



**Universidad  
de Valparaíso**  
CHILE

**Instituto de Física y Astronomía**  
Facultad de Ciencias, U. de Valparaíso



## **SEMINARIOS ASTROFISICOS**

### **Lista de seminarios astrofísicos realizados para Profesores, Postdocs, alumnos de Postgrado y Pregrado**

**Auditorio 11-A, Facultad de Ciencias, Gran Bretaña 1111, Playa Ancha, Valparaíso.**

## **Año 2014**

**Martes 07 de Enero, 2014,**

**Sala 11 de la Facultad de Ciencias.**

**Gabriel Cáceres, Pennsylvania State University**

**"Searching for Exoplanets using Kepler Time Series"**

The search for extrasolar planets has advanced greatly in recent years. The success of the methods, particularly measurements of radial velocities and transits, has led to 976 confirmed exoplanets around 740 stars (with 162 of these systems having multiple planets). The Kepler satellite, launched in 2009, has recorded light curves for over 100,000 stars to search for transits. To date, 188 of the confirmed planets were contributed by Kepler and a total of 3,603 additional candidates have been discovered. Smaller planets, or those that orbit at a greater distance, are harder to detect since they leave a much smaller footprint in the lightcurve of the host star. This is exacerbated, of course, if the star has higher noise or intrinsic variability. To push these boundaries, and if we hope to find Earth analogues, new methods must be developed to extract such a small signal from the data. Using the publicly available Kepler dataset, we have recently begun work on alternative methods of modeling these systems. Although analyses of time series are ubiquitous in many fields, the exact methods used vary greatly. To this end, using common techniques in Statistics and Economics but not as widely used in Astronomy, we hope to decrease the autoregressive noise in these time series and achieve better sensitivity to both smaller/more distant planets and more generally with noisier stars

**Miercoles 15 de Enero, 2014,**

**Sala 1 de la Facultad de Ciencias.**

**Dr. Alfredo Santillan, Universidad de México**

**"Supercómputo del Siglo XXI: que es y para qué sirve?"**

En esta charla hablaré brevemente del Supercómputo del siglo XXI. Presentaré algunas propiedades de la supercomputadora más potente del planeta de acuerdo a la lista "Top 500 SC", así como, estadísticas vinculadas a esta tecnología, por ejemplo, como están distribuidos estos equipos en todo el mundo, cuáles son sus rendimientos, que tipo de conexiones utilizan, etc. Finalmente, mostraré algunos ejemplos de los tipos de problemas en los que se utiliza dicha tecnología.

**Miercoles 22 de Enero, 2014,**

**Sala 1 de la Facultad de Ciencias.**

**Dr. Roy Ostensen, Leuven University, Belgium**

**"The origin of Hot Subdwarf stars"**

Hot subdwarf stars are the remnants of stars that have somehow lost their hydrogen envelope during the red giant phase, and are now core-helium burning without a hydrogen burning shell. In order to reach this peculiar configuration they must have lost almost all their remaining hydrogen in some kind of binary interaction. The majority of such subdwarfs are found in binary systems, but a significant number appears to be devoid of any companions that can have caused such significant mass loss. I discuss the latest results with respect to the binary connections and the asteroseismic results revealed by data from the Kepler spacecraft, and outline the tentative connections for giant planets to be involved in the envelope ejection

**Martes 01 de Abril, 2014,  
Sala 11-A de la Facultad de Ciencias.  
Dr. Henri Boffin, LEuropean Southern Observatory, ESO, Chile  
"The Mass Ratio Distribution of Binary Stars"**

The forthcoming large surveys will provide us with an amazingly large set of new binaries. Most of these will be single-lined spectroscopic binaries (SB1) - including exoplanets - for which, because of the unknown inclination angle, we will unfortunately not have a direct knowledge on the masses of the components, an essential ingredient to apprehend the evolution of these systems and understand the various mass transfer mechanisms. Fortunately, statistical methods allow us to derive the mass ratio distribution of large samples of SB1 (and in the case of planets, on the planet mass distribution), that is, when they are applied properly. I will show how these methods have already been applied to a wide range of different binaries

