



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

SEA

**Libro de resúmenes
Abstract book**

Sesiones Plenarias/ Plenary Sessions

SESIÓN INAUGURAL Y PREMIOS TESIS SEA
OPENING SESSION AND SEA PRIZES TO THE BEST THESIS
Lunes 16 de julio / Monday 16 July

10:30	Apertura y bienvenida
11:00	Miguel Querejeta Pérez, Premio 2016, Astronomía y Astrofísica Making galaxies passive: Insights from resolved studies of nearby galaxies
11:20	Ignacio Mateos Martín, Premio 2015-2016, Instrumentación Design and assessment of a low-frequency magnetic measurement system for eLISA
11:40	Laura Sánchez Menguiano, Premio 2017, Astronomía y Astrofísica The shape of the ionised gas abundance distribution in spiral galaxies
Pausa 12:00 - 12:10	
12:10	Mesa redonda: Gestores de los Planes Nacionales, Coordinador, RIA, Informe SEA RRHH

Making galaxies passive: Insights from resolved studies of nearby galaxies

Premio SEA 2016 a la mejor tesis en Astronomía y Astrofísica / SEA 2016 to the best thesis in Astronomy and Astrophysics

Miguel Querejeta (European Southern Observatory, Garching, Germany)

The rapid suppression of star formation is thought to be an important process in the evolution of the most massive galaxies, but the mechanisms involved are still hotly debated. In this thesis, we consider two agents that control star formation: AGN feedback and galaxy mergers. First, we focus on the interplay between stellar structure, nuclear activity, and molecular gas. We start presenting our public catalogue of stellar mass maps for more than 1500 nearby galaxies. Based on the baryonic mass distribution of the spiral galaxy M51, we show that there is sufficient molecular gas inflow to feed the AGN, and feedback effects which include a molecular outflow and a large-scale radio jet. In the second part, we address the role of galaxy mergers in the buildup of a passive population of lenticular galaxies (or S0s), the most common early-type galaxies in the Universe. Using numerical simulations, we show that even major mergers of spiral galaxies can result in lenticulars, with a bulge-disc coupling and specific angular momentum in agreement with observations. Globally, our results show that both internal processes (transport of gas and AGN feedback) and external mechanisms (mergers) have the ability to regulate and eventually suppress star formation in galaxies.

Design and assessment of a low-frequency magnetic measurement system for LISA

Premio SEA 2015-2016 a la mejor tesis en Instrumentación / SEA 2015-2016 to the best thesis in Instrumentation

Ignacio Mateos Martín (Universidad de Cádiz)

Among the different sensors required for LISA, magnetometers are necessary devices to determine the magnetic force effects that can perturb a drag-free test mass away from its pure geodesic motion. For this reason, this thesis is mainly focused on the design of a system capable of monitoring magnetic fields with low-noise conditions at sub-millihertz frequencies. Different magnetic sensing technologies (fluxgate, magnetoresistance, and atomic magnetometer), together with dedicated electronic noise reduction techniques, are studied in order to assess if they can be used for space missions demanding low-frequency requirements, such as LISA and a space atom interferometer termed STE-QUEST. Moreover, these missions require a thorough knowledge of the local magnetic disturbances generated by the different on-board electronics subsystems located in the spacecraft. Therefore, it is necessary to investigate the magnetic characteristics of the proposed sensors and their possible impact on the scientific experiment. The design of the magnetic sensing devices in LISA is previously addressed in the development and validation of the magnetic diagnostic subsystem of the LISA Pathfinder mission, also part of this thesis. Within this context, a critical point found in this precursor mission was the unsatisfactory level of accuracy of the magnetic field map reconstruction at the test mass. A robust interpolation method based on a new magnetometer array configuration is also evaluated. On the whole, a much more solid option is considered for LISA, due to the fact that its objectives are more demanding than in LISA Pathfinder. In addition to this, a simplified flight model of the currently proposed magnetic measurement system for LISA has been developed for a CubeSat so as to increase the technology readiness level of the instrument.

The shape of the ionised gas abundance distribution in spiral galaxies

Premio SEA 2017 a la mejor tesis en Astronomía y Astrofísica / SEA 2017 to the best thesis in Astronomy and Astrophysics

Laura Sánchez Menguiano (Instituto de Astrofísica de Andalucía, IAA, CSIC)

In this talk I will review the main results of my PhD thesis aimed at characterising the ionised gas abundance distribution in spiral galaxies by using two sets of high-quality integral field spectroscopic (IFS) data from the CALIFA and AMUSING surveys. We observe that, together with the well-known radial negative gradient, a significant number of galaxies also display a drop in the abundances towards the inner parts of the discs and a flattening in the outermost regions. This suggests that the widely accepted scenario in which the oxygen abundance distribution of spiral galaxies is well described by a single radial negative gradient might be incomplete and deviations from it are needed for a proper characterisation of the distribution. In addition, differences in the residual non-radial abundances spatially coincident with the brightest regions of the disc, that seem to correspond to the spiral arms in most cases, are reported. These differences present a significant dependence with the morphology of the spiral arms and the galaxy mass, suggesting that these properties might be the main drivers of local abundance variations in spiral galaxies. In the particular case of NGC 6754, one of the galaxies with the highest local abundance variations, we perform an analysis of its azimuthal abundance and velocity-residuals distributions. This galaxy shows, for the first time, clear signatures of ongoing gas radial migration affecting the abundance distribution. The results obtained in this thesis provide strong constraints to chemical evolution models aimed at explaining the formation and evolution of spiral galaxies, trying to do our bit in the comprehension of the Universe around us.

