



Understanding the Universe through Large Scale Astronomical Surveys

Teruel, Spain · October 5–9, 2026

CONFERENCE PROGRAM (Last updated: October 5, 2026)

Program

Day 0 - Sunday - Oct 4th

19:30 **Free SOCIAL EVENT: Welcome Reception** — Jardín del Mausoleo de los Amantes de Teruel (Calle Caracol 2). Please visit the Social Events Website.

Day 1 - Monday - Oct 5th

09:00 **Institutional Opening**

Session I: Understanding Cosmic Structure at High Redshift

10:00 **Rita Tojeiro** — *An unprecedented view of the Universe with DESI* (Invited talk)

10:35 **Laura Scholz-Díaz** — *A wide-field dedicated spectroscopic facility to unveil the co-evolution of galaxies and the cosmic web up to $z=1$* (Contributed talk)

10:55 **Coffee Break (Sala La Muralla)**

Session II: Understanding Galaxy Evolution through the Cosmic Web

11:30 **Anna Porredon** — *Exploring the Dark Universe with Euclid* (Invited talk)

12:05 **Rosa María González Delgado** — *Galaxy Evolution through cosmic web: the legacy surveys approach* (Contributed talk)

12:25 **Ana María Conrado** — *The void effect on galaxy evolution: insights from CAVITY and DESI* (Contributed talk)

12:45 **Rosa Calvi** — *Tracing Environmental Effects through CO Emitters in a $z \sim 2.2$ Protocluster* (Contributed talk)

13:05 **Lunch Break (CEFCA Headquarters)**

Session III: Understanding Clustering through the Cosmic Web

14:30 **Mara Salvato** — *eROSITA contribution to MW, COSMOLOGY and Galaxy/AGN evolution studies* (Invited talk)

- 15:05 **Jacobo Asorey Barreiro** — *Cosmology with the SKA Observatory: clustering from precursor extragalactic radio surveys* (Contributed talk)
- 15:25 **Jun Toshikawa** — *Diverse Protoclusters Disclosed by Systematic Observations* (Contributed talk)
- 15:45 **Andrea Biviano** — *The velocity anisotropy of clusters of galaxies and their assembly history* (Contributed talk)
- 16:05 **Coffee Break (Sala La Muralla)**
- Session IV: Understanding the Milky Way in the Gaia Era**
- 16:30 **Antonella Vallenari** — *Gaia: Ten years of surveying the Milky Way and beyond* (Invited talk)
- 17:05 **Subhabrata Majumdar** — *Mapping the Milky Way in Six Dimensions: A contiguous, homogenised, phase-space GAIA gold catalogue up to 250 kpc* (Contributed talk)
- 17:25 **Adrián Hidalgo** — *Milky Way archaeology with J-PLUS DR4: stellar parameters from a purely algebraic photometric method* (Contributed talk)
- 19:00 **Free SOCIAL EVENT: Guided walking tour of Teruel downtown** — Departure: Plaza de la Catedral 1. Please visit the Social Events Website.

Day 2 - Tuesday - Oct 6th

- Session V: Understanding the Universe through SDSS and Large Photometric Surveys**
- 09:20 **Carlos Allende** — *The Sloan Digital Sky Survey* (Invited talk)
- 09:55 **Héctor Vázquez Ramío** — *The J-PAS Extended Early Data Release* (Contributed talk)
- 10:15 **Juan Antonio Fernández Ontiveros** — *JOLINES: A value-added catalogue of optical line intensities for nebular emission galaxies* (Contributed talk)
- 10:35 **Marilena Spavone** — *Mapping Galaxy Assembly through Stellar Halos and Intracluster Light in the Era of Deep Surveys* (Contributed talk)
- 10:55 **Coffee Break (Sala La Muralla)**
- Session VI: Understanding Observational Cosmology**
- 11:30 **Jonás Chaves** — *Cosmology with DESI: Cracks in Λ CDM?* (Invited talk)
- 12:05 **Swaraj Pradhan** — *Towards Bayesian Photometric Cosmic Chronometers* (Contributed talk)
- 12:25 **Mar Pérez Sar** — *Probing the Large Scale Structure with angular density and redshift fluctuations* (Contributed talk)
- Posters**
- 12:45 **Oral Poster Presentations**
- 13:05 **Lunch Break (CEFCA Headquarters)**
- Session VII: Understanding the Universe through Large Spectroscopic Surveys**
- 14:30 **Scott Trager** — *WEAVE: surveying the Milky Way and the Universe with the ING's next-generation spectroscopic survey facility* (Invited talk)
- 15:05 **J. Alfonso L. Aguerri** — *WEAVE Cluster Surveys: Science Verification first results* (Contributed talk)
- 15:25 **Jordi Cepa** — *The Lockman SpReSO survey* (Contributed talk)

- 15:45 **Chiara Buttitta** — *Unveiling the faintest side of the Universe: discoveries, structure and open issues on ultra-diffuse galaxies* (Contributed talk)
- 16:05 **Coffee Break (Sala La Muralla)**
- Session VIII: Understanding the Variable Universe**
- 16:30 **Tesla Jeltema** — *The Vera C. Rubin Observatory's Legacy Survey of Space and Time: Overview and Early Science* (Invited talk)
- 17:05 **Alessandro Ederoclite** — *Time-Domain Wide-Field Surveys: the Paradigm Switch of the Discovery Machines* (Contributed talk)
- 19:00 **Free SOCIAL EVENT: Public Talk by Prof. Emilio Alfaro** — "La geometría del pecado", in Spanish, at Centro Cultural de San Julián (Carretera San Julián 14). Please visit the Social Events Website.

Day 3 - Wednesday - Oct 7th

- 08:30 **Bus Teruel - Galáctica** — Departure: Paseo del Óvalo 3-7
- Session IX: Understanding the Milky Way & the Local Group**
- 10:15 **Borja Anguiano** — *J-ATLAS: Javalambre Andromeda and Triangulum Legacy Astrophysical Survey* (Contributed talk)
- 10:35 **Yang Huang** — *A Photometric Revolution in Galactic Archaeology — Unlocking the Milky Way with ~ 100 Million Stars* (Contributed talk)
- 10:55 **Coffee Break (Galactica)**
- Session X: Understanding Galaxy Clusters & Environment**
- 11:30 **Magda Arnaboldi** — *The ESO public surveys: An overview of the current and future plans and of the surveys' scientific legacy* (Invited talk)
- 12:05 **Christopher Haines** — *CHANCES: The CHileAN Cluster Galaxy Evolution Survey* (Contributed talk)
- 12:25 **Ariane Trudeau** — *Harnessing the statistical power of large surveys: two stacking analyses of the MaDCoWS2 galaxy clusters at $0.5 < z < 2.0$* (Contributed talk)
- 12:45 **Lunch Break (Galactica)**
- 14:30 **Free SOCIAL EVENT: Visit to Galactica**
- 16:00 **Free SOCIAL EVENT: Visit to the OAJ**
- 18:30 **Bus OAJ - Teruel** — Arrival: Paseo del Óvalo 3-7, by 20:00h

Day 4 - Thursday - Oct 8th

- Session XI: Understanding the contribution of Mariano Moles (I)**
- 09:00 **Javier Cenarro** — *A Legacy of Legacy Surveys: Mariano Moles and the CEFCA Vision* (Special talk)
- 09:25 **Silvia Bonoli** — *J-PAS: the Universe in multi-color* (Special talk)
- 09:45 **Carlos López San Juan** — *J-PLUS: the Javalambre Photometric Local Universe Survey* (Special talk)
- 10:05 **Isabel Márquez** — *Exploring the universe from the ALHAMBRA* (Invited talk)

- 10:30 **Alessia Moretti** — *A Comprehensive Census of the Local Cluster Universe: The WINGS/OmegaWINGS Legacy* (Invited talk)
- 10:55 **Coffee Break (Sala La Muralla)**
- Session XII: Understanding the contribution of Mariano Moles (II)**
- 11:30 **Vicent J. Martínez** — *Mariano Moles and the search of two numbers* (Contributed talk)
- 11:50 **A lifetime of pioneering new cosmic frontiers** — Round table. Chairs: Isabel Márquez & Vicent J. Martínez
- 13:05 **Lunch Break (CEFCA Headquarters)**
- Session XIII: Understanding the Universe at different Wavelengths and Scales**
- 14:30 **Lourdes Verdes Montenegro** — *Celebrating the Survey Universe in the SKA Observatory Era* (Invited talk)
- 15:05 **Emily Kerrison** — *The First Large Absorption Survey in HI (FLASH): A new radio census of neutral gas beyond the local Universe, and a treasure trove for multi-wavelength studies of galaxy evolution* (Contributed talk)
- 15:25 **Simón Véliz Astudillo** — *From Cores to Infall Regions: Morphological Pre-processing Signatures in CHANCES Evolution Clusters* (Contributed talk)
- 15:45 **Sara Navarro Umpiérrez** — *Mini-HAWKs: A pilot survey designed to discover new quiescent black holes.* (Contributed talk)
- 16:05 **Coffee Break (Sala La Muralla)**
- Session XIV: Understanding Methodologies for Cosmological Probes**
- 16:30 **Carlos Hernández Monteagudo** — *Angular redshift fluctuations (ARF): a turolense cosmological observable* (Contributed talk)
- 16:50 **Finian Ashmead** — *Optimizing Photometric Redshift Training Sets with UMAP* (Contributed talk)
- 17:10 **Krzysztof Lisiecki** — *CORN: Chronometers of Relic Nature The first estimate of the expansion rate of the Universe using compact relic galaxies* (Contributed talk)
- 17:30 **Raul Abramo** — *Measurement of the Hubble constant from the cross-correlations of galaxies and dark sirens* (Contributed talk)
- 20:00 **SOCIAL EVENT: Conference Dinner** — At Hotel Palacio La Marquesa (Plaza Fray Anselmo Polanco 2). Please visit the Social Events Website.