**Miercoles 02 de Abril, 2014,  
Sala 11-A de la Facultad de Ciencias.  
Dr. Aren Heinze, Department of Physics and Astronomy, Stony Brook University, New York, USA  
"Boulders in the Main Belt: How to Find the Faintest Asteroids"**

In 2003, Bernstein et al. used the Hubble Space Telescope to discover two Kuiper Belt objects fainter than 28th magnitude. These remain the faintest Solar System objects ever accurately measured, by a factor of about five. This remarkable feat was accomplished by means of a conceptually simple yet computationally intensive method that can be used to detect any type of moving celestial body. I have adapted this method for asteroid searches, and I report on its enormous potential to discover new asteroids and probe hitherto unexplored aspects of asteroidal dynamics and evolution. My April 2013 observations at Kitt Peak yielded a factor of ten improvement in sensitivity to main-belt asteroids, allowing the small 0.9m telescope I used to attain a sensitivity threshold similar to that obtained using conventional techniques on a 4m telescope. I am now engaged in a program of observations using DECam on the 4m Blanco telescope here in Chile – the optimal instrument in the world for this type of work. I expect to discover three thousand new main belt asteroids, most of them fainter than any previously measured, and many smaller than 100 m in size. I will describe the method and the scientific value of such discoveries.

**Martes 15 de Abril, 2014,  
Sala 11-A de la Facultad de Ciencias.  
Dr. Thomas Henning, Max Planck Institute for Astronomy, Heidelberg  
"From Protoplanetary Disks to Extrasolar Planetary Systems"**

More than 1000 extrasolar planets have been detected so far and several thousands of planetary candidates have been revealed by the Kepler space mission. These "new worlds" are characterized by a large range in orbital and structural parameters, demonstrating the diversity of planetary system architectures. At the same time, astronomical observations at infrared and millimeter wavelengths have demonstrated the presence of proto-planetary disks around young stars and allowed the determination of their physical and chemical compositions. The lecture will summarize our knowledge of planetary system formation in these disks, bridging the gap between their circumstellar micron-sized dust particles and planetary bodies of many 1000 km in size.

**Martes 22 de Abril, 2014,  
Sala 11-A de la Facultad de Ciencias.  
Dra. Diah Gunawan, ALMA y U. de Valparaíso  
"ALMA Observation of Mass Loss in OB Type Stars"**

The fast and dense outflows from massive OB type stars are driven by radiative line acceleration. Multiple evidence points to an over-estimation (by up to a factor of ten) of the currently accepted mass-loss rates from these stars as shown by inconsistencies in results derived using different diagnostics, attributed to wind clumping. Potential downward revisions of mass-loss rates of massive stars have a profound effect on the stars' evolution, and hence feedback from them which in turn affects the evolution of the host galaxy. Therefore we urgently need to establish the true mass-loss rates of OB stars, by constraining the clumping structure. Current diagnostics study the base wind zones (H method), early intermediate zones (IR/FIR continua) and outermost zones (radio continua). However, a big region of the intermediate zone is currently unconstrained. ALMA provides the necessary sub-millimeter and millimeter observations to constrain the density/clumping structure in the intermediate wind zone, in which the wind is extremely sensitive to clumping. We will show the current result from ALMA observations for our goal to constrain the physical origin of wind clumping.