GAIA**Lunes 16 de julio / Monday 16 July**

18:00	Xavier Luri Gaia DR2
18:20	Alcione Mora Gaia DR2: Results, validation, data exploitation
18:40	Amina Helmi New views on the Galaxy and its satellites from Gaia
19:10	Julia de León Synergies between Gaia and Asteroids

Gaia DR2

Xavier Luri (Instituto de Ciencias del Cosmos, Universidad de Barcelona, IEEC-ICCUB)

The second release of the Gaia catalogue (Gaia DR2) will take place on April 25th 2018. In this talk I will review the observations on which it is based, the data processing leading to it and the main characteristics of the resulting dataset (its contents, the precision and the known limitations of its data).

Gaia DR2: Results, validation, data exploitation

Alcione Mora (Gaia Team, European Space Astronomy Centre)

This talk is composed of three parts. The first one presents a short overview on the scientific impact of Gaia in the first three months after the second data release (DR2). Refereed papers and preprints have been considered. The second part explains the effort required to validate the data before publication. Note the data are much richer than just astrometry, which required several teams with a broad range of expertise. Finally, some hints are providing on how the data can be exploited, including access to the main Archive at ESA-ESAC, its partner data centres, and future challenges.

New views on the Galaxy and its satellites from Gaia

Amina Helmi (Kapteyn Astronomical Institute, University of Groningen)

In this talk I will focus on the dynamics and formation of the Milky Way and its satellites. I will describe the latest results obtained from the analysis of the spectacular 2nd data release of the Gaia mission, with particular emphasis on globular clusters, dwarf spheroidal galaxies and the Magellanic Clouds.

Synergies between Gaia and Asteroids

Julia de León (Instituto de Astrofísica de Canarias, IAC)

Gaia space telescope of the European Space Agency was launched in mid-2013 with the aim of making the largest, most precise 3D map of our Galaxy. It was designed to pinpoint the positions, distances, motions, and other properties of more than a billion stars. As part of the missions science objectives, Gaia is regularly obtaining observations of asteroids, primarily in the main asteroid belt, but it will also detect faint near-Earth objects and large trans-Neptunian objects in the Kuiper belt. Due to its location at the Lagrange point L2 and its ability to observe close to the Sun (at 45 degrees of angular distance), Gaia will be able to discover asteroids inside the orbit of the Earth, as well as objects in exotic orbits, as it will observe far from the ecliptic. In addition, the accuracy of the measurements of the positions and the velocities of the asteroids observed by Gaia will provide orbits with an unprecedented precision. This, together with the improved astrometry of the stars will allow to predict stellar occultations even for small objects, providing information on their sizes and shapes. Gaia will also detect binaries and will provide measurements of the masses of these objects. Gaia instruments include blue and red photometers (BP and RP) that will provide low-resolution ($R \sim 20 - 90$) slit-less spectra of hundreds of thousands of asteroids in the range 0.35 – 0.90 microns. This spectral database will be used to generate a Gaia taxonomical classification that will serve to infer mineralogical composition of asteroids. As the spacecraft scanned the sky from 2014 to 2016, more than 13000 asteroids have been detected. Epoch astrometry of these objects will be included in the Gaia Data Release 2 in April 2018. Here I will show an update on the status of Gaia synergies with asteroids.

ASTRONOMY IN PORTUGAL / COLLABORATIONS PORTUGAL-SPAIN

Martes 17 de julio / Tuesday 17 July

11:30-11:45	André Moitinho, Francesca Figueras Iberian Astronomy
11:45-12:15	José Manuel Afonso When critical mass catches up to strategy: the road for Portuguese Astronomy
12:15-12:45	Nuno Santos Exoplanets
12:45-13.15	Francisco J. Castander Euclid (collaboration Spain/Portugal)

When critical mass catches up to strategy: the road for Portuguese Astronomy

José Manuel Afonso (Instituto de Astrofísica e Ciências do Espaço / U. Lisboa)

Portuguese Astronomy has gone through a tremendous growth over the last 30 years. This was prompted by a strategic decision to join the major international organizations in the field, but was only made possible due to a major investment in human resources, that successfully resulted in the creation of a highly skilled and internationally recognized workforce in the country. The evolution from manpower-oriented to strategy-oriented research units, particularly intensified over the last few years, has created a consolidated human and technical infrastructure capable to face up to the major challenges in the field.

Exoplanets

Nuno C. Santos (Instituto de Astrofísica e Ciências do Espaço/U. Porto)

The field of exoplanet science has seen a tremendous development over the last 20 years. Both the Portuguese and Spanish astronomical communities found their way into this competitive field of research. In several cases, the development of state-of-the-art projects in the field stimulated relevant collaborations between the communities in the two countries.