Day 5 - Friday - Oct 9th

- Session XV: Understanding Resolved Stellar Populations and the Low Surface Brightness Universe**
- 09:20 **Sean Bruton** — *SPHEREx* (Invited talk)
- 09:55 **Ignacio Sevilla Noarbe** — *Optical–infrared survey synergies in the Rubin era* (Contributed talk)
- 10:15 **Luis Diaz-Garcia** — *Galaxy evolution at the advent of J-PAS: stellar population properties up to $z \sim 1$* (Contributed talk)
- 10:35 **Julio Esteban Rodríguez Martín** — *Spatially Resolved Galaxy Evolution with J-PAS and Py2DJPAS* (Contributed talk)
- 10:55 **Coffee Break (Sala La Muralla)**
- Session XVI: Understanding Chemical Evolution of Galaxies**

- 11:30 **Stefano Zibetti** — *Linking metals to stellar-mass growth on local and galaxy-wide scales: the many faces of the stellar mass-metallicity relation from large spectroscopic surveys* (Contributed talk)
- 11:50 **Carmen P. Padilla-Torres** — *The OTELO survey: The evolution of galaxies.* (Contributed talk)
- 12:10 **Concluding Remarks & Discussion**
- 13:05 **Farewell Lunch (CEFCA Headquarters)**

Talk Abstracts

An unprecedented view of the Universe with DESI

Rita Tojeiro

In April 2026, DESI completed its original 5-year survey plan, producing the largest three-dimensional map of the Universe as seen through the accurate positions of more than 47 million galaxies and quasars. The primary scientific goal of DESI is to constrain the nature of Dark Energy but the scientific reach of the survey extends far beyond that. In this talk, I will highlight some of the key scientific milestones of DESI. I will also discuss how a survey of this scale opens up unprecedented views of the Universe, including the study of rare populations of extragalactic objects, multi-scale environment classifications, the relationship between galaxies and large-scale structure, and the impressively detailed characterisation of galaxy population statistics over more than 5 decades in stellar mass. I will also highlight current and future synergies with other surveys, and conclude with an outlook of DESI's future into the next decade.

A wide-field dedicated spectroscopic facility to unveil the co-evolution of galaxies and the cosmic web up to $z=1$

Laura Scholz-Díaz

L. Scholz-Díaz, A. Gallazzi, F. Belfiore, M. Sargent

How galaxy growth depends on hierarchical structure formation and the large-scale cosmic web remains under debate, especially beyond the Local Universe. In the next decades, Euclid, Rubin/LSST, and Roman will deliver broad-band photometry for billions of galaxies over tens of thousands of square degrees, enabling accurate photometric redshift estimates and broad large-scale structure mapping. Yet, highly complete spectroscopic surveys with high spatial sampling ($>10^4$ galaxies/deg²) over cosmologically-representative volumes ~ 1 Gpc³ (>100 deg²) are required for precisely reconstructing the cosmic web on Mpc scales, finely resolving its structures (especially filaments) on sub-Mpc scales, and robustly identifying dark matter halos down to halo masses of 10^{13} Msun. The development of a dedicated wide-field spectroscopic facility with large-collecting-area, highly-multiplexed optical-NIR multi-object spectrographs and a monolithic large FoV IFS, such as WST, is critical for densely sampling the cosmic web environment of galaxies at $z>0$. Moreover, this facility can also provide deep spectroscopy to trace stellar and ISM properties of statistically large and representative galaxy populations. In this talk, I will present WST and its extragalactic science case, focusing on its $z=1$ survey W1ZES. W1ZES is a magnitude-limited survey at 0.30 are limited either in mass completeness, sample size, spectral quality or sample selection (LEGA-C, 4MOST-WEAVE/StePS, MOONRISE, PFS/Deep). By densely mapping the cosmic web and simultaneously tracing galaxies' physical properties, W1ZES can unveil the interplay between large-scale cosmic web structures and galaxy evolution up to $z=1$.

Exploring the Dark Universe with Euclid

Anna Porredon

Euclid is a space mission from the European Space Agency designed to study the geometry and nature of the dark Universe. Since launching on July 1, 2023, it has already surveyed over 5000 square degrees and the consortium is analysing its first data release (DR1). In this talk, I will give an overview of the Euclid mission and its current status, with a focus on the photometric probes. I will also discuss potential synergies with other galaxy surveys.

Galaxy Evolution through cosmic web: the legacy surveys approach

Rosa María González Delgado

R. González Delgado, A. Conrado, R. García Benito, L. Díaz García, G. Martínez Solaeche, J. Rodríguez Martín

Galaxies are embedded within the cosmic web, a complex network of voids, sheets, filaments, and clusters that provides the large-scale framework for their formation and evolution. Understanding how galaxy properties vary across this structure is essential for reconstructing the processes that drive galaxy evolution and the growth of cosmic structure. In this contribution, we present recent results from the J-PAS, CAVITY, and DESI legacy surveys, aimed at quantifying the impact of environment across the full density range of the cosmic web. By combining measurements of star formation rate, ages, and stellar mass, we investigate how galaxy evolution depends on location, from the most underdense void interiors to the densest cluster cores. Our analysis leverages integral field spectroscopy for several hundred galaxies from the CAVITY survey, together with thousands of DESI spectra targeting galaxies in nearby voids, enabling a detailed characterization of low-density environments. In parallel, we study thousands of galaxy groups embedded in filaments and nodes identified in the internal data release of J-PAS, covering $\sim 29 \text{ deg}^2$, to probe environmental effects in denser regions. This multi-survey approach provides a statistically robust and comprehensive view of environmental dependence. We report: (i) evidence for slow evolutionary pathways and delayed quenching in void galaxies; (ii) systematic radial trends with void-centric distance, linking galaxy properties from void interiors to surrounding walls and filaments; (iii) signatures of pre-processing in galaxy groups within filaments; and (iv) strong environmental variations in quenching, morphology, and stellar populations from cluster outskirts to cores. These results highlight the critical interplay between local physical processes and the large-scale structure of the Universe in shaping galaxy evolution.

The void effect on galaxy evolution: insights from CAVITY and DESI

Ana María Conrado

A. Conrado, R. González Delgado, R. García-Benito

The large-scale environment shapes galaxy evolution, with void galaxies known to be bluer, later-type, less massive, and slower-evolving than those in denser regions. However, the effect of the void environment on star formation activity and the role of location within voids remain under debate. We tackle these questions using two complementary approaches: spatially-resolved integral field data from the Calar Alto Void Integral-field Treasury Survey (CAVITY) and statistical analysis of void-centric trends from the DESI Bright Galaxy Survey (BGS). Our CAVITY sample comprises 220 void galaxies observed with PMAS/PPaK at Calar Alto. We derive maps of SFR, sSFR, and dust extinction (A_V) from extinction-corrected $H\alpha$, analysing global properties and radial profiles out to two half-light radii. Comparing to a CALIFA control sample matched in morphology and stellar mass, we find void galaxies show elevated sSFR in their outer parts ($R > 1 \text{ HLR}$), particularly for late-types, and lower extinction. We find that void early spirals are more gas-rich (5% globally, 23% in outer parts), indicating slower transition from star-forming to passive states. Complementing this, we analyse DESI BGS galaxies ($z < 0.08$) cross-matched with the DESIVAST void catalogue. Using J-PAS photometry and BaySeAGal SED fitting, we find that as galaxies approach void centers, they become less massive, younger, more metal-poor, and have higher SFR and sSFR, with more extended SFHs. These trends persist until a relative void-centric distance of $R_{\text{eff}} \sim 1.4$, and remain when comparing to a mass- and redshift-matched control sample. However, differences disappear when restricting to star-forming galaxies only, suggesting the primary void effect is an increased fraction of star-forming galaxies rather than enhanced activity within them. These results reveal that void environments slow galaxy evolution through prolonged gas retention and reduced quenching.

Tracing Environmental Effects through CO Emitters in a $z \sim 2.2$ Protocluster

Rosa Calvi

The assembly of the most massive structures in the Universe begins within galaxy protoclusters, which represent the early stages of galaxy cluster formation. At cosmic noon, galaxies experience the peak of star formation and rapid stellar mass assembly, making this epoch ideal for studying the physical processes that regulate galaxy growth. By combining optical, far-infrared, and molecular gas observations of CO-emitting galaxies in the Spiderweb protocluster at $z \sim 2.2$, we investigate the interplay between gas content, star formation, and environment. In particular, we use multi-wavelength tracers to assess how gas accretion and consumption are linked to the cosmic web. In the era of large surveys such as Euclid, Vera C. Rubin Observatory LSST, and Square Kilometre Array, this work highlights the importance of multi-wavelength synergies for a better understanding of galaxy evolution and formation in the distant universe.

eROSITA contribution to MW, COSMOLOGY and Galaxy/AGN evolution studies

Mara Salvato

With 4.5 passes over the entire sky completed in 2.5 years, eROSITA has contributed to our understanding of the MW, COSMOLOGY, and Galaxy/AGN (co)evolution. In my talk, I will present a brief list of highlights across all three fields and discuss how we can improve our understanding going forward using eROSITA in synergy with other large-scale multi-wavelength surveys.

Cosmology with the SKA Observatory: clustering from precursor extragalactic radio surveys

Jacobo Asorey Barreiro

The distribution of radio continuum galaxies on the sky is a useful, fast, and accessible probe of the distribution of matter in the Universe, covering more than 12 billion years of cosmic history. It can be used to learn about the initial conditions, the physics of dark matter, and the nature of the dark energy. However, since radio continuum galaxies are observed through synchrotron emission, they cannot easily be localised in the radial direction, and cross-identification sources from optical catalogues are still low. There are a number of unknown functions relating to the radio galaxy populations that all need to be modelled accurately in order to make reliable inferences about fundamental physics such as the number density of radio continuum galaxies $n(z)$ and radio galaxy bias $b(z)$. In the talk, I will show the latest cosmological results from SKAO pathfinders such as the Evolutionary Map of the Universe (EMU) galaxies and the prospects for future continuum surveys with SKAO in terms of cosmology and extragalactic astrophysics.

Diverse Protoclusters Disclosed by Systematic Observations

Jun Toshikawa

We have conducted a systematic search for protoclusters at high redshifts based on the wide-field imaging of the Hyper SuprimeCam Subaru Strategic Programme (HSC-SSP). The HSC-SSP is composed of the Wide ($\sim 900 \text{ deg}^2$, ~ 26 AB mag in i-band) and Deep/UltraDeep (DUD; $\sim 25 \text{ deg}^2$, ~ 27 mag) layers. Protocluster candidates are selected as regions with a significantly enhanced surface density of dropout galaxies. In the Wide layer, we have statistically investigated protocluster properties, such as dark matter halo mass by clustering and correlation with rare galaxy populations of quasars, radio galaxies, or sub-mm galaxies. Deep and multi-wavelength images in the DUD layer enable us to study the stellar population of protocluster galaxies. Now, we are carrying out follow-up spectroscopy to determine protocluster

members via Ly-alpha emissions, and four protoclusters at $z \sim 3-4$ are newly confirmed. Since these protoclusters are identified by the same dataset and technique, they represent a good sample to study the diversity of protocluster properties with minimal observational biases. Combining both photometric and spectroscopic datasets, each protocluster is found to exhibit the unique properties of star-forming activity and internal structure. The uniform approach to searching protoclusters on which this study builds enables us to link observed variations at the onset of cosmic noon to different pathways in the history of cluster formation. In our presentation, we will overview our protocluster search in the HSC-SSP and present our latest results obtained from follow-up observations to discuss possible environmental effects on galaxy evolution.