**Martes 07 de Mayo, 2014,  
Sala 11-A de la Facultad de Ciencias.**

**Dr. Phil Lucas, Reader in Astrophysics, University of Hertfordshire**  
**"Eruptive variable protostars: the view from VISTA and UKIDSS"**

Until now the Milky Way has been largely unexplored territory in the time domain, especially in the infrared. A consequence of this is that it has not been possible to address the longstanding question of whether FUor/EXor type unsteady accretion is common amongst Young Stellar Objects (YSOs), with all the implications that would have for masses and ages of normal pre-main sequence stars. We present a sample of ~800 high amplitude ( $\Delta K > 1$  mag) infrared variable stars from VVV (Vista Variables in the Via Lactea), an ESO public survey with the VISTA telescope. This sample is complemented by a further ~300 high amplitude variables from the UKIDSS Galactic plane survey. We show that most of these objects are YSOs, usually too obscured by extinction to be detectable in the optical. High quality spectra from Magellan/FIRE and Gemini/NIFS indicate that many of these objects are eruptive variables, although other populations are present. The SEDs indicate that we are seeing objects at an earlier stage in their evolution than most classical FUors and EXors, corresponding to a time when the average accretion rate was somewhat higher. In the course of this project we expect to be able to quantify the incidence of eruptive variability on timescales up to a few years

**Martes 14 de Mayo, 2014,**  
**Sala 11-A de la Facultad de Ciencias.**

**Dr. Alberto Bolatto, Department of Astronomy and Joint Space Institute, University of Maryland, College Park**  
**"The ALMA view of one of the nearest starburst galaxies"**

In the context of galaxy evolution, it is particularly interesting to understand better the mechanisms that regulate starburst activity in galaxies. In this talk I will present an analysis of the molecular ISM properties in the prototypical circumnuclear starburst galaxy, NGC 253, derived from ALMA observations. I will discuss the evidence for a molecular superwind, our measurements of the mass loss rate, and the possible gas entraining mechanisms. I will show our measurement of the properties of giant molecular clouds in the starburst, in an effort to better understand the conditions in this region. Finally, I will present and discuss some of the chemical complexity we see in the data. The extremely rich spectroscopy, a common feature in many ALMA datasets, opens new windows for the study of physical conditions in extragalactic systems.

**Martes 27 de Mayo, 2014,**  
**Sala 11-A de la Facultad de Ciencias.**

**Maximiliano Haucke, estudiante de Doctorado en Astronomía, Facultad de Ciencias Astronómicas y Geofísicas, UNLP.**

**"Estrellas B Supergigantes: el eslabón perdido de la evolución"**

Las estrellas supergigantes B (BSG) son objetos muy luminosos que muestran grandes variaciones espectroscópicas y fotométricas. Poseen fuertes vientos estelares que interactúan con el medio interestelar circundante, capaces de transferir energía y momento, favoreciendo la creación de burbujas y ondas de choque. Si bien el estudio teórico de los vientos de las estrellas supergigantes O correlaciona bastante bien con las observaciones, para las BSG aún quedan varios interrogantes sin responder. En esta charla se mostrarán resultados sobre un estudio espectroscópico del viento de una muestra de estrellas BSG, mediante el análisis de las líneas de H y He. En particular la línea H alfa es muy importante para el estudio del viento estelar, ya que se origina en el viento. El análisis está basado en el ajuste de los perfiles de línea observados con perfiles teóricos obtenidos con el código hidrodinámico FASTWIND, que nos permitió obtener los parámetros de las estrellas y del viento, y así poder discutir, entre otras cosas, los posibles mecanismos que influyen en la variabilidad.