In this talk I will review what is the status of exoplanet research in Portugal, with a focus on the work done by the Planetary Systems team at the Instituto de Astrofísica e Ciências do Espaço (IA). I will further highlight ESO and ESA projects where collaborations already exist with Spanish colleagues and institutions. The presentation is intended to foster further collaborations between the Portuguese and Spanish communities.

Euclid: ESA cosmology mission

*Francisco Javier Castander (Institut de Ciències de l'Espai, ICE, CSIC,
and Institut d'Estudis Espacials de Catalunya, IEEC)*

The accelerated expansion of the universe places one of the greatest challenges to our understanding of the universe. The European Space Agency is going to launch the Euclid mission to study this problem characterizing the structure of the universe. Euclid is equipped with a wide field optical imager and a near-infrared spectrophotometer. It will carry out a survey of 15000 deg² with space high resolution images in one broad optical band and three near-infrared bands. It will also do slitless spectroscopy in the near-infrared in all the survey area. Euclid will use these data to perform a cosmological analysis using the weak lensing and clustering techniques. In addition, the large amount of high quality data will serve for many other astrophysical studies.

ATHENA AND SYNERGIES**Martes 17 de julio / Tuesday 17 July**

18:00	Francisco Carrera Athena: mission and Spanish participation
18:30	María Díaz Trigo Synergies between Athena and ESO
18:50	Marc Ribó CTA-Athena synergies
19:10	Miguel Pérez Torres SKA-Athena synergies

Athena: mission and Spanish participation

Francisco J. Carrera (Instituto de Física de Cantabria (CSIC-UC), Santander)

Athena (Advanced Telescope for High ENergy Astrophysics) is the X-ray observatory mission selected by ESA to address the Hot and Energetic Universe theme, due for launch ≥ 2028 . Athena undertakes three key scientific objectives: 1) Determine how and when large-scale hot gas structures formed in the Universe and track their evolution from the formation epoch to the present day. 2) Perform a complete census of black hole growth in the Universe, determine the physical processes responsible for that growth and its influence on larger scales, and trace these and other energetic and transient phenomena to the earliest cosmic epochs. 3) Provide a unique contribution to astrophysics in the 2030s by exploring high energy phenomena in all astrophysical contexts, including those yet to be discovered.

From the unique perspective endowed to Athena by its unprecedented spectroscopic and imaging capabilities in the 0.5-12keV range, this mission will lead the quest into solving these questions from its launch.

The Athena mission concept is that of a single large-aperture grazing-incidence X-ray telescope, utilising a novel technology (Si pore optics) developed in Europe, with 12m focal length and 5 arcsec HEW angular resolution. The focal plane contains two instruments. One is the Wide Field Imager (WFI) providing sensitive wide field of view imaging and low resolution spectroscopy, as well as bright source observation capability. The other one is the X-ray Integral Field Unit (X-IFU) delivering spatially resolved high-resolution X-ray spectroscopy over a limited field of view. Synergies with other facilities (ESO, SKA, CTA, etc.) are being identified and developed.

Spain has an important role in Athena, with a significant contribution to the X-IFU instrument, including the dewar for the detector cooling system, the algorithms for the on-board pulse detection software, and a leading scientific contribution. Spain also leads the Athena Community Office, set up to help optimising the participation of the more than 800 scientists which are helping to shape up the mission through its working groups.

Synergies between ATHENA and ESO

María Díaz Trigo (European Southern Observatory)

ATHENA (Advanced Telescope for High Energy Astrophysics) is the X-ray observatory mission selected by the European Space Agency (ESA) to address the Hot and Energetic Universe scientific theme. It is due for launch in 2028. In September, 2016 an ESO-ATHENA Synergy Team was established to identify potential scientific synergies between ATHENA and Optical/near-infrared (NIR) and sub/mm ground facilities from ESO (the Very Large Telescope (VLT), the European Extremely Large Telescope (E-ELT), the Atacama Large Millimeter/submillimeter Array (ALMA) and the Atacama Pathfinder Experiment (APEX)). In this talk I will report on the results of this exercise, focusing on the topic of accretion physics.

CTA-Athena synergies

*Marc Ribó Gomis (Departament de Física Quàntica i Astrofísica,
Institut de Ciències del Cosmos, Universitat de Barcelona
& Institut d'Estudis Espacials de Catalunya)*

The Cherenkov Telescope Array (CTA) is the next generation ground-based observatory for gamma-ray astronomy. With one site in each hemisphere (the northern one being built in La Palma) CTA will provide in a few years from now a new and deep view of the non-thermal Universe in Very High Energy (VHE) gamma rays. In parallel, the Athena X-ray satellite will provide a deep view of the X-ray Universe in about a decade from now. In this context, it is time now to start exploring the synergies that will be possible by using these facilities in the mid-term future. In particular, both thermal and non-thermal X-ray emissions have been observed in sites capable of accelerating particles up to VHEs that produce gamma rays in the TeV domain. The study of the X-ray emission can provide insight into the physical scenarios to understand such TeV sources, and vice-versa. I will provide an overview of CTA and its Key Science Projects and I will discuss possible synergies with the Athena X-ray satellite.