The velocity anisotropy of clusters of galaxies and their assembly history

Andrea Biviano

A. Biviano, F. Rodriguez, CLASH-VLT Collaboration

We characterize the orbits of galaxies in nine massive clusters at $0.19 < z < 0.45$ from the CLASH-VLT survey, via the determination of their velocity anisotropy profiles, $\beta(r)$. Thanks to the unprecedented amount of spectroscopic members (from 150 to 950 per cluster) we determine significant differences in the orbital distributions of galaxies in different clusters, and investigate on the cause of this variance. By comparison with $z \sim 0$ clusters and with two sets of cosmological numerical simulations, we find that $\beta(r)$ carries information on the assembly history of the cluster. We then use clusters in the DESI survey, to test theoretical predictions about the beta-dependence of the cluster assembly bias in the large-scale structure.

Gaia: Ten years of surveying the Milky Way and beyond

Antonella Vallenari

The Gaia mission has completed the 10.5 years of survey, collecting the astrometric, photometric, and spectroscopic data for about 2.5 billion celestial sources, from the solar system to the Milky Way to the distant universe. Work is ongoing to produce Gaia DR4 based on the first 5.5 years of data, with the release expected by the end of 2026, while the full 10 year of data will be delivered in the Gaia DR5 (in 2030). The exquisite precision of the Gaia data in synergies with photometric and spectroscopic data have revolutionized our knowledge of the structure, dynamics and evolution of the Milky Way. In this talk, I will provide a brief overview of Gaia DR4 data and I will present some of the recent advances on our Galaxy

Mapping the Milky Way in Six Dimensions: A contiguous, homogenised, phase-space GAIA gold catalogue up to 250 kpc

Subhabrata Majumdar

S. Majumdar, S. Mukherjee, A. Srivastav

We present a comprehensive, quality-assured, homogenised catalogue of 33 million stellar sources with full 6D phase-space information, spanning a contiguous Galactocentric distances from the inner galaxy to the outer halo. The catalogue cross-matches Gaia DR3 astrometry with spectrophotometric distances and line-of-sight velocities from 14 large-scale surveys (including DESI, SDSS-BOSS, LAMOST, GALAH and GES). Gaia-anchored, survey-specific zero-point corrections and statistical normalisation suppress both random and systematic errors prior to aggregation. We further derive spectrophotometric parallaxes by jointly exploiting multi-band photometry and spectroscopic observations; for sources with discrepant or missing measurements, superior data from overlapping surveys supersede unreliable values and supplement absent radial velocities, improving both completeness and internal consistency. This

multi-survey synthesis yields precise parameters and kinematics for confirmed members of globular clusters, dwarf galaxies, and stellar streams. Of the final sample, there are around half-million halo stars, predominantly faint ($G > 17$) and metal-poor ($[\text{Fe}/\text{H}] < -1$) tracers., and extend well beyond the Gaia parallax limit ($\gtrsim 10$ kpc). This unique dataset is ideally suited for accurate multi-component mass modelling, cluster kinematics, chemical abundance mapping, galactic archaeology, dark matter searches, etc over almost the entire Milky Way volume. As an example, we construct the first single-survey (GAIA) contiguous rotation curve (including full tracer velocity anisotropy) from centre to 250 kpc.

Milky Way archaeology with J-PLUS DR4: stellar parameters from a purely algebraic photometric method

Adrián Hidalgo

A. Hidalgo, A. del Pino, C. López-Sanjuan, J. Alzate

Deriving stellar parameters such as effective temperature (T_{eff}), surface gravity ($\log g$), metallicity ($[\text{Fe}/\text{H}]$), and alpha-element abundance ($[\alpha/\text{M}]$) from spectroscopy for millions of stars is observationally expensive, yet essential for understanding the formation and evolution of the Milky Way. We present a purely algebraic method that infers stellar parameters using multi-filter photometry alone. The approach is flexible, interpretable, and requires only a modest spectroscopic training set. Its simplicity allows us to identify which photometric bands carry the most information for each stellar parameter, enabling straightforward and rapid adaptation to other surveys with similar filter configurations. Applied to J-PLUS DR4, which covers 5000 square degrees with 12 optical bands, seven of them narrow, the method produces a catalogue of 13 million stars with derived stellar parameters and associated uncertainties. The size of this sample enables systematic selections of metal-poor populations ($[\text{Fe}/\text{H}] < -1.5$) to trace merger debris, map stellar streams over thousands of square degrees, and automatically identify white dwarfs through their distinctive loci in the $[\alpha/\text{M}]-[\text{Fe}/\text{H}]$ and $\log g-T_{\text{eff}}$ planes. Because the model is survey-agnostic and computationally lightweight, it remains effective even in regions with very limited spectroscopic coverage, making it particularly well suited to sparsely sampled areas. The division strategy in the $[\alpha/\text{M}]-[\text{Fe}/\text{H}]$ plane successfully separates the main Milky Way components, and the resulting abundance distributions exhibit the expected behaviour. This catalogue therefore provides a powerful resource for studying the structure, formation, and evolutionary history of the Milky Way.

The Sloan Digital Sky Survey

Carlos Allende

The SDSS marked an inflection point in the way observational astronomy works, changing forever the small-group culture by large collaborations, and speeding up progress dramatically. The SDSS started in 2000, introducing multiple innovative solutions for multiplexing data acquisition while preserving high data quality. The SDSS 2.5-m telescope is one example, a very fast ($f/2.25$) Ritchey-Chrétien designed to maximize field-of-view and image quality – and two interchangeable correctors optimized for imaging or spectroscopy. Other examples are the imaging camera with 30 (+24) CCDs for drift-scanning observations, and the twin 320-fiber (later upgraded to 500 for BOSS) spectrographs fed from plug plates. SDSS embraced APOGEE as one of its programs using the Apache Point Observatory 2.5m telescope starting in 2011, and a second instrument started operations in early 2017 on the Dupont 2.5m at Las Campanas Observatory, revolutionizing high-resolution spectroscopy of stars. Another SDSS program, MaNGA has performed 2D spectroscopy of galaxies since 2014 using fiber bundles, making it possible a much larger sample than in previous projects. Over the years BOSS has measured 1.5 million galaxy redshifts, MaNGA has mapped 10,000 galaxies and APOGEE has derived detailed chemical patterns for about a million stars. SDSS has inspired many other collaborations and instruments, and the SDSS continues operations Today.

The J-PAS Extended Early Data Release

Héctor Vázquez Ramió

H. Vázquez Ramió, J-PAS Collaboration

The J-PAS Extended Early Data Release (E2DR) presents the complete dataset from the first year of scientific operations of the Javalambre-Physics of the Accelerating Universe Astrophysical Survey (J-PAS) with its dedicated camera, JPCam. The E2DR extends the J-PAS Early Data Release (EDR) to encompass all observations gathered during the first year of operations, covering approximately 28 deg² observed with the full set of J-PAS filters across multiple seeds of the survey. The dataset includes flux-calibrated individual and coadded images in all 57 J-PAS bands, together with photometric catalogues and photometric redshifts for detected sources brighter than $i=22.5$. The E2DR represents a significant step forward in the delivery of J-PAS data to the community, demonstrating the survey's unique capability to deliver low-resolution pseudo-spectra ($R \sim 60$) for every source within the survey footprint without target selection, and setting the stage for the forthcoming first full Data Release of J-PAS.

JOLINES: A value-added catalogue of optical line intensities for nebular emission galaxies

Juan Antonio Fernández Ontiveros

J. Fernández Ontiveros, J-PAS Collaboration

Emission lines in galaxy spectra provide unique information on the physical conditions of the interstellar medium, enabling measurements of fundamental properties such as star formation rates, gas excitation, metallicity, and active galactic nucleus (AGN) activity. In this work, we present the value-added catalogue JOLINES (J-PAS Optical Line Intensities for Nebular Emission galaxies), which provides emission-line fluxes for galaxies in the spectrophotometric catalogues of miniJPAS, J-NEP, and the J-PAS Early Data Release (EDR). To obtain reliable emission-line fluxes from narrow-band photometry, we model and subtract the continuum using the spectral energy distribution fitting tool CIGALE. This approach effectively mitigates uncertainties associated with direct continuum subtraction techniques, including systematics produced by stellar absorption features underlying the emission lines. We validate the method using simulated observations of galaxy spectra with added noise, exploring its performance across different equivalent-width (EW) regimes and emission-line strengths. In addition, we compare the recovered emission-line fluxes with spectroscopic measurements from the Sloan Digital Sky Survey (SDSS) and the Dark Energy Spectroscopic Instrument (DESI). Our results show a tight correlation between photometric and spectroscopic fluxes, particularly for the brightest emission lines, with a typical dispersion of ~ 0.3 dex. Reliable fluxes are recovered for emission lines with $EW \gtrsim 20 \text{ \AA}$, in agreement with previous empirical studies. The current catalogue comprises approximately 13,900 sources with reliable measurements in the H α + [NII] complex and 7,200 in [OIII]5007, providing statistically robust samples for the brightest optical emission lines. This resource will be expanded in future J-PAS releases, enabling large-scale studies of star formation, AGN activity, and galaxy evolution.

Mapping Galaxy Assembly through Stellar Halos and Intracluster Light in the Era of Deep Surveys

Marilena Spavone

Stellar halos and intracluster light (ICL) are among the most powerful tracers of galaxy assembly, preserving the fossil record of past accretion and interaction events. Detecting and characterizing these diffuse components requires ultra-deep imaging and spectroscopy capable of probing the low surface brightness Universe over large spatial scales. In this talk, I will present recent results from the VST Early-type Galaxy Survey (VEGAS), the Fornax Deep Survey (FDS), and the Fornax3D project, combining deep multi-band imaging and MUSE spectroscopy to study galaxy outskirts in nearby groups and clusters.

These data reveal tidal features, diffuse light, metallicity gradients, and kinematic transitions that trace the build-up of stellar halos and the growth of the ICL. By comparing the observed accreted stellar mass fractions and stellar population properties with predictions from cosmological simulations, we are able to constrain the relative role of in-situ and ex-situ processes in the formation of massive galaxies. I will also discuss the key role that current and future deep large-area surveys will play in unveiling the low surface brightness Universe and connecting galaxy evolution across environments and cosmic scales.

Cosmology with DESI: Cracks in Λ CDM?