**Martes 10 de Junio, 2014,**  
**Ricardo Dorda Laforet, Universidad de Alicante, España.**

**"Caracterización de supergigantes rojas en diferentes galaxias"**

En los últimos años varios trabajos han puesto de manifiesto la gran importancia de las estrellas supergigantes rojas. Su altísima luminosidad, baja temperatura y corta edad las convierten en herramientas clave para estudiar la estructura galáctica y la formación estelar en regiones poco accesibles debido a la extinción. Así mismo, son objetos clave para los modelos de evolución estelar, en tanto que sus características extremas y la breve duración de la fase RSG sirven para poner a prueba la validez de los modelos evolutivos. Ahora bien, son objetos esquivos. Sus características fotométricas no pueden distinguirlas de gigantes rojas, por lo que se requieren estudios espectroscópicos para identificarlas y clasificarlas. Sin embargo, existen tres problemas. Primero, el número de estándares definidas es muy pequeño, especialmente en los tipos espectrales más tardíos. Segundo, las supergigantes rojas frecuentemente son variables, sobre todo en los tipos espectrales más tardíos. Tercero, la aparición de bandas de TiO debilita e incluso hace desaparecer las líneas atómicas de los espectros más tardíos, provocando que las gigantes y las supergigantes rojas de tipo espectral M se puedan confundir fácilmente entre ellas. Pese a todo ello, hasta la fecha no se ha hecho un estudio detallado de sus características espectrales con una muestra estadísticamente significativa, atendiendo, además, al efecto de la metalicidad en dichas características. Para arrojar algo de luz en esta cuestión se ha realizado un estudio multiépoca de más de 200

supergigantes rojas, la mayor muestra estudiada de forma sistemática hasta la fecha, con estrellas provenientes de ambientes muy diferentes: SMC, LMC y la Galaxia. Esta muestra ha sido observada a dispersión intermedia, tanto en la región azul del espectro como en la región del triplete infrarrojo del Ca. Nuestro objetivo es obtener índices capaces de distinguir con precisión tipo espectral, clase de luminosidad y el efecto de la metalicidad, incluso si las bandas de TiO, los principales indicadores de tipo espectral en estrellas M, no están dentro del rango espectral considerado, como ocurre en el caso de Gaia. Estos resultados pueden aplicarse inmediatamente a la clasificación espectroscópica y de luminosidad de dos amplias muestras de candidatas a supergigantes rojas observadas en la región del Triplete de Ca, a resolución intermedia. La primera muestra, de 650 candidatas, fue tomada de la región del brazo de Perseo. La segunda muestra, de 1700 candidatas, fue tomada de la región de contacto entre la Barra Galáctica y el Brazo de Scutum- Crux. La correcta clasificación de dichas candidatas permitirá, mediante el estudio de sus velocidades radiales, la estructura galáctica en estas dos regiones clave. Así mismo, este estudio proporcionará el mayor catálogo de supergigantes rojas hasta la fecha, muchas de ellas previamente desconocidas, con la gran ventaja de haber sido estudiadas y clasificadas uniformemente.

**Viernes 13 de Junio, 2014,**

**Dr. Marcin Hajduk from N. Copernicus Astronomical Center, Torun, Poland**

**"Planetary nebula Hen 2-260 and its variable central star"**

HEN 2-260 We discovered the central star of the planetary nebula Hen 2-260 to be variable. The photometric monitoring of Hen 2-260 revealed non-periodic variations on a timescale of hours or days. There is no direct indication for the central star binarity in the spectrum nor for strong stellar wind. Variability is most likely caused by the pulsations of the star. The nebula is relatively dense and young. The central star is at the point to start O<sup>+</sup> ionization ( $T_{\text{eff}} = 30000\text{K}$ ). We report the 50% increase of the [OIII] 5007Å line flux between 2001 and 2012. The central star evolves to higher temperatures at the rate of  $(38 \pm 7) \text{ K yr}^{-1}$ , consistent with the post-AGB evolutionary tracks for the final mass of about  $0.63 M_{\text{sun}}$

**Martes 17 de Junio, 2014,**

**Dr. Florentin Millour, Observatoire de la côte d'Azur (Nice, France), Astronome-Adjoint, responsable scientifique logiciel MATISSE**

**"Pushing the limiting magnitude of optical interferometers: application to the observation of AGN"**

AGNI will present two aspects of a research work ongoing to push forward the sensitivity of optical interferometers. Indeed, the first-generations of optical interferometers have provided deceiving sensitivity limits, restricting this technique mainly to bright stars. This limited in practice the science related to extragalactic objects, and especially AGNs, which were only observable in thermal infrared. The advent of spectro-interferometry, mainly with the workhorse instrument AMBER on the VLTI, led us to rethink the paradigm of what sets the sensitivity limits of an optical interferometer. I will present here the results of the AGN study conducted with the AMBER instrument in the past three years and how we managed to progress on that aspect thanks to a new observing strategy approach, and show some ideas being developed to enhance significantly the limiting magnitude of current and future interferometers.