Synergies between Athena and the Square Kilometre Array

Miguel Pérez Torres (Instituto de Astrofísica de Andalucía, CSIC)

If you go to the Athena webpage, you find the following one-sentence summary: "Athena: Revealing the Hot and Energetic Universe". If you do a similar thing with the Square Kilometre Array (SKA), you find the following: "Square Kilometre Array: Exploring the Universe with the world's largest radio telescope." Both facilities will deeply transform the current knowledge of galactic and extragalactic astronomy, both by themselves and in mutual collaboration, in the latter case transcending their individual capabilities.

Indeed, while not pursuing exactly the same science goals, Athena and the SKA share a number of them, including galaxy clusters and large-scale structure, AGN and surveys, X-ray binaries, accretion physics and transient phenomena. This calls for exploitation of both facilities in a synergetic fashion. I will give an overview of (some of) the possible synergies between Athena and the SKA, focusing on a few illustrative examples, so the Spanish astronomical community can be ready to exploit as best as possible both Athena and the SKA.

GRAVITATIONAL WAVES

Miércoles 18 de julio / Wednesday 18 July

11:30	Gabriela González Ground-based gravitational wave detectors: status and latest observations
12:00	Carlos Sopena LISA: The future space-based gravitational-wave detector
12:30	Sascha Husa Modelling the gravitational wave signal from compact binary coalescence
13:00	Vitor Cardoso Testing General Relativity with gravitational waves

Ground-based gravitational wave detectors: status and latest observations

Gabriela González (Physics and Astronomy Department, Louisiana State University)

The discoveries of gravitational waves from mergers of black holes and neutron stars with LIGO and Virgo detectors have opened a new era of gravitational wave astrophysics, with very bright prospects for the future. We will describe the details of the latest discoveries of mergers of binary black hole systems, the observation of a merger of neutron stars that was followed up by many electromagnetic observations, and the exciting prospects for the next years.

LISA: The future space-based gravitational-wave detector

*Carlos F. Sopuerta (Institute of Space Sciences, ICE, CSIC,
and Institute of Space Studies of Catalonia, IEEC)*

LIGO and Virgo have inaugurated the era of Gravitational Wave Astronomy by observing several binary black hole mergers and the merger of a neutron star binary that has made possible multi-messenger astronomy with gravitational waves. These detections have produced revolutionary discoveries. At the same time, there are ongoing efforts to detect gravitational waves beyond the high-frequency band of the ground-based detectors. Indeed, the European Space Agency (ESA), after the success of its own LISA Pathfinder mission to demonstrate the required technology for space, has selected LISA (Laser Interferometer Space Antenna) as its third large-class mission (L3) with launch date around 2034. The main goal of LISA is to carry out the science proposed in the white paper "The Gravitational Universe", consisting in low-frequency gravitational-wave astronomy. In this talk I will describe the status of the mission, its main scientific goals and its potential for new discoveries in astrophysics, cosmology, and fundamental physics.

Modelling the gravitational wave signal from compact binary coalescence

Sascha Husa (Department of Physics, University of the Balearic Islands)

This talk summarizes the state of the art of modelling the gravitational wave signals emitted by compact binary systems, and how these models fit into the context of gravitational wave data analysis. Finally, open problems are sketched, with a view of the requirements of planned future gravitational wave detectors.

Testing General Relativity with gravitational waves

Vitor Cardoso (Instituto Superior Técnico, Lisboa)

We just celebrated the centenary of two pivotal breakthroughs in physics: the discovery of the Schwarzschild solution, describing a non-rotating black hole, and Einstein's prediction of gravitational waves. We are now one one: the direct detection of gravitational waves.

Gravitational waves offer a unique glimpse into the unseen universe in different ways, and allow us to test the basic tenets of General Relativity, some of which have been taken for granted without observations: are gravitons massless? Are black holes the simplest possible macroscopic objects? do event horizons and black holes really exist, or is their formation halted by some as-yet unknown mechanism? Do singularities arise in our universe as the outcome of violent collisions? Can gravitational waves carry information about the nature of the elusive dark matter?

In this talk, I will describe the science encoded in a gravitational wave signal and what the upcoming years might have in store regarding fundamental physics and gravitational waves.

SCIENCE / INSTRUMENTATION**Miércoles 18 de julio / Wednesday 18 July**

18:00	Agustín Sánchez Lavega The exploration of Jupiter by JUNO and Saturn during Cassini Grand Finale
18:30	Armando Gil de Paz First science with MEGARA
19:00	David Sobral The quest for PopIII stars in early galaxies: Are we there yet?
19:30	María Jesús Martínez González Latest achievements in Solar Physics

The exploration of Jupiter by JUNO and Saturn during Cassini Grand Finale

Agustín Sánchez Lavega (Universidad del País Vasco UPV/EHU)

The Juno spacecraft has been orbiting Jupiter since July 4, 2016, following an elliptical polar orbit every ~53 days with pericenters within ~3,500 km above the cloud tops. During each perijove flyby of Jupiter, the different instruments have studied in detail the atmosphere, the electromagnetic environment and especially the internal structure of Jupiter, aspects that will be presented in this talk. In parallel, the Cassini spacecraft that was orbiting Saturn from July 1, 2014, ended its successful mission with the “Grand Finale” consisting in 22 risky passes through the gaps between the planet, at about 3,100 km above Saturn's cloud layer, and 320 km from the visible edge of the inner ring. The “Grand Finale” that started on April 26 ended on September 15, 2017 when Cassini entered the atmosphere of the planet being quickly destroyed. We present some of the most important results obtained of Saturn during this last exploration.