Jonás Chaves

The Dark Energy Spectroscopic Instrument (DESI) has produced the largest three-dimensional map of the Universe to date, tracing large-scale structure using galaxies, quasars, and the Lyman-alpha forest at low, intermediate, and high redshift, respectively. Analyses of these data have delivered some of the most precise constraints on dark energy through baryon acoustic oscillation and full-shape clustering measurements. The combination of DESI measurements with external datasets shows increasingly strong tension with a simple cosmological constant description of dark energy, with several analyses indicating a preference for dynamical dark energy models. In this talk, I summarize recent cosmological results from DESI and discuss their implications for the Λ CDM framework and its possible extensions. I will place particular emphasis on measurements from the Lyman-alpha forest, which provides a uniquely powerful probe of large-scale structure at high redshift. The results presented here are based on the first three years of DESI observations, while analyses of the full five-year dataset are now underway and expected to further sharpen these questions.

Towards Bayesian Photometric Cosmic Chronometers

Swaraj Pradhan

S. Pradhan, P. Renard, E. Gaztanaga

The cosmic chronometers method provides a direct, cosmology-independent way to measure the expansion history of the universe by using the differential ages of passively evolving galaxies. Traditionally, they require high-resolution spectroscopy to reliably measure subtle stellar absorption features, extract a pure passive galaxy sample, and accurately measure differential ages. We build on existing works that use the D4000 spectral break as a proxy for measuring galaxy ages and apply it to a photometry-selected galaxy sample from VIPERS PDR2 in the range $0.5 \leq z \leq 0.8$. Our goal is to extend the scope of the standard CC framework to photometric surveys, which are inexpensive, provide better overall statistics, and are free of target selection bias. To achieve this, we first select a massive and passive galaxy sample using rest-frame colors and mass. Second, we design a Bayesian framework to infer full galaxy age posteriors in fine redshift bins, using a D4000-age-metallicity grid from stellar population synthesis (SPS) models. We also marginalize over metallicity, using a Gaussian metallicity prior ($\log(Z/Z_{\odot}) = 0.13 \pm 0.032$) to break the D4000-age-metallicity degeneracy. Subsequently, we derive age-difference posteriors between the i^{th} and $(i+n)^{\text{th}}$ redshift bins by convolving their age posteriors to propagate the non-Gaussian features correctly. Finally, using the median and errors extracted from the differential age posteriors, we calculate the inverse-variance-weighted average $H(z)$ over our selected redshift range to provide robust constraints. We derive a new measurement of $H(z = 0.65) = 94.86 \pm 29.25$, (stat.) ± 10.80 , (syst.) $\text{km s}^{-1} \text{Mpc}^{-1}$, which is competitive with existing CC studies and acts as a proof-of-concept for our photometry-only sample selection. In our upcoming work, we will extend this method to the narrow-band photometry sample from PAUS, which has reliable D4000 measurements and precise redshifts. This work also opens the possibility of measuring $H(z)$ for ongoing narrow-band photometric surveys such as J-PAS, which are much wider than PAUS, and thus would greatly reduce the statistical errors.

Probing the Large Scale Structure with angular density and redshift fluctuations

Mar Pérez Sar

C. Hernández Monteagudo, A. Kovács, M. Pérez Sar

The accelerated expansion of the Universe remains one of the central open problems in cosmology. While traditional probes such as the Cosmic Microwave Background, Type Ia Supernovae, and Baryon Acoustic Oscillations have enabled precision cosmology, persistent tensions between independent measurements highlight the need for complementary observables to validate existing results and address systematic effects. In this work, we explore the cosmological potential of combining angular density fluctuations and angular redshift fluctuations to probe large-scale structure and cosmic dynamics. We analyze their angular power spectra over a wide range of scales and show that angular redshift fluctuations carry particularly valuable information on small scales, where they directly trace the dynamics of cosmic voids. Cosmic voids provide a promising laboratory for these studies due to their reduced sensitivity to nonlinear effects and their enhanced response to modified gravity models.

WEAVE: surveying the Milky Way and the Universe with the ING's next-generation spectroscopic survey facility

Scott Trager

The last three decades of astronomical discovery have largely been driven by surveys, especially by the synergy between imaging and spectroscopic surveys across the electromagnetic spectrum. In this presentation, I will describe the capabilities and current status of WEAVE, the next-generation optical spectroscopic survey facility at the William Herschel Telescope of the ING. WEAVE has a 2-degree field of view, three observing modes — nearly 1000 individually positioned 1.3'' fibres, a large (1.5' x 1.3') integral field unit, and 20 mini-integral field units — and two spectral resolution modes — a moderate-spectral resolution mode (3000–6000) across 360–950 nm or higher-resolution modes (11000–20000) in narrower bands. This very flexible instrument is used for 70% of the ING time to observe eight surveys, ranging from Gaia followup to LOFAR followup and from the Milky Way Galaxy to high redshifts, making excellent use of imaging surveys from the ground (LOFAR, APERTIF, J-PLUS + J-PAS) to space (Gaia, Planck, and others). I will present recent results from some of these surveys, as well as a few recent highlights from ING Open Time observations, and describe our future plans.

WEAVE Cluster Surveys: Science Verification first results

J. Alfonso L. Aguerri

Galaxy clusters are the most massive gravitationally bound structures in the Universe and provide unique laboratories for studying the interplay between galaxy evolution and environment. In this context, the WEAVE Cluster Survey is one of the key surveys that will be carried out with the WEAVE spectrograph at the William Herschel Telescope, designed to exploit its multiplexing capabilities to obtain deep spectroscopy for large samples of galaxies in and around nearby galaxy clusters. The survey aims to investigate how environmental processes affect galaxy properties across different density regimes, from cluster cores to filaments. Particular emphasis is placed on low-mass galaxies down to stellar masses of $\log(M_{\text{star}}/M_{\text{sun}}) > 8.0$ (corresponding to $M_r < -16$), which represent the last frontier in spectroscopic studies of nearby galaxy clusters due to their extreme sensitivity to environmental effects. In this contribution, we present the first results from the Science Verification phase of the WEAVE Cluster Survey. These data provide high-quality spectroscopy for thousands of galaxies in the nearby clusters A2142 and A2626, covering a wide range of environments from dense cluster cores to filaments and low-density regions. We present the quality of the spectroscopic dataset together with the first scientific results, including redshift determinations, galaxy kinematics, environmental characterisation, and stellar population analysis across different density regimes. We also describe the survey strategy, target selection,

and the main scientific goals of the project. Finally, we discuss the synergies between WEAVE and current large photometric and spectroscopic surveys such as J-PLUS, J-PAS, SDSS, and DESI, highlighting the potential of combining these datasets to study galaxy evolution across the cosmic web. The combination of WEAVE spectroscopy with current wide-field photometric surveys will provide an unprecedented spectro-photometric characterisation of nearby galaxy clusters down to $M_r < -14$ ($\log(M_{\text{star}}/M_{\text{sun}}) > 7.0$), enabling environmental studies across almost the entire dwarf galaxy population and opening a new observational window on galaxy transformation in the local Universe. These first observations demonstrate the scientific capabilities of the WEAVE Cluster Survey and pave the way for future studies of environmental galaxy evolution in the era of large astronomical surveys.

The Lockman SpReSO survey

Jordi Cepa

J. Cepa, Lockman SpReSO Team

Lockman SpReSO provides X-ray through FIR data for around 1000 galaxies in the central 24x24 arcmin² of the Lockman Hole. The galaxies were detected at a 5σ depth of 6 mJy at 100 and 160 μm using the Herschel Space Observatory. Spectroscopy for the optical counterparts was obtained using OSIRIS/GTC covering 3600-10000 $\text{\AA}$, down to a limiting depth of $R(\text{AB})=24.5$ magnitudes. The Lockman Hole's exceptionally low Galactic HI column density ($N_{\text{HI}} \sim 5 \times 10^{19} \text{ cm}^{-2}$) — the lowest on the sky — minimizes foreground X-ray absorption and dust extinction, making it the optimal field for combining deep X-ray and FIR data. Unlike broad-area surveys such as COSMOS, Lockman SpReSO achieves magnitude-complete spectroscopic coverage of all FIR-detected counterparts brighter than $R(\text{AB}) = 24.5$, providing a homogeneous, unbiased sample for statistical studies of galaxy evolution. The forthcoming public release of the catalogue will include spectroscopic redshifts, emission line fluxes, and SED fits, providing a legacy resource for the community. The survey's unique combination of low Galactic foreground absorption, deep FIR selection, and wide optical spectral coverage enables the study of low stellar mass ($\log(M^*/M_{\odot}) \sim 7.6$) and high redshift systems out to $z \sim 5$, making Lockman SpReSO a powerful benchmark for galaxy evolution studies. In this contribution, we present the evolution of the star-forming main sequence — with IR-selected star-forming galaxies shifting above the main sequence at $z > 0.4$ by ~ 0.4 dex — and of the mass-metallicity relation. We further report on the evolution of the obscured AGN fraction, the connection between X-ray absorption and the geometry and physical properties of the dusty torus, and the interplay between AGN activity and the star formation and dust properties of their host galaxies, within the main survey highlights. The depth and multiwavelength coverage of Lockman SpReSO make it a natural complement to photometric large-area surveys, offering spectroscopic ground truth for SED-based methods and photometric redshift calibration.

Unveiling the faintest side of the Universe: discoveries, structure and open issues on ultra-diffuse galaxies

Chiara Buttitta

The new generation of all-sky surveys is pushing the frontier into the low-surface-brightness (LSB) regime, where the most revealing relics of galaxy mass assembly across all environments are preserved. Tracing galaxy assembly across diverse environments places stringent constraints on their formation within the Λ cold dark matter (ΛCDM) paradigm. This scenario postulates that galaxies form within DM halos and that the baryonic content of low-mass DM halos should be observable as dwarf galaxies. Validating the ΛCDM cosmological model, therefore, critically depends on our ability to identify these baryonic counterparts, enabling a complete census and detailed characterization of the faintest LSB galaxy population. In this context, the ultra-diffuse galaxies (UDGs) play a special role, as they are among the faintest and lowest-surface-brightness ($\mu_{0,g} \geq 24 \text{ mag/arcsec}^2$, $R_e \geq 1.5 \text{ kpc}$) galaxies known in the Universe. Over the past two decades, deep imaging and spectroscopic surveys have significantly

advanced our understanding of galaxy mass assembly across environments, delivering the most complete census to date of the faintest and least massive stellar systems. These include UDGs, their associated globular cluster systems, and so-called “dark galaxies”, i.e., HI clouds with either no detectable optical counterparts or only extremely faint ones. Leveraging these expanded datasets, UDGs are now estimated to account for $\sim 5\text{--}8\%$ of the overall galaxy population, and their inclusion is required to reproduce galaxy mass and LF accurately. In this talk I would like to i) briefly review the state-of-the art on UDGs’ science, from both observational and theoretical sides, providing how much this field of research improved thanks to the advances in instrument developments, ii) illustrate the groundbreaking results we are obtaining from interdisciplinary large projects that I am leading, focused on the detection and analysis of UDGs from deep imaging survey at the VLT-Survey telescope and follow-up integral-field spectroscopic survey with MUSE@ESO-VLT.