**Miercoles 19 de Junio, 2014,**

**Dra. Lydia Cidale, Facultad de Ciencias Astronómicas y Físicas, Universidad de La Plata, Argentina**

**"Estructura de los vientos estelares en estrellas supergigantes azules"**

Se discuten las propiedades de los vientos impulsados por radiación en relación a nuevas soluciones hidrodinámicas. Posibles relaciones entre la variabilidad del viento, los modos de pulsación observados y la evolución de la estrella en el diagrama H-R

**Martes 24 de Junio, 2014,**

**Dr. Dominique Proust, Centro Nacional de la Investigación Científica (CNRS) del Observatorio de Paris-Meudon.**

**"Clusters and superclusters of galaxies: what they can tell us"**

Clusters and superclusters of galaxies are the largest bound structures in the universe. their structure and evolution are precious indicators of the cosmic history, in particular for masses determinations. I present some examples of clusters and superclusters we have studied during the last years, in particular the supercluster Shapley-8 ( $z=0.05$ ) whose gravitational potential contributes to deviate the Local Group from the Hubble flow, the supercluster SC0028-0005 ( $z=0.23$ ) which has a composite morphology, and the cluster AC114 ( $z=0.32$ ) which has a complex morphology, X-ray sources and for which the global metallicity has been measured. Finally, the dynamics and evolution of clusters whose central galaxy has a double component (dumbbell clusters) is presented.

**01 de Julio de 2014**

**Martes 05 de Agosto, 2014**

**Dr. Igor Mirabel, CEA\_Sacaly-France & CONICET-Argentina**

### **"Black Holes at the Dawn of the Universe"**

The end of the dark age of the universe is one of the major frontiers in cosmology. Until recently most models assumed that the ultraviolet radiation from the first generations of massive stars was the main (and in some models the only) cause of re-ionization of the intergalactic medium. Based on recent observational and theoretical results I will show that during the first billion years, sources of X-rays, such as stellar black holes, determined the early thermal history of the universe, as well as the re-ionization of the intergalactic medium over large volumes of space. X-rays from the fossils of massive stars had a direct impact on the properties of the faintest galaxies at high redshifts and on the smallest dwarf galaxies in the local universe. In this context, feedback from compact high mass X-ray binaries can provide additional clues to understand the tension between the numbers of dwarf galaxies observed in the local universe and the numbers of those galaxies predicted by the cold dark matter model ( $\Lambda$ CDM) of the Universe.

**Martes 22 de Julio, 2014,**

**Nicolás Tejos, University of California, Santa Cruz**  
**"the Intergalactic medium in the Cosmic Web"**

I will present observational results on the properties and distribution of the intergalactic medium (IGM) in the cosmic web. I use proprietary and public data from HST UV spectroscopy of background QSOs to observe the IGM in absorption, together with galaxies mapped in emission from optical spectroscopy. By cross-matching the position of individual HI absorption line systems to those of different large scale structures (LSS) traced by galaxy distributions (e.g. voids, filaments, clusters), I characterize the IGM in different cosmic environments. I will present results on the properties of the IGM: (i) around normal star-forming and non-star-forming galaxies; (ii) within and around galaxy voids at  $z$  lesser than 0.1, that trace low- and mean-density environments respectively; and (iii) in cosmological filament traced by galaxy cluster pairs, that correspond to high density environments. With these datasets, we can directly test the modern paradigm for the cosmic web developed from cosmological simulations of structure formation.