First science with MEGARA

Armando Gil de Paz (Universidad Complutense de Madrid)

On August 31st 2017, MEGARA, the new IFU and MOS of GTC, completed its commissioning at the telescope and by the time of this meeting should have already started its regular open-time observations at GTC. As part of the tests designed for this commissioning phase, we carried out the observation of a number of astronomical targets of different kinds: stars of different spectral types and brightness, planetary nebulae, extragalactic HII regions and nuclear regions of galaxies at different distances and of different morphological types, even high-redshift galaxies and QSOs. In this talk, I will describe the performance of the instrument highlighting its main capabilities as demonstrated by these observations. In summary, MEGARA provides GTC with an unprecedented combination of wide wavelength coverage (0.36-1 micron), high-resolution ($R=6000-20000$) spectroscopy and high collecting power and efficiency with both IFU and MOS capabilities, now accessible in full to our astronomical community.

The quest for PopIII stars in early galaxies: are we there yet?

David Sobral (Lancaster University)

The first generation of stars (PopIII) are thought to have been crucial for the first chemical enrichment of the Universe and likely kick-started re-ionisation. Due to their zero metallicity, PopIII stars are expected to have been much more massive and luminous than any star formed subsequently, generating key observational signatures such as strong HeII lines and absence of metal lines. However, their expected short lifetimes and early formation (as early as just ~100 million years after the Big Bang) makes them hard to find, while many of their signatures could be confused with low metallicity stars and/or low metallicity AGN. I will review some of the latest observational searches for the first stars, some key difficulties, and what we are already learning about stellar populations at increasing redshift. While finding “pure” PopIII galaxies will be incredibly challenging even with JWST, current observations already hint for significant average changes in stellar populations at higher redshift, implying highly effective temperatures, lower metallicities and likely high binary fractions. Furthermore, evidence for late reionisation may boost the prospects of finding PopIII stars, at least in the outskirts of galaxies at $z\sim 7-10$.

Latest achievements in Solar Physics

María Jesús Martínez González (Instituto de Astrofísica de Canarias, IAC)

Solar Physics is a discipline within Astrophysics that deals with a rich variety of topics, from the Sun as a Quantum Physics laboratory, to the study of the interplay between magnetic fields and the solar plasma (scales of thousands of km down to few km) from both the observational and the numerical point of view, and to the space weather and its consequences in our technological society. The Spanish solar community is devoted to basically all aspects of solar studies and is leading very important instrumental projects both ground-based (such as the EST) and space-borne (such as Solar Orbiter). In this talk, I will review the most important latest achievements in Solar Physics with the main focus on the Spanish side, approaching some fundamental questions. How do magnetic fields form and evolve in the Sun? How does dynamo actually work? What mechanism/s underlie coronal heating? Why does the Sun have a cycle? Which disturbances are induced in the interplanetary space by solar activity? Which is their real effect on Earth?

NEW DEVELOPMENTS IN HIGH RESOLUTION IMAGING

Jueves 19 de julio / Thursday 19 July

11:30	Itziar de Gregorio Monsalvo ALMA: Science with exceptional submillimeter capabilities
12:00	Shep Doeleman The Event Horizon Telescope: Science at the Black Hole Boundary
12:30	António Amorim PT@GRAVITY: The infrared Camera, the software, the observations
13:00	José Luis Gómez Probing the innermost regions of blazar jets at tens of microarcseconds through space and millimeter VLBI observations

ALMA: science with exceptional submillimeter capabilities

Itziar de Gregorio Monsalvo (European Southern Observatory / Atacama Large Millimeter Array)

The Atacama Large Millimeter/submillimeter Array (ALMA) is the world's preeminent facility for millimeter and submillimeter-wave astronomy with transformational capabilities to study the origin of galaxies, stars, and planets. ALMA consists of 66 antennas located on the Chajnantor plateau, 5000 meters altitude in northern Chile, and equipped with receivers covering atmospheric windows between ~30 and 950 GHz. ALMA is an international partnership of Europe, North America and East Asia in cooperation with the Republic of Chile. Since its third Call for Proposals ALMA received more submissions than any other telescope in history, setting a new record on the latest Call for Cycle 6 by surpassing 1800 proposal. In this talk I will present a brief summary on the general ALMA science operations concepts, scientific results, and the present and future capabilities.

The Event Horizon Telescope: Science at the Black Hole Boundary

Sheperd Doeleman (Harvard-Smithsonian Center for Astrophysics)

The Event Horizon Telescope project links mm and submm wavelength facilities around the globe into a VLBI array capable of spatially resolving the nearest supermassive black holes. Towards SgrA*, the 4 million solar mass black hole at the Galactic Center, and M87, the ~6 billion solar mass black hole in Virgo A, EHT observations at 1.3mm can resolve the 'silhouette' of the event horizon. First EHT observations in April 2017 have been correlated and are now being processed and analyzed, with VLBI detections to all sites. This talk will provide an update on progress, science goals, and describe new directions for this ultra-high angular resolution work over the coming years, including exploration of space-VLBI opportunities, new sites, and extension to shorter wavelengths.