The Vera C. Rubin Observatory’s Legacy Survey of Space and Time: Overview and Early Science

Tesla Jeltema

The Vera C. Rubin Observatory’s Legacy Survey of Space and Time will enable an enormous breadth of science from our local neighborhood to very distant galaxies and cosmology. I will give an overview of the Observatory, survey status, and early science results and plans. I will also highlight synergies with other surveys and how to get involved.

Time-Domain Wide-Field Surveys: the Paradigm Switch of the Discovery Machines

Alessandro Ederoclite

Time-domain astrophysics has been at the core of some of the most critical discoveries in the field, from the birth of extragalactic astronomy — the detection of Cepheids first in the Magellanic Clouds and later in M31 — to the evidence for the accelerating expansion of the Universe through type Ia supernovae. Wide-field time-domain surveys have evolved substantially over the past two decades. Early projects relied on single sites and one or few filters, as in PanSTARRS, while more recent efforts have expanded to multi-site networks such as ASAS-SN and broad multi-filter coverage culminating in LSST. This progression reflects a broader paradigm shift: from serendipitous discovery toward systematic, survey-driven astrophysics. In this presentation, I review the current landscape of the field and outline the prospects opened by next-generation projects that combine narrow-band filters — such as J-VAR — with global multi-site networks such as SiTian, pushing simultaneously the limits of cadence and depth. I will discuss the role that the Observatorio Astrofísico de Javalambre is positioned to play in this evolving landscape over the next decade and beyond.

J-ATLAS: Javalambre Andromeda and Triangulum Legacy Astrophysical Survey

Borja Anguiano

B. Anguiano, A. del Pino

In the Λ CDM paradigm, dark matter halos form hierarchically and provide the ‘skeleton’ on which the baryonic components of galaxies form, grow, and evolve through the hierarchical assembly of subhalos. Halo stars can have multiple, distinct origins—accreted from disrupted satellites, formed in situ, or dynamically ejected from the inner galaxy—and each pathway is expected to imprint characteristic chemical abundance patterns (e.g., metallicity and detailed element ratios) across the halo. The Andromeda Galaxy (M31) and Triangulum Galaxy (M33) offer an ideal combination of proximity and an external vantage point, enabling a detailed yet global view of halo assembly. The J-ATLAS survey adds a crucial dimension to this picture: a wide-area, homogeneous map of stellar chemical enrichment

across the disks, halos, and satellite systems of M31 and M33. Leveraging the 56 J-PAS narrowband filters across the optical down to $m \approx 23$ mag, J-ATLAS will complement previous broadband efforts (e.g., Pan-Andromeda Archaeological Survey) by delivering low-resolution photo-spectra for millions of resolved stars. These photo-spectra enable robust SED fitting analyses that go beyond global metallicity, providing constraints on key abundance dimensions (e.g., $[\text{Fe}/\text{H}]$ and multiple element-sensitive features that trace α -elements and other nucleosynthetic channels) across distinct structural components and substructures. The resulting catalog of stellar parameters and abundance estimates at unprecedented scale will allow us to chemically tag disrupted debris, distinguish accreted versus in situ populations, and directly test Λ CDM driven halo formation scenarios through their predicted chemo structural signatures. We have already begun this effort with a pilot survey targeting the Giant Stellar Stream, using it as a benchmark substructure to validate the abundance methodology and quantify chemical gradients within tidal debris. Finally, the synergy between J-ATLAS and RomAndromeda will enable chemo-dynamical studies by combining our abundance constraints with the high-fidelity proper motions delivered by the Nancy Grace Roman Space Telescope.

A Photometric Revolution in Galactic Archaeology — Unlocking the Milky Way with ~100 Million Stars

Yang Huang

The field of Galactic archaeology has entered a data-rich era, driven by large spectroscopic surveys such as SDSS, LAMOST, APOGEE, and GALAH, together with the transformative astrometric data from Gaia. However, despite their success, spectroscopic surveys remain limited by complex selection functions and relatively sparse sampling compared to the vast number of stars in the Milky Way. To overcome these limitations, we have developed a photometric approach to derive stellar parameters for massive stellar samples using narrow- and medium-band surveys. In this talk, I will present the SPORTS project (Stellar Parameters fOR all The Stars), which aims to measure fundamental stellar parameters—including metallicity, effective temperature, luminosity class, distance, and age—for tens of millions of stars across the Galaxy. By combining data from SAGES and J-PLUS in the northern sky, and SMSS and S-PLUS in the southern sky, together with Gaia, we have derived stellar parameters for nearly 90 million stars. The unique filter systems of J/S-PLUS further enable the measurement of chemical abundances such as $[\alpha/\text{Fe}]$ and carbon, opening a new window on the chemical mapping of the Milky Way. This photometric approach provides a complementary pathway to spectroscopy, enabling homogeneous, all-sky coverage with well-defined selection functions. Looking ahead, upcoming surveys such as J-PAS and the Chinese Space Station Telescope (CSST) will significantly extend both the depth and precision of this method, allowing us to probe the outer disk and distant halo, and to construct a global, high-resolution chemo-dynamical map of the Milky Way. These developments illustrate how large-scale photometric surveys, in synergy with spectroscopic and astrometric data, are reshaping our ability to reconstruct the formation and evolution history of our Galaxy.

The ESO public surveys: An overview of the current and future plans and of the surveys' scientific legacy

Magda Arnaboldi

Large surveys are considered a key tool in observational astronomy because they allow explorations that go beyond individual targeted observations. They are characterized by large investments that comprise dedicated telescopes and instruments, a wide community of astronomers involved in these science projects and extended networks for the science data distribution and analysis. The scientific success of these projects includes the legacy value of their science products that are made available through the ESO archive (but also project-based archives) for further scientific exploration by the community. ESO Public Surveys are an example of an effective implementation of this strategy, with the goal of supporting

the scientific advancement of its community. I will briefly report on the seventeen VST (optical), VISTA (NIR) and the spectroscopic public surveys which are all completed. I will present the recently started KMOS (NIR) IFU public surveys, with an outlook on the soon-to-be started 4MOST spectroscopic surveys.

CHANCES: The CHileAN Cluster Galaxy Evolution Survey

Christopher Haines

We present the CHileAN Cluster galaxy Evolution Survey (CHANCES), one of the 18 public spectroscopic surveys that will be carried out with 4MOST over five years (2026-2031). CHANCES (<https://chances.uda.cl/>) will target 500,000 galaxies in and around 150 of the most massive galaxy clusters in the local Universe and out to $z=0.45$. CHANCES will provide comprehensive spectroscopic coverage of galaxies out to $5r_{200}$ for each cluster and, in synergy with XMM (CHEX-MATE) and eROSITA, permit in-depth studies of the mass assembly of clusters at late epochs and the impact of pre-processing on galaxies within infalling X-ray groups and connecting filamentary structures. We discuss the survey design and key scientific motivations, and present results from the Survey Program Validation (SPV) observations of galaxies around three galaxy clusters (A3558, A754 and the Bullet cluster) carried out in March and April 2026, demonstrating the ability of CHANCES to obtain redshifts, velocity dispersions and star formation histories for thousands of cluster galaxies. These SPV data will become publicly available in the 4MOST DR0 currently scheduled in November.

Harnessing the statistical power of large surveys: two stacking analyses of the MaDCoWS2 galaxy clusters at $0.5 < z < 2.0$

Ariane Trudeau

A. Trudeau, A. Gonzalez, K. Thongkham, M. Brodwin, T. Connor, P. Eisenhardt, E. Moravec, S. Stanford, D. Stern

We present two stacking analyses that fully exploit the statistical power of existing surveys to investigate the star formation and the assembly histories of $0.5 < z < 2$ galaxy cluster samples from the Massive and Distant Clusters of WISE Survey 2 (MaDCoWS2). Our stacks are centered on the cluster centroids. This variant of the image stacking is called total light stacking and ensure that the light of faint galaxies is taken into account. To study the star formation history, we combine WISE, GALEX, and Herschel images of 10k clusters and groups at $0.5 < z < 2.5$ within the GAMA fields. Our results show that the sSFR increases with projected radius and redshift, with a transition at $z=1.6$ to a flat sSFR profile suggesting that the onset of the environmental quenching happened at this epoch, with a timescale of about 600 Myr. We next applied the same stacking technique to the 83k clusters at $0.5 < z < 2$ in the MaDCoWS2 survey, serendipitously discovering that the splashback radius — the apocenter of the first orbit of infalling material and the physical boundary between the cluster and its infalling region — is detectable in stacked WISE 1 and 2 images. We use this new splashback determination technique to show that the fractions of stellar mass within the cluster infalling region increase with increasing redshift — a proof of concept that highlights the potential of total light stacking to probe the star formation history of the cluster infalling region with Euclid and Roman.

A Legacy of Legacy Surveys: Mariano Moles and the CEFCA Vision

Javier Cenarro

This talk will present, from a historical perspective, the vision and key contributions of Prof. Mariano Moles to the creation of the Centro de Estudios de Física del Cosmos de Aragón (CEFCA) and the Observatorio Astrofísico de Javalambre (OAJ), dedicated to advancing our understanding of the Universe through the design, execution, and scientific exploitation of large astronomical sky surveys.

J-PAS: the Universe in multi-color

Silvia Bonoli

The J-PAS survey was conceived to push the boundaries of narrow-band photometric surveys. With its unique set of 54 narrow-band filters covering the entire optical wavelength range, J-PAS effectively provides a low-resolution spectrum for every observed pixel. Carried out at the Javalambre Observatory with the JPCam wide-field camera on the JST250 telescope, J-PAS has the potential to advance a wide variety of astrophysical fields. In this talk I will present the survey and its history, its current status, and the first scientific results, ranging from stellar science to galaxy evolution, galaxy clusters and cosmology.

J-PLUS: the Javalambre Photometric Local Universe Survey

Carlos López San Juan

In this talk, the highlights of the first legacy survey from JAST80 and T80Cam at OAJ, the Javalambre Photometric Local Universe Survey (J-PLUS), are presented.