**Martes 29 de Julio, 2014**

**Dr. Eduard Rusu, Universidad de California Davis**

**"Subaru Telescope Adaptive Optics Observations Of Gravitationally Lensed Quasars"**

We have started in 2011 a campaign to observe a large fraction of the gravitationally lensed quasars discovered by the SDSS Quasar Lens Search, using high-resolution laser guide star adaptive optics observations enabled by the Subaru Telescope. We have succeeded in observing 23 lensed quasars and 3 candidates, constituting the largest adaptive optics observation campaign of lensed quasars attempted so far. The purpose of the campaign was to obtain accurate relative astrometry, photometry and lens shapes for each system, reveal detail unseen in existing low-resolution data, and use these to constrain mass models. To the extent that time allows, I will describe our data analysis technique, as well as present some new results such as: new insights into selected individual systems, a confirmation of the relation between the quasar host galaxy and its central supermassive black hole at high redshift, as well as the mass profile of the elliptical lensing galaxies

**Martes 05 de Agosto, 2014,**

**Dr. Nuria Huelamo, Centro de Astrobiología, CAB/INTA-CSIC, España**  
**"The disk around the young star T Cha: the ALMA view"**

T Chamaeleontis (T Cha) is a young late-type star with signatures of planetary formation. Its spectral energy distribution (SED) shows that the star is surrounded by a transitional disk with a  $\sim 15$ -20 AU dust gap, and sparse aperture masking observations suggest the presence of a substellar companion candidate within the gap. The modeling of the SED reveals that the disk around T Cha is peculiar: either is too narrow (ring-like structure) or too tenuous, and these properties might be the result of on-going planetary formation. However, the models are too degenerate and it is not possible to distinguish between the two scenarios. In this talk I will present spatially resolved observations of T Cha obtained with ALMA. They allow to break the degeneracy between models and characterize the T Cha disk. **Creditos Imagen:** ESO/L.

**Martes 12 de Agosto, 2014**

**Dr. Cuauhtemoc Campuzano, U. Veracruzana. CINVESTAV-IPN México**

**"Fuentes y Efectos de Campos Estacionarios no-circulares conformalmente planos"**

Durante varias décadas los espacios estacionarios que se han estudiado son los estacionarios circulares. Existen una serie de términos y tecnicismos poco entendido y que se han vuelto parte de los discursos al hablar de espacios-tiempo. En esta plática, además de aclarar ciertos conceptos, se pretenden mostrar cuales son los espacios estacionarios más generales que se construyen con dos vectores de Killing, además de presentar los avances en cuanto a las fuentes y efectos que estos espacios han reportado.

**Martes 19 Agosto 2014, 15:30 - 17:00**

**Dr. Stefan Vogt-Geisse, Pontificia Universidad Católica de Chile, Departamento de Química-Física**  
**"Explorando la estructura de moléculas a través de la química cuántica"**

Desde sus tímidos inicios en los años 1950 hasta hoy, la química teórica computacional ha tomado un rol cada vez más importante en el estudio de propiedades moleculares. Esto se debe al desarrollo de computadores cada vez más poderosos y teorías más refinadas que permiten predecir estructuras y energías para sistemas moleculares de gran complejidad con una precisión nunca antes vista. En este seminario se introducirán las bases de la química cuántica y se ilustrarán aplicaciones varias incluyendo la aplicación en el área de la Astroquímica

**Martes 26 de Agosto, 2014, 15:30 - 17:00**

**Daniel Pryjma, Wolfram Research, Inc.**  
**"Mathematica for Teaching and Education" Wolfram**

Learn how to improve your classroom experience with Mathematica. This course gives a tour of functionality relevant to teaching and learning, along with case studies and best-practice suggestions for course integration. Topics include making your classroom dynamic with interactive models and a survey of computation and visualization capabilities useful for teaching practically any subject at any level. [August 26, 2014]

**Miércoles 27 Agosto 2014, 15:30 - 17:00**

**Klaus Rubke, estudiante Doctorado en Instituto de Astrofísica de Canarias, Spain**  
**"MASGOMAS PROJECT, New Automatic-tool for cluster search in VVV"**