PT@GRAVITY: The infrared Camera, the software, the observations.

António Amorim (CENTRA-SIM and FCUL, Universidade de Lisboa)

GRAVITY is a new instrument to coherently combine the light of the European Southern Observatory Very Large Telescope Interferometer with the goal to achieve an astrometry resolution of 10 micro-arcsecond. We discuss the steps and challenges involved in designing and manufacturing, in Portugal, both the infrared acquisition camera, that is the imaging subsystem of the GRAVITY beam combiner, and the associated image processing software fitting the ESO framework. In particular the challenges to maintain and consolidate the team with the required expertise involve specificities that go beyond the more common research setup in our institutes. The new galactic center results obtained with the guaranteed time observational program are discussed. We illustrate the science observation opportunities presented by this new instrument, now becoming available at ESO for the community.

Probing the innermost regions of blazar jets at tens of microarcseconds through space and millimeter VLBI observations

José Luis Gómez (Instituto de Astrofísica de Andalucía, CSIC)

Investigating how AGN jets originate, and what are the sites and mechanisms for the production of high energy emission, requires probing these jets at the highest angular resolution. We present the results of our RadioAstron Key Science Program to study a sample of AGN jets in combination with the Event Horizon Telescope (EHT) and the GMVA. Among our earlier results, we have successfully imaged the jet in BLLac at an angular resolution of 21 microarcseconds (uas), revealing a large scale helical magnetic field in the vicinity of the central black hole, and 0716+714 at 24 uas, showing a sharp inner bending that may be responsible for the characteristic intraday variability observed in this source. OJ287 is the best candidate for harboring a coalescing supermassive binary black hole (SMBBH) system, making it an excellent laboratory for studying strong-field relativistic effects and the future detection of nano- and milli-hertz gravitational waves. Our quasi-simultaneous RadioAstron, EHT, and GMVA observations of OJ287 reveal a highly twisted jet at an unprecedented angular resolution of 10 uas (26 Schwarzschild radii); these are analyzed in combination with our multiwavelength monitoring (optical to gamma-rays), to test the SMBBH scenario and jet formation models.

ENSEÑANZA Y DIVULGACIÓN DE LA ASTRONOMÍA

Jueves 19 de julio / Thursday 19 July

15:30	I Premio Javier Gorosabel de colaboración ProAm
15:45	Vicent Martínez Historia de la divulgación de la Astronomía (del siglo XVI al siglo XX)
16:05	Inés Rodríguez Hidalgo Que se quede el infinito sin estrellas. Difusión de la Astronomía desde los museos de ciencia y planetarios
16:25	Angel R. López Sánchez Redes sociales, blogs, podcasts y divulgación "virtual"
16:45	Carmen del Puerto La Astronomía y las UCCs. Casos de éxito en comunicación y divulgación científica
17:05	Juan Ángel Vaquerizo La enseñanza de la astronomía en los centros educativos

Historia de la divulgación de la Astronomía (del siglo XVI al siglo XX)

Vicent J. Martínez (*Observatorio Astronómico de la Universitat de València*)

La divulgación de la ciencia y, en particular, la divulgación de la astronomía no es un fenómeno reciente. Obviamente, como en todos los ámbitos de la comunicación, la evolución histórica de la divulgación de la astronomía está asociada, sobre todo, a los cambios en el medio utilizado y en el público al que esta actividad se ha dirigido. Algunos de estos medios han permanecido con el paso del tiempo y aún, hoy en día, están vigentes y tienen un importante peso relativo en el conjunto de las actividades de divulgación. Los ejemplos más característicos de este tipo de actividades son las charlas o conferencias, los libros que buscan un público lector no especializado o las sesiones públicas de observación del cielo llevadas a cabo y comentadas por astrónomos profesionales o amateurs. Todas esas actividades ya las encontramos en astrónomos del siglo XVI en España, como Jerónimo Muñoz, catedrático de Universidad, primero en Valencia y posteriormente en Salamanca y por supuesto, en el siglo XVII con Galileo Galilei en Italia, cuyo *Diálogo sobre los dos máximos sistemas del mundo*, escrito en italiano popular puede considerarse el primer best-seller de divulgación científica, no tan solo por haber sido un éxito de ventas y lectores, sino también por su contenido rompedor y su original estilo narrativo, casi teatral. Este será el punto de partida de nuestra contribución para, a continuación analizar la divulgación de la astronomía a finales del siglo XVII y principios del XVIII, de la mano de pensadores como Bernard le Bovier de Fontenelle y la influencia de su libro de divulgación *Conversaciones sobre la pluralidad de los mundos*, así como de los pre-ilustrados españoles, los *novatores*.

Haremos mención al papel del enciclopedismo en la divulgación de la astronomía en el marco de la Ilustración, a finales del siglo XVIII, así como de la prensa periódica. Será en el siglo XIX y principios del XX cuando se consolide definitivamente la figura del divulgador de la astronomía, fundamentalmente en Francia, con astrónomos como Camille Flammarion o en el Reino Unido con Robert Ball.

