, linking bar occurrence with dynamical accretion stage and cluster assembly history. Preliminary results reveal systematic differences between the interacting and non-interacting environments, consistent with enhanced bar formation in dynamically disturbed systems. Given the strong connection between cluster mergers and large-scale radio phenomena (including relics and shock fronts), future integration with radio continuum observations will provide a complementary framework to assess the role of intracluster medium dynamics in environmentally driven bar formation.

Rodriguez Taboada, Rocio Daniela - Probing hierarchical clustering analysis for astrochemical studies

Abstract: We present a hierarchical clustering analysis aimed at exploring whether chemical similarity among dense cores can be used as a classification criterion and whether such a classification reflects real physical differences. To this end, a dendrogram was constructed using molecular abundance ratios of five species observed with the Atacama Large Millimeter Array (ALMA): HC_3N, $H^{13}CN$, $HN^{13}C$, $HC^{17}O^+$, and $H^{13}CO^+$, toward a sample of molecular cores of interest. In particular, HC_3N was adopted as a “calibrator” for the construction of these ratios, given its nearly invariant behavior with respect to temperature. Based on this analysis, the cores were grouped exclusively according to their chemical similarity, resulting in distinct groups or clusters. The relationship between the defined clusters and the gas kinetic temperature was then examined. The results show that the chemically defined groups exhibit differentiated thermal behaviors, suggesting that molecular chemistry may act as a tracer of the evolutionary state of the cores. This study shows that dendrograms can be used as a tool to investigate the connection between molecular composition and the physical properties of cores in the early stages of star formation.

Saffe, Carlos - Herbig AeBe stars are considered the pre-main-sequence progenitors of early-type stars.

Abstract: There are many important questions to answer for this group of young stars, such as the age at which diffusion processes begin to operate and the abnormally high fraction of peculiar lambda Boo stars among them. We have compiled a sample of Herbig AeBe spectra obtained with

the ESPADONS spectrograph to determine their detailed chemical composition and compare their pattern with that of chemically peculiar stars. On this occasion, we present the fundamental parameters of the stars as preliminary results, along with the search for spectroscopic variation of intense lines.

Sarmiento, Luna Isabel - Estrellas binarias y efecto Doppler

Abstract: This report presents an experimental simulation of a binary star system through the analysis of the Doppler effect. The system was modeled using three mobile devices: two were mounted on a rotating apparatus to emit distinct acoustic frequencies, while a third device recorded signal variations as the emitting sources approached or receded from the observer. This experiment serves as a simulation of spectroscopic Doppler shifts—a method utilized in Astronomy to determine the masses and radial velocities of binary stars, as well as for the detection of exoplanets.
This work was conducted by students as part of the Thermodynamics and Electromagnetism Laboratories course, in the context of astronomy education.

Simondi Romero, Federico Oscar - Age and Metallicity Determination of Pismis 16 Using Gaia Data

Abstract: We present an analysis of the relatively understudied Galactic open cluster Pismis 16 based on data from Gaia Data Release 3 (DR3). Using astrometric parameters, including proper motions and parallaxes, we identify the most probable cluster members. Subsequently, photometric data for these members are used to construct the cluster's color–magnitude diagram. An isochrone fitting procedure is then performed, enabling us to estimate the cluster's age and metallicity.

Vega-Neme, Luis - Detailed spectroscopy of the active nucleus of SDSS J092613.80+065056.4

Abstract: We present a detailed spectroscopy of SDSS J092613.80+065056.4 taken with Baade 6.5m Telescope + IMACS at Las Campanas Observatory (Chile). The long-slit of 0.7 arcsec allowed us to extract spectra not only for the nucleus but also for regions mapped along the slit. Here we analyze the emission lines H and [OIII]4959,5007, which reveals a complex kinematics, mainly at the central regions of the galaxy. We also show the level of activity and the physical conditions of the ionized gas from nuclear and off-nuclear regions.

Zuloaga, Camila - Detailed chemical analysis of an evolved binary star with planets using Gemini/MAROON-X spectra

Abstract: Binary systems, in which one component hosts a planet, provide unique astrophysical laboratories for studying the impact of planet formation on stellar chemical composition. Assuming both stars form from the same molecular cloud and share the same initial composition any abundance differences may be linked to the process of planet formation and evolution. To date, chemical differences have been detected in 5 out of ~12 main-sequence binary systems with planets; therefore, it's unclear whether planetary formation can leave observable signatures in their host stars. Moreover, the recent discovery of abundance differences in a binary system composed of giant stars without known planets raises important questions about the interpretation of these signatures. Based on high-resolution Gemini/MAROON-X spectra, here we present a detailed chemical analysis of a subgiant binary system in which one component hosts a planet . This study represents the first high-precision abundance analysis performed for a binary system at this evolutionary stage, providing new constraints on the connection between stellar chemistry and planet formation.