New tools are necessary to analyze the huge amount of data in the era of ongoing sky surveys. We present preliminary result of MASGOMAS Automatic-Tool, focused in a search of OB groups of the far edge intersection zone between the bulge and Sagittarius arm covered by VVV

**Martes 02 Septiembre 2014, 15:30 - 17:00**

**Dr. Nelson Braga, Profesor Asociado, Universidad Federal de Río de Janeiro (UFRJ)**  
**"String Theory and Strong Interactions"**

The initial motivation for the development of String Theory was the search for a model for the strongly interacting particles: the hadrons. In this talk we will start reviewing some of the initial ideas of representing particles, like protons and neutrons, by rotating strings in flat space-time. Then we will present a simplified (and hopefully pedagogical) picture of the AdS/CFT duality between string theory in a higher dimensional curved space and a gauge theory in four dimensions. We will see how this kind of duality can be used in order to calculate properties of hadrons in physical regimes where Quantum Chromodynamics, the quantum field theory that governs strong interactions, can not be solved perturbatively. [Septiembre 2, 2014]

Nelson Braga es Graduado en Ingeniería Eléctrica (1982), Máster en Física (1984) y Ph.D. en Física (1990) por la Universidad Federal de Río de Janeiro (UFRJ). En la actualidad es profesor asociado en el Instituto de Física de la UFRJ. Su especialidad es el área de la Física de Partículas Elementales y Campos, centrandose su interés en temas de Teoría Cuántica de Campos, Teoría de Cuerdas, y muy especialmente en el último tiempo en el estudio de Dualidades entre la Teoría de Cuerdas y sus aplicaciones en la Fenomenología de las Interacciones Fuertes.

**Martes 09 Septiembre 2014, 15:30 - 17:00**

**Dr. Paolo Cassata, IFA, U. de Valparaíso**  
**"Lyman alpha as an Astrophysical Tool"**

Lyman alpha Lyman alpha line is the strongest line originating in star forming regions, and the Ly $\alpha$  photons, that at rest have a wavelength in the far UV, are redshifted in the optical window at  $z > 2$ . Therefore, Lyman alpha is routinely used to explore the high redshift Universe, up to and even beyond the epoch of reionization. However, the line is resonant, meaning that it is easily scattered/absorbed in the IGM of galaxies. As a result, "Ly $\alpha$  escape fraction" (the fraction of the produced Ly $\alpha$  photons that can eventually escape from the galaxy) is a complicated function of star formation activity, IGM geometry, kinematics and ionization state. I will review the techniques that are used to identify high redshift Ly $\alpha$  emitters, to constrain their luminosity function and to understand their properties. I will present the results that I obtained studying galaxies with and without Ly $\alpha$  emission in the Vimos-VLT Deep Survey (VVDS) and the Vimos-VLT Ultradeep Survey (VUDS), two of the biggest spectroscopic campaigns ever undertaken at the VLT.

**Martes 07 Octubre 2014, 15:30 - 17:00**

**Dr. Cristóbal Espinoza, Instituto de Astrofísica de la Pontificia Universidad Católica, Santiago**  
**"The Rotation of Pulsars"**

Pulsars are extremely stable rotators, sustained by their very large and steady moments of inertia. The accuracies achieved by pulsar timing, the method by which a pulsar's rotation can be tracked turn by turn over years, have allowed the use of pulsars as celestial clocks, thereby providing stringent tests to the theory of general relativity and possibly enabling the detection of gravitational waves. The precision of this technique has also revealed small timing irregularities which are intrinsic to pulsars rotation. They have been clearly identified as two types, namely glitches

and timing noise. While glitches are rapid and sporadic positive step changes in rotation rate, timing noise appears like a slow process, continuously decelerating or accelerating the rotation with respect to a simple slow down model. The exact physical mechanisms giving rise to these effects are unknown and it is unclear whether there is any connection between the two phenomena. In this talk I will review recent observational advances on the understanding of these irregularities and will show how they teach us about the interior dynamics, structure and magnetospheric content of neutron stars