Una mención aparte merecerá la contribución a la divulgación de la astronomía de la aparición de revistas especializadas a finales del XIX, como *Nature* y otras, en el ámbito español, como *La Ilustración Española y Americana* en la que escribieron ilustres astrónomos como José Joaquín Landerer y Augusto Arcimis.

Acabaremos nuestro análisis incluyendo la divulgación de la ciencia durante el siglo XX en el marco del concepto de "esfera pública" introducido por el filósofo alemán Jürgen Habermas, así como del papel de los nuevos medios de comunicación en esta actividad, particularmente del cine y de la televisión, con una mención especial a la serie Cosmos de Carl Sagan.

**Que se quede el infinito sin estrellas.
Difusión de la astronomía desde los museos de ciencia y planetarios.**

Inés Rodríguez Hidalgo (Museo de la Ciencia de Valladolid)

El título no es tan exagerado si recordamos que más de veinte planetarios repartidos por el territorio español hacen “de oficio” la magia de poner las estrellas al alcance del público. Estos singulares espacios con tamaños, disposiciones y aforos diversos, fijos o portátiles, veteranos o recientes, en museos de ciencia, observatorios, escuelas, o aislados, con sistemas optomecánicos, digitales o mixtos... devuelven a sus visitantes la emoción de contemplar un espectacular cielo nocturno libre de contaminación lumínica. Cuentan, además, con recursos para simular la bóveda celeste en distintos lugares y épocas, para incorporar movimiento, para superponer círculos, ejes, órbitas, líneas, dibujos, imágenes, textos, animaciones, videos... o para proyectar programas *fulldome* de tema astronómico. Todo ello convierte a los planetarios en valiosas herramientas para la enseñanza y divulgación de la astronomía.

Al mismo tiempo, en nuestro país existe otra quincena de museos de ciencia sin planetario en los que se realizan numerosas actividades que acercan la astronomía al público de todas las edades y formaciones: charlas y ciclos de conferencias, cursos, exposiciones, celebración de la *World Space Week* y efemérides astronómicas, concursos, talleres didácticos, espectáculos, observaciones (frecuentemente en colaboración con agrupaciones de astrónomos no profesionales), acampadas... ¡incluso crear un “Jardín de la Galaxia”!

En la ponencia conoceremos a estos aliados fundamentales en la difusión de la astronomía. Su trabajo ofrece entretenimiento inteligente y experiencias inolvidables, permite transmitir conocimientos básicos y sirve de escaparate a los últimos avances, contribuye a fomentar vocaciones y a educar a la sociedad en actitudes positivas hacia la astronomía y la ciencia en general.

Redes sociales, blogs, podcasts y divulgación "virtual"

Angel R. López Sánchez

(Australian Astronomical Observatory & Macquarie University)

La comunicación y la divulgación científica están en auge. Esto es consecuencia de varios factores como la necesidad de informar a la sociedad sobre qué es lo que hacen los científicos y destacar la importancia de los nuevos descubrimientos y la tecnología que hay detrás de ellos. Pero además ayuda mucho a promover la investigación científica que los propios científicos realizamos a un público más amplio que el del ámbito académico. Las redes sociales juegan un papel destacado en todo esto, conectado de forma efectiva tanto con otros científicos como en el público en general, además de servir de escaparate de cómo trabaja un científico y comentar noticias y descubrimientos en tiempo casi real con gente de todo el mundo. En esta charla usaré ejemplos concretos de mi propia experiencia, algunos como Jefe de Comunicación Científica del Observatorio Astronómico Australiano, de cómo las redes sociales, escribir en blogs y participar en podcasts puede ayudar a diseminar el trabajo científico, sirve para iniciar nuevos proyectos de investigación y motiva a gente de distinta condición a profundizar en los misterios del Universo. También apuntaré cómo, viviendo y trabajando en Australia, gracias al "universo virtual" puedo participar de forma rutinaria en distintos actos de divulgación científica en España, incluyendo charlas virtuales en universidades, colegios e institutos de secundaria españoles.

La Astronomía y las UCC.
Casos de éxito en comunicación y divulgación científica.

Carmen Del Puerto Varela (Unidad de Comunicación y Cultura Científica, UC3, Instituto de Astrofísica de Canarias)

Con motivo del Año de la Ciencia 2007, la Fundación Española para la Ciencia y la Tecnología (FECYT), en su Convocatoria de Ayudas para la realización de actividades de difusión y divulgación científica y tecnológica, promovió la creación y el fortalecimiento de las Unidades de Cultura Científica y de la Innovación (Red UCC+i) en universidades y centros de investigación. El objetivo de estas unidades sería convertirse en uno de los principales agentes en la difusión y divulgación de la ciencia y la innovación en España, constituyendo un servicio clave para mejorar e incrementar la formación, la cultura y los conocimientos científicos de los ciudadanos, como recoge la Ley de la Ciencia, la Tecnología y la Innovación.

Como resultado de dicha convocatoria, se crearon 53 unidades distribuidas por todo el territorio nacional que contribuirían al establecimiento de estructuras para una adecuada transmisión de los desarrollos científicos y tecnológicos a la sociedad. Se establecieron distintas modalidades de estas unidades según se ajustaran a los siguientes criterios: 1) líneas de actuación (comunicación de resultados de I+D+I, divulgación general del conocimiento científico y tecnológico, asesoramiento y formación del personal investigador en difusión de la ciencia y la tecnología, investigación sobre los procesos de difusión social de la I+D+I); 2) naturaleza de los centros o entidades a las que pertenecieran (públicos del sistema de I+D+I, privados sin ánimo de lucro); 3) campo de especialización; 4) alcance geográfico de las acciones; 5) público objetivo; y 6) presupuesto anual.

Actualmente, según el directorio de centros de la Red UCC+i disponible en la página de la FECYT, aunque no actualizado, se hayan registradas 81 unidades con esta denominación, de las cuales unas 3 estarían relacionadas directamente con la Astronomía y la Astrofísica, sin contar las UCC del CSIC, universidades y otras entidades multidisciplinares.

En esta charla se hablará de la historia, composición, actividad e impacto de algunas de estas UCC, entre ellas la Unidad de Comunicación y Cultura Científica (UC3) del Instituto de Astrofísica de Canarias (IAC), heredera de las funciones del anterior Gabinete de Dirección de este centro, que fue pionero en la comunicación y divulgación científica de la Astronomía en España.

La enseñanza de la astronomía en los centros educativos

Juan Ángel Vaquerizo Gallego (Centro de Astrobiología, CSIC-INTA)

Pasado reciente y presente de la enseñanza de la astronomía en los centros educativos a la luz de las sucesivas reformas de las leyes educativas en España. ¿Qué nos espera en el futuro?

SCIENCE / INSTRUMENTATION**Viernes 20 de julio / Friday 20 July**

11:30	Consuelo Cid Space weather: Understanding the Sun-Earth interaction
12:00	Pedro Amado CARMENES scientific results
12:30	José Alberto Rubiño Martín Cosmology with the CMB: Latest results from PLANCK and the QUIJOTE experiment
13:00	Rita Tojeiro Large scale structure

Space weather: Understanding the Sun-Earth interaction

Consuelo Cid Tortuero (Universidad de Alcalá de Henares)

Our modern technological society has become increasingly vulnerable to disturbances from outside the terrestrial environment, in particular to those initiated by explosive events on the Sun. When a solar event occurs, several changes take place in the space environment, defining what it is labelled as space weather. Although the term 'Space Weather' refers to the physical and phenomenological state of natural space environments, this presentation will focus on the space weather effects which arise from the dynamic conditions in the Earth's space environment driven by processes on the Sun. From the solar perspective, flares, coronal mass ejections and solar energetic particles accelerated to near-relativistic energies will be the ingredients for a space weather event. From the terrestrial perspective, disturbances include a large range of phenomena extending from geomagnetic storms to energetic particle events or to ionospheric disturbances. Fixing the puzzle between solar activity and terrestrial disturbances is far from an easy task. Moreover, it requires a multidisciplinary approach and the involvement of users. This presentation reviews the kind of space weather events and the state of the art of the scientific approach and the nowcasting and forecasting services.

CARMENES scientific results

Pedro J. Amado (Instituto de Astrofísica de Andalucía, CSIC)

CARMENES is a Spanish-German collaboration, the name for the consortium and the instrument built for, and currently operating at, the 3.5 m telescope of the Calar Alto observatory in Almeria, Spain. It consists in two high-resolution ($R \gtrsim 80,000$) spectrographs covering the whole wavelength range from 0.52 to 1.71 μm . with only small gaps. The instrument was optimized for precise radial velocity (RV) measurements of M dwarf stars to detect exoplanets in their temperate zone, though it is already showing its potential for other science cases like the study of the exoplanet atmospheres. It is currently carrying out what is the largest RV survey to date for this type of star, accumulating a huge database of almost 10,000 high-resolution spectra in both the optical and, for the first time, the near infrared, since it started in Jan 1, 2016. I will present an overview of the instrument, and provide a few examples of science results.

Cosmology with the CMB: Latest results from PLANCK and the QUIJOTE experiment

José Alberto Rubiño Martín (Instituto de Astrofísica de Canarias, IAC)

This talk presents an overview of the cosmological results derived from the observations of the ESA's Planck mission. These cosmological results are mainly based on the Planck measurements of the cosmic microwave background (CMB) temperature and lensing-potential power spectra, although I will also briefly discuss other aspects of the Planck data, as the statistical characterization of the reconstructed CMB maps, or the constraints on cosmological parameters using the number counts of galaxy clusters detected by means of the Sunyaev-Zeldovich effect in the Planck maps.

I will also review the current status and first results of the QUIJOTE (Q-U-I JOint TEnerife) experiment, a project with the aim of characterising the CMB polarisation and other galactic or extragalactic physical processes that emit in microwaves in the frequency range 10-42 GHz, and at large angular scales (1 degree resolution). The experiment has been designed to reach the required sensitivity to detect a primordial gravitational wave component in the CMB, provided its tensor-to-scalar ratio is larger than $r \sim 0.05$.

Large-scale structure

Rita Tojeiro (University of St Andrews)

Over the last 30 years we have spent significant human effort in mapping out the Universe on the largest scales – and the progress has been astonishing. In this talk, I will review the motivation behind these efforts (from Dark Energy to small-scale galaxy environment), our achievements thus far, and take a good look at what the future will bring.