Exploring the universe from the ALHAMBRA

Isabel Márquez

The Advanced Large, Homogeneous Area Medium-Band Redshift Astronomical (ALHAMBRA) survey transformed observational cosmology by demonstrating that multi-filter imaging could achieve a level of precision comparable to that of complex spectroscopic surveys over large cosmic volumes. At the heart of this international project was the strategic and scientific leadership of Mariano Moles. As Principal Investigator, he conceived and led a collaboration of more than 50 scientists from 16 institutions worldwide, transforming a bold conceptual vision into a lasting cornerstone of modern astrophysics. In this talk, we examine his pioneering development of the specialized 23-filter system, an innovative configuration that achieved unprecedented photometric-redshift accuracy for hundreds of thousands of faint galaxies spanning 10 billion years of cosmic history. Conceived at the Instituto de Astrofísica de Andalucía and carried out with the 3.5-meter telescope at the Calar Alto Observatory, ALHAMBRA provided the direct technical and algorithmic blueprint for subsequent wide-field surveys such as J-PLUS and J-PAS.

A Comprehensive Census of the Local Cluster Universe: The WINGS/OmegaWINGS Legacy

Alessia Moretti

Understanding the physical mechanisms driving galaxy evolution requires a comprehensive mapping of the structural, kinematic, and stellar population properties of galaxies across diverse cosmic environments. Over the past two decades, the WINGS (WIde-field Nearby Galaxy-cluster Survey) and its extension, OmegaWINGS, have provided an unprecedented and definitive benchmark for the study of the galaxy population in local galaxy clusters at $z \sim 0.04 - 0.07$. This survey has been the first and still is the most detailed survey of clusters in the nearby Universe and as such it serves as a benchmark for higher redshift samples. Combining wide-field multi-band imaging with extensive optical spectroscopy, WINGS/OmegaWINGS have yielded robust determinations of both cluster memberships and non parametric star formation histories, allowing a significant mapping of galaxy properties up to $\sim 1 R_{\text{vir}}$. Key insights from WINGS/OmegaWINGS include quantifying the dramatic impact of the cluster environment on the quenching of star formation, mapping the morphology-density relation with high statistical precision, and identifying the pivotal role of ram-pressure stripping and hints of preprocessing

in the infalling regions. Nowadays, the legacy of WINGS/OmegaWINGS is currently being propelled into a new era by next-generation massive spectroscopic surveys, such as the WEAVE-Clusters survey on the William Herschel Telescope and the 4MOST/CHANCES (CHileAN Cluster Galaxy Evolution Survey) on the VISTA telescope. Together, these surveys will expand our grasp of galaxy ecosystems by providing unprecedented target density, wider radial coverage out to the cluster infall regions, and a seamless bridge between the local universe and intermediate redshifts. By combining the deep archival heritage of WINGS with the high-multiplex capabilities of WEAVE and 4MOST, we are poised to comprehensively trace the life cycle of cluster galaxies from the cores of massive halos out to the cosmic web.

Mariano Moles and the search of two numbers

Vicent J. Martínez

Back in 1970, the late Allan Sandage wrote a much-quoted paper pointing to two numbers that take us closer to answers about the nature of cosmic expansion. His goal was to measure them and discover how they change with cosmic time. Those numbers are the Hubble constant, H_0 , and the deceleration parameter, q_0 . The first of these two numbers tells us how fast the universe is expanding. The second, q_0 , needs a little explaining: it arises because Hubble implicitly assumed that if we double the distance to a galaxy, we double the recession velocity. However, that might be only approximately true. There are mathematical cosmological models which predict a small systematic deviation from the strict straight line that Hubble drew through the data showing the Hubble-Lemaître Law. Sandage's second number, q_0 , is a measure of that deviation and an indicator of which relativistic models to prefer. It is related to the cosmological constant Λ . We know little or nothing about the cosmological constant. In fact, we do not even know that it is a constant! Einstein first said there was a constant energy field when he created his first cosmological model derived from General Relativity in 1917. His solution was neither expanding nor contracting. It was static and unchanging, and so the field had to be constant. Constructing more sophisticated models that had this constant field was an easier task: they were derived by the Belgian Relativist Georges Lemaître. The standard cosmology models today are Lemaître models and referred to as Λ Cold Dark Matter (Λ CDM) models. In this talk, I will present the historical development of the cosmological constant, from its first postulation by Albert Einstein to its current interpretation as dark energy. I will discuss how its role has evolved within the framework of modern cosmology, particularly in the context of the Λ CDM model. Special attention will be given to the contributions made over the past fifty years by Mariano Moles, noting that his early work on Λ had a theoretical focus, while his later research in observational cosmology and large-scale structure helped constrain cosmological parameters and strengthen the empirical foundations of a Λ -dominated universe.

Celebrating the Survey Universe in the SKA Observatory Era

Lourdes Verdes Montenegro

The construction of the SKA Observatory (SKAO) is progressing rapidly. With its two telescopes, SKA-Low in Australia and SKA-Mid in South Africa, it is expected to transform radio astronomy in many aspects, including data handling, open science, and survey-driven discovery. As science verification is expected to commence in 2027, the international community is preparing for a new era of radio astronomy. In this contribution, I will present an overview of the current status of the SKAO and the scientific opportunities during science verification and early operations. It will highlight how the SKAO builds upon the legacy of precursor and pathfinder surveys, such as WALLABY, LADUMA, MHONGOOSE, MIGHTEE, and RACS, which have already demonstrated the power of large radio surveys for studying galaxy evolution, neutral hydrogen, and large-scale structure. These projects are helping to shape future observing strategies and survey concepts for the SKAO era. Meanwhile, the Spanish SKAO community has evolved, growing in scientific participation and national coordination efforts. Current initiatives aim at preparing for early SKAO observations; potential projects based on science verification data as well as developing future

PI-led programmes and larger Key Science Projects. In addition, Spain hosts the espSRC, a node of the SKA Regional Centre Network, which is supporting data-intensive, multi-wavelength research.

The First Large Absorption Survey in HI (FLASH): A new radio census of neutral gas beyond the local Universe, and a treasure trove for multi-wavelength studies of galaxy evolution

Emily Kerrison

E. Kerrison, E. Sadler, E. Mahony, H. Yoon

The First Large Absorption Survey in HI (FLASH) is a wide-area, untargeted survey conducted on the Australian Square Kilometre Array Pathfinder (ASKAP), designed to systematically probe cold neutral gas in galaxies beyond the local Universe. By detecting HI 21-cm absorption at redshifts $0.4 < z < 1.0$, FLASH provides a unique window into the evolution of the cold gas reservoir and the role of AGN feedback in galaxy evolution, doing so at the critical period after cosmic noon where star formation rates begin to decline. The FLASH survey commenced in 2023 and has reached 98% complete as of May 2026, providing uniform spectral coverage of $25,000 \text{ deg}^2$ of the extragalactic southern sky. In this talk, I will showcase the FLASH dataset, which is publicly available and comprises some 150,000 radio spectra, 600 radio continuum images and associated catalogues, and I will highlight some of the ways in which we are augmenting our data products for higher-level access and analysis through collaboration with the Australian SKA Regional Centre (AusSRC). The true scientific power of the FLASH survey will only come through leveraging connections with other large surveys at a variety of wavelengths, from the radio through to the optical and X-ray. I will end my talk with a showcase of some of the work already being done in this multiwavelength space, tracing fast outflows of cold gas with MeerKAT, identifying AGN with young radio jets using Bayesian statistics, understanding the redshift distribution of our sources with DESI and machine learning, and probing the gas content of distant star forming galaxies with combined UV-optical crossmatching, to name but a few. As a pathfinder for future HI absorption studies with the Square Kilometer Array (SKA), FLASH is a critical benchmark both technically and scientifically - laying the groundwork for delivering widefield radio spectral line surveys in an accessible format to the astronomical community, whilst also providing a groundbreaking dataset with which to probe the gas in galaxies in the distant Universe.

From Cores to Infall Regions: Morphological Pre-processing Signatures in CHANCES Evolution Clusters

Simón Véliz Astudillo

S. Véliz Astudillo, A. Monachesi, C. Haines, A. Bewaldi, V. Sampaio, C. Lima-Dias, D. Pallero, R. Baier, F. Piraino-Cerda, Y. Jaffé

Understanding the physical and morphological transformations of galaxies in various cosmic environments is fundamental in astrophysics. Galaxy clusters, as the largest gravitationally bound structures, are ideal laboratories for studying galaxy evolution. The dense environments of the inner regions of clusters accelerate galaxy evolution, often leading to transformations in morphology and star formation activity, including the cessation of star formation, i.e. the quenching of galaxies. However, recent studies have shown that even at large distances from the cluster centers ($R \sim 5R_{200}$), galaxies appear quenched, or at least, with lower star formation activity in comparison with field galaxies. A pre-processing scenario is proposed, where galaxies in substructures and filaments undergo significant evolutionary changes before falling into the cluster environment. In this context, the CHileAN Cluster galaxy Evolution Survey (CHANCES) will play a crucial role. CHANCES is one of the 4MOST extragalactic community surveys, designed to study galaxy evolution in and around approximately 150 galaxy clusters over the last 4 Gyr of cosmic time ($0.00 < z < 0.45$). By extending spectroscopic coverage beyond the virial radius up to $5R_{200}$, obtaining spectra for $\sim 2,000$ galaxies per cluster, CHANCES will provide an unprecedented

homogeneous view of how cluster environments shape galaxy populations from the dense cores to the infalling regions where preprocessing is expected to be relevant. In this work, we focus on the CHANCES Evolution Sub-Survey, a subsample of 50 galaxy clusters in the redshift range $0.07 < z < 0.45$. We present a morphological classification of the 4MOST target galaxies based on images from the DESI Legacy Imaging Survey Data Release 10, using random forest models trained on parametric and non-parametric morphological indices in different redshift bins to account for resolution effects. This classification allows us to trace the late-type galaxy fraction as a function of clustercentric distance out to 5R200, providing a morphological view of environmental effects across the full extent of the cluster influence zone. Our results reveal a flattening of the late-type galaxy fraction at large clustercentric radii, a signal consistent with pre-processing by substructures and filaments in the cluster outskirts, where cluster-specific mechanisms such as ram-pressure stripping are expected to be weak or negligible. Remarkably, this signal is consistently observed regardless of cluster dynamical state, mass, or redshift, suggesting that pre-processing may be a universal feature of cluster assembly across a wide range of cluster properties and cosmic times. We are currently investigating the connection of this signal with the presence of galaxy groups and cosmic filaments in the cluster surroundings, which will allow us to identify the specific environments responsible for the early morphological transformation of galaxies. If time allows, we will also present results regarding this connection.

Mini-HAWKs: A pilot survey designed to discover new quiescent black holes.

Sara Navarro Umpiérrez

S. Navarro, G. Escobar, J. Casares, M. Pérez Torres

One of the main challenges in understanding stellar-mass black holes is the lack of observational data, since most galactic black holes have been detected via X-ray outbursts and therefore constitute a small and biased sample. To overcome this limitation and accelerate the rate of black hole discovery, the HAWKs project was designed, with Mini-HAWKs serving as its pathfinder. Mini-HAWKs is a pilot photometric survey covering 50 square degrees of the Northern Galactic Plane, with 400 hours of guaranteed time, currently being carried out with the JAST80 telescope at the Observatorio de Javalambre. It uses three interference filters centered on H-alpha, which allow the recovery of the full-width at half-maximum (FWHM) and equivalent widths of H-alpha lines photometrically. We will show how this information can be used to efficiently identify candidate dormant black holes through color-color diagrams and light curves constructed solely from the H-alpha measurements. This method relies on the fact that very broad H-alpha emission lines ($\text{FWHM} \gtrsim 2200 \text{ km s}^{-1}$) are indicative of the strong gravitational fields surrounding compact objects. This strategy is promising not only for discovering new black holes, but also for identifying a wide range of other stellar populations, such as cataclysmic variables, Mira variables, and Wolf-Rayet stars, among others, providing valuable data for multiple lines of research. We present the preliminary results from the first observations, which already include the discovery of a new cataclysmic variable and a Green Pea galaxy, highlighting the broad scientific potential of the Mini-HAWKs survey.

Angular redshift fluctuations (ARF): a turolense cosmological observable

Carlos Hernández Monteagudo

C. Hernández Monteagudo et al.

The idea behind using the galaxy redshifts as a cosmological observable "per se" arose during the design of the cosmological exploitation of J-PAS, a survey seen by then as a huge "redshift factory". About ten years later, ARF have been used, from a cosmological perspective, to set competitive constraints on the nature of gravity, to characterise the gas profile in and around halos in the redshift interval $z \in [0,5]$, or to measure the inflationary parameter f_{NL} accounting for local non-Gaussianity in the primeval curvature perturbations. ARF have also been/are also being used to measure galaxy linear

biases, constrain photometric redshift PDFs, and identify systematics in galaxy surveys. I will briefly review past and ongoing applications of ARF, and future prospects for upcoming surveys.

Optimizing Photometric Redshift Training Sets with UMAP

Finian Ashmead

F. Ashmead, J. Newman, B. Andrews

The volume of galaxy imaging data continues to outpace that of the high quality spectroscopic data used to precisely measure physical parameters like redshift and specific star formation rate (sSFR). In the near future, this problem will be exacerbated as facilities like Rubin and Roman rapidly build up sky maps extending to higher redshifts and dimmer fluxes, regimes where the spectroscopic datasets provide an even more sparse and biased sampling of the galaxy population than among brighter, lower redshift objects. Image properties like photometric colors can be mapped to physical parameters using spectroscopic galaxies as training data, but in lower-dimensional color spaces there tend to be degenerate redshift solutions, while in higher-dimensional spaces the curse of dimensionality exacerbates the deficient sampling by labeled data. However, since observed galaxy colors are highly correlated and driven by a small number of physical parameters (mainly redshift and sSFR), this is a perfect case for dimensionality reduction. Self-organizing maps (SOMs) have become a popular approach among astronomers, but feature drawbacks like information loss to binning data in cells and constrained geometry. To ameliorate these issues, I use uniform manifold approximation and projection (UMAP) to study the color–redshift relation, compressing a seven-dimensional Rubin+Roman-like color space to three dimensions and recovering a thin, densely-sampled manifold with monotonic and roughly orthogonal trends in redshift and sSFR. Position in this compressed color space maps coherently to redshift, such that it can be reliably interpolated from only a small and highly-biased subset of labeled data using a simple kNN-based estimator. The physically-meaningful organization of the data in the low-dimensional space gives us a way to combine complementary information contained in the ground-based optical and space-based infrared observations while avoiding the curse of dimensionality. Similarly, it provides a way to leverage our biased and incomplete spectroscopic data to map color to redshift across the full distribution of imaged galaxies in the color space, allowing us to take maximum advantage of the synergies between surveys.

CORN: Chronometers of Relic Nature The first estimate of the expansion rate of the Universe using compact relic galaxies

Krzysztof Lisiecki

K. Lisiecki, A. Pollo, N. Principi Cavaterra

The persistent discrepancy between the locally measured Hubble constant, derived from Cepheids and Type Ia supernovae, and the value inferred from the cosmic microwave background highlights the need for independent cosmological probes that can fully exploit current and forthcoming large spectroscopic surveys. Cosmic chronometers offer a direct, model-independent measurement of the expansion history, but their precision is currently limited by systematic uncertainties in stellar population modelling when the full red and quiescent galaxy population is used. Extended star formation histories, residual star formation, and merger-driven rejuvenation introduce biases in age estimates that propagate into the differential age–redshift relation. In the era of large surveys, sample definition becomes the dominant systematic. I propose a chronometer strategy tailored to survey-scale datasets that focuses on relic galaxies: the oldest, most compact systems at a given epoch, selected through homogeneous structural and spectroscopic criteria. These galaxies are expected to host rapidly formed, uniformly old stellar populations with minimal subsequent mass assembly, making them closer to ideal single-burst systems and therefore better suited for differential age measurements. This work leverages the largest spectroscopically confirmed relic sample as a pilot dataset to define robust selection functions that can be applied to wide-area surveys.

I will discuss which survey characteristics impact stellar age precision, and what is still lacking in current single stellar population models when moving to survey-quality data. By combining careful sample curation with survey-optimised stellar population modelling, a relic-based chronometer approach can scale to next-generation datasets, reduce systematic uncertainties, and provide an independent constraint on the expansion history that is competitive in the context of large survey cosmology.

Measurement of the Hubble constant from the cross-correlations of galaxies and dark sirens

Raul Abramo

We measure for the first time the Hubble constant (H_0) from the cross-correlation of galaxies and gravitational waves (GW), by applying the Peak Sirens method. This method consists of finding the peak of the 3D angular cross-spectrum $C_{\ell}(z, D_L)$ between the galaxy redshifts (z) and the GW luminosity distances (D_L). Using two GW events from the GWTC-3.0 catalog and the GLADE+ galaxy catalog, we make the first detection of the cross-correlation peak at 5.9σ confidence. This signal comes mostly from the best localized event in the catalog, GW190814, which alone provides a 3.4σ significance. Adding also the multimessenger event GW170817, but without using its known redshift, we find $H_0 = 67^{+18}_{-15}$ km s $^{-1}$ Mpc $^{-1}$ and the first observational constraint on the GW bias, $b_{\text{gw}} < 4.3$ at 95% CI. These measurements set the stage for future novel cosmological constraints with this technique.

SPHEREx

Sean Bruton

Abstract not available.

Optical–infrared survey synergies in the Rubin era

Ignacio Sevilla Noarbe

I. Sevilla Noarbe, N. Weaverdyck, M. Martín Puebla

Optical imaging surveys increasingly rely on infrared observations to extend their redshift reach and improve the accuracy of object classification and photometric redshifts. However, obtaining sensitivity beyond 1 micron within a single survey instrument is technically challenging and often observationally expensive. In this contribution, we explore how complementary infrared data from external facilities have enhanced the scientific exploitation of the Dark Energy Survey (DES), highlighting both the benefits and practical challenges of combining heterogeneous datasets across different depths, resolutions, and wavelengths. We discuss the impact of ancillary infrared information on source classification and photo- z performance using data from surveys such as VHS and WISE, and examine the implications for the Rubin Observatory LSST era. We further consider the opportunities opened by forthcoming synergies with Euclid and the Roman Space Telescope, where joint optical–infrared analyses will play a central role in maximizing the scientific return of next-generation cosmological surveys.

Galaxy evolution at the advent of J-PAS: stellar population properties up to $z \sim 1$

Luis Diaz-Garcia

L. Diaz-Garcia, R. Gonzalez Delgado, J-PAS Collaboration

At the dawn of the large-scale astronomical surveys, the Javalambre Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is emerging as a reference dataset to pursue galaxy evolution studies. The

J-PAS survey collects imaging from 54 narrow bands ($\text{FWHM} \sim 145$) in the optical range that, once completed, will include 8000 deg^2 of the northern sky hemisphere (depth $i\text{SDSS} \sim 22.4$ for galaxies). Making use of its second internal data release (IDR, i.e. the first J-PAS dataset with all the bands across 30 deg^2 of the sky), we have characterized the potential and capabilities of J-PAS to ultimately study the star formation history and assembly of galaxies in different environments. During this talk, I would plan to briefly introduce part of the methodologies and the limitations for some of the critical parameters to perform galaxy evolution studies in this survey, such as detection depth, stellar mass completeness, spectral-type classification, etc. In addition, I would present the accuracy of the stellar population properties (age, metallicity, extinction, stellar mass, etc.) of J-PAS galaxies up to redshift $z \sim 1$ (also according to magnitude and stellar mass). Finally, I would also like to introduce some of the stellar population studies and new results that we are obtaining in our galaxy evolution group (led by Rosa Gonzalez Delgado), such as the evolution of the stellar content of galaxies since $z \sim 1$ and the distribution of stellar population properties of spatially-resolved J-PAS galaxies in the nearby Universe (IFU-like studies) up to more than 3 half-light radius only using the J-PAS images. All this allows us to constrain the star formation history and assembly of these galaxies with the advantages of multi-band photometric imaging.

Spatially Resolved Galaxy Evolution with J-PAS and Py2DJPAS

Julio Esteban Rodríguez Martín

J. Rodríguez-Martín, R. González Delgado, L. Díaz-García, G. Martínez-Solaesche, A. de Amorim, R. García-Benito, A. Conrado, R. Cid Fernandes, J. Thainá-Batista, J-PAS Collaboration

The Javalambre-Physics of the Accelerating Universe Astrophysical Survey (J-PAS) is an ongoing survey mapping thousands of square degrees in the Northern Hemisphere. Its photometric system, composed of 56 narrow-band filters, enables detailed spectral energy distribution (SED) fitting and emission-line detection. In addition, its large field of view (FoV) allows the study of extended nearby galaxies, as well as the identification of galaxy groups and clusters and their member galaxies without significant pre-selection biases. The combination of these characteristics provides IFU-like data that are particularly well suited for studying galaxy evolution on local scales, including the impact of environment on galaxy properties. In this talk, I will summarise our recent results using Py2DJPAS, our publicly available Python-based tool designed to automate the analysis of spatially resolved galaxies in J-PAS and miniJPAS data. Using miniJPAS observations, we have shown that J-PAS data provide robust spatially resolved stellar-population and emission-line measurements, in good agreement with spectroscopic IFU surveys such as Mapping Nearby Galaxies at Apache Point Observatory, while extending the analysis to larger galactocentric distances. Our results support an inside-out formation scenario for galaxies and reveal clear differences between red and blue populations, while showing only weak environmental effects for the low-mass groups explored in our sample. I will also present our latest results based on the first internal data release of J-PAS. These results demonstrate the strong potential of J-PAS for spatially resolved studies of galaxy evolution across a wide range of environments.

Linking metals to stellar-mass growth on local and galaxy-wide scales: the many faces of the stellar mass-metallicity relation from large spectroscopic surveys

Stefano Zibetti

S. Zibetti, A. Gallazzi, D. Mattolini, L. Scholz-Diaz

A central challenge in galaxy evolution is understanding the physical origins of observed global scaling relations, such as the mass-metallicity relation (MZR). While multi-object spectroscopic (MOS) surveys like SDSS have established these correlations across vast galaxy samples, their integrated measurements cannot directly reveal the underlying local physical processes. Integral-field spectroscopic (IFU) surveys bridge this gap by spatially resolving galaxies and uncovering the local relations that underpin global

trends. Using CALIFA IFU data of ~ 400 nearby galaxies, we reveal a quasi-universal relation between local (~ 1 kpc scale) stellar metallicity and surface mass density (μ^*), only mildly modulated by total galaxy mass. This local scaling provides the physical foundation for interpreting global measurements: the tight μ^* -metallicity relations in massive galaxy cores ($> 3 \times 10^{10} M_\odot$) reflect rapid dissipative collapse with efficient metal enrichment, while increased scatter beyond ~ 1 Re indicates stochastic late-time assembly through minor mergers. Less massive systems ($< 3 \times 10^{10} M_\odot$) never reach the high μ^* values of massive galaxies, explaining their distinct position in global scaling relations. Critically, our spatially-resolved analysis resolves a long-standing puzzle in the global MZR: why do quiescent and star-forming galaxies follow different relations in global properties? We find that locally both populations obey the same μ^* -metallicity relation. The apparent dichotomy in global measurements arises because passive galaxies systematically achieve higher μ^* values across their entire structure—a key insight only accessible through resolved spectroscopy. This demonstrates that structural differences, not fundamentally different enrichment physics, drive the observed offset in integrated measurements. Our results illustrate the essential synergy between IFS and MOS surveys: large statistical samples from SDSS and future surveys (WEAVE, 4MOST, WST) at higher redshift identify the phenomena requiring explanation, while resolved spectroscopy provides the physical interpretation. As upcoming surveys extend both approaches to higher redshifts, this complementarity will be crucial for connecting local physical processes to cosmic evolutionary trends, demonstrating how galaxy structural evolution is intrinsically coupled to the baryonic cycle. In both integrated and spatially resolved studies, the role of large surveys encompassing of several tens of thousands of galaxies or resolved regions, respectively, is key. Beating down the intrinsic scatter thanks to large statistics is essential to robustly identify the trends in these relations. Moreover, only very extensive and comprehensive statistical samples allow for controlling for the many parameters that characterize galaxies and describe the physical processes at work. Thus, large spectroscopic surveys promise to be a fundamental way forward to study galaxy evolution also in the next decades. In this perspective, I will illustrate a few aspects of the science case for an extensive $z < 1$ MOS survey with the proposed Wide-field Spectroscopic Telescope.

The OTELO survey: The evolution of galaxies.

Carmen P. Padilla-Torres

C. Padilla-Torres, J. Cepa, B. Cedrés, Á. Bongiovanni, J. González-Serrano, OTELO Team

OTELO is designed to make decisive progress in understanding the evolution of field galaxies across cosmic time. Its observational design enables exploration, with unprecedented sensitivity, a limiting flux of 5×10^{-19} erg/s/cm² and equivalent widths (EW) $\leq 5 \text{ \AA}$, of the low-mass galaxy regime, detecting emission line systems of stellar masses down to $\sim 106 M_\odot$. As reference, the MUSE Hubble Ultra Deep Field barely reach down to $M^* \sim 108 M_\odot$ in few cases, and only at redshifts below ~ 0.4 , and none at redshifts above ~ 0.7 . However, OTELO detects the bulk of emitters around $108\text{--}109 M_\odot$ even at $z > 1.4$, reaching down to $107 M_\odot$ at redshift 0.4. Then, OTELO reaches stellar masses one order of magnitude lower than MUSE. Moreover, the galaxies targeted by OTELO represent local and intermediate-redshift analogues of the systems responsible for the reionization at high redshift, providing clues for understanding this critical milestone of the evolution of the universe. In this contribution, the physical and chemical evolution of the ionized gas, particularly through key tracers such as [O III] and [O II], the evolution of star formation systems, luminosity functions, the main sequence, the mass-metallicity relations and Lyman alpha systems is presented. Since OTELO and their ancillary data ranging from UV through FIR has been released, and is accessible via a web-based tool, its public database of 11.237 galaxies with 6.600 photometric redshifts up to $z \sim 6.5$, enables systematic studies of low-mass systems, facilitating research on the mechanisms governing star formation, chemical evolution, and galaxy assembly processes across different environments and cosmic epochs.

Poster Abstracts

Environmental Transformation of Bulges and Disks in the Hydra Cluster: Preparing for the CHANCES/4MOST Survey

Ciria Lima Dias

C. Lima-Dias, A. Monachesi, G. Montaguth, S. Torres-Flores, Y. Jaffe, H. Méndez-Hernández, C. Haines

We present the Hydra cluster as a benchmark for a homogeneous study of bulge and disk evolution in nearby galaxy clusters within the framework of CHANCES (CHileAN Cluster galaxy Evolution Survey). Using 12-band imaging from the S-PLUS survey, we model galaxy surface-brightness with GALFITM through single-component Sérsic fits and multi-band bulge–disk decompositions. Our analyses show that Hydra provides a valuable laboratory for linking galaxy structure, star formation, and environment: about 88 per cent of its galaxies are quenched, and the cluster appears close to virialization while still showing some evidence of dynamical perturbations and substructure. The bulge–disk decomposition further reveals that environmental transformation is also reflected in the internal properties of galaxies. In particular, approximately 37 per cent of the galaxies have bulges bluer than their disks, suggesting younger central stellar populations and supporting an outside-in quenching scenario. We also find that smaller, more compact, and bulge-dominated galaxies tend to be redder at fixed stellar mass, while disk size drives the overall galaxy mass–size relation. Building on these results, we are extending the same methodology to the full low-redshift CHANCES sample, comprising about 50 clusters at $z < 0.07$ and two superclusters, Shapley and Horologium. By combining homogeneous structural measurements with CHANCES spectroscopy, this project will connect bulge and disk evolution with stellar population, kinematic, and star-formation properties across a broad range of environments.

The non-axisymmetric structures in the Chilean Cluster Evolution Survey

Hugo Méndez-Hernández

H. Méndez-Hernández, A. Monachesi, C. Lima-Dias, CHANCES Collaboration

4MOST (4MOST 4-metre Multi-Object Spectroscopic Telescope, de Jong+11) is a multi-object spectrograph with up to ~ 2400 fibres and spectral resolutions of 5000 and 20000, distributed over an hexagonal field-of-view of 4.2 square degrees mounted in the VISTA survey telescope capable of survey a large fraction of the southern sky in a few years. During the second half of 2026 the instrument was mounted and system verification and commissioning campaigns were successfully finalized. At this moment, the Survey Programme Validation campaign designed to test the survey strategies and scientific readiness of the 4MOST facility is being executed. Within the 4MOST-SPV campaign CHANCES designed different experiments to test our survey strategies. The CHileAN Cluster Galaxy Evolution Survey, will study the evolution of galaxies in and around ~ 150 massive galaxy clusters, from the local Universe out to $z \sim 0.45$. It will target $\sim 300\,000$ $r_{AB} < 20.4$ galaxies with 4MOST, providing comprehensive spectroscopic coverage of each cluster out to $5r_{200}$ in synergy with eROSITA. Its wide and deep scope will trace massive and dwarf galaxies from the surrounding filaments and groups to the cores of galaxy clusters, enabling the study of galaxy pre-processing and the role of the evolving environment on galaxies. CHANCES will also study the effect of clusters on the cold circumgalactic medium by targeting 50.000 cluster–QSO pairs. The CHANCES-low- z sub-survey targeted two different low redshift clusters (A754 and A3558), in this work I will present the results of the detection of non-axisymmetric structures (bars, lopsided disks, arms) of ~ 2500 cluster galaxy members in the context of their stellar properties (i.e. age, metallicity) and their location within the LSS in and around these dense environments.

Constraining galaxy formation and evolution via color gradients and size–mass relations with the DESI Legacy Imaging Survey and MaNGA

Li-Wen Liao

L. Liao, A. Cooper

Large sky surveys have significantly improved our understanding of galaxy formation and evolution by enabling statistical studies of galaxy properties and scaling relations. In particular, these relations provide important observational constraints on galaxy assembly histories and baryonic processes. In this talk, I will present two galaxy scaling relations at low redshift: the galaxy color gradients and the more widely studied size–mass relation. Our work utilizes the DESI Legacy Imaging Survey, incorporating MaNGA IFU observations for the color gradient analysis. For the color gradient study, I will highlight why these gradients are a competitive observable for probing galaxy formation. I will also discuss how the environment affects the size–mass relation, while addressing the observational challenges involved in these studies. Based on these two projects, I will further discuss how survey characteristics, including surface brightness limits, spatial resolution, and wavelength coverage, affect the interpretation of galaxy structural properties and stellar populations. Finally, I will highlight the limitations of relying on a single survey and discuss how combining multiple large-scale datasets may improve our understanding of galaxy evolution in the future.

Is the Milky Way a spiral galaxy?

Emilio Alfaro

The nature of the Milky Way spiral pattern remains poorly constrained, particularly from our position inside the Galactic disc. We analyse young open clusters and YSO-based groups in the solar neighbourhood to test whether they trace continuous spiral arms or fragmented structures. Using a density-supported Bayesian Gaussian Mixture Model (BGMM) and Minimum Spanning Tree (MST) analysis, we identify local overdensities, branches, and connections between them. Both methods reveal distinct local components rather than continuous arm ridges, with the clearest correspondence in the Local–Sagittarius region. Young clustered tracers therefore appear to form fragmented, spiral-like segments with partial links between neighbouring structures. Determining whether this morphology reflects spiral-arm formation or subsequent evolution will require additional age, vertical, and kinematic information.