**Martes 14 Octubre 2014, 16:00 - 17:00**

**Dra. Amelia Bayo, IFA, Universidad de Valparaíso**

**"Studying low-mass stars in the VO... and other things!"**

New low-mass members in the outskirts of Cha I After over ten years of the first implementations, the Virtual Observatory is still far too little exploited in our everyday work as astronomers. A very important problem is the lack of "advertizing" in the non-technical community. In this talk I will review (in a biased way that allows me to go into more details) science cases that have benefited immensely from VO-techniques and tools. I will also try to be as critical as possible regarding problems that are still not solved in the "VO-world", where the interactions with the users/astronomers is vital for a successful development.

**Martes 21 Octubre 2014, 15:30 - 17:00**

**Dr. Anders Overaa, University of Heidelberg, Germany**

**"Isotopes and NLTE: A new study of light elements in 47 Tucanae"**

Over the past two decades, both photometric and spectroscopic observations have revealed that, unlike what was previously believed, Milky Way globular cluster systems cannot be considered single stellar populations. Photometric sequences and abundance variations have by now been found in every well studied globular cluster. In particular the mechanisms responsible for the observed variations in light elements are active areas of research, with polluter candidates ranging from AGB stars to winds from Fast Rotating Massive Stars. Using high-resolution spectra and a combination of 1D and 3D model atmospheres, we have derived the light element abundances in 13 red giants in the metal rich globular cluster 47 Tucanae. In this talk, I will discuss our NLTE results for aluminum as well as present the isotopic ratios of magnesium, and discuss the implications for the polluter candidates. Créditos imagen: Hubble Space Telescope.

**Martes 28 Octubre 2014, 15:30 - 17:00**

**Patrice Bouchet, Head JWST/MIRI Centre of Expertise, TRG & DSM/IRFU/Service d'Astrophysique, CEA-Saclay UMR AIM, CNRS**

**"The JWST, James Webb Space Telescope"**

El telescopio espacial James Webb (JWST) es el resultado de la colaboración entre las agencias espaciales norteamericana (NASA), europea (ESA) y canadiense (CSA). Será el principal observatorio espacial durante las próximas décadas. Será tanto el sucesor del telescopio Espacial Hubble (HST) como del telescopio Spitzer, este último dedicado al infrarrojo. El JWST está diseñado para ser un telescopio de 6.5 m de diámetro, enfriado pasivamente, y equipado con 4 instrumentos que proveerán capacidad para la toma de imágenes, y para la espectroscopía en el infrarrojo entre 0.6 a 27 micrones. El lanzamiento está previsto para octubre 2018. En esta charla, haré primero una descripción general de la misión JWST y las últimas noticias respecto de su estado de avance actual. Luego me enfocaré sobre los casos científicos que condujeron a su conceptualización, describiendo a sus 4 instrumentos (NIRCam, NIRSpec, NIRISS and MIRI) y sus potencialidades.

**Miércoles 29 Octubre 2014, 15:30 - 17:00**

**Dr. Juan Antonio Fernandez Ontiveros, Instituto di Astrofisica e Planetologia Spaziali (INAF-IAPS).**

**"AGN torus and Starburst scenario in the central 100 pc of IC 3639"**

The detection of the active nucleus in IC 3639 using the no-track mode in VLT/MIDI corresponds to one of the faintest measurements so far achieved with mid-IR interferometry. Strong star-formation and AGN activity coexist on small spatial scales in the nucleus of IC 3639, within the inner 100 pc. The resulting brightness distribution shows the contribution of the the AGN, which explains dust heating in the innermost parsecs, plus the star-formation component that heats the dust at larger scales and dominates the total mid-IR luminosity. The case of IC 3639 is in contrast with the quenching of star-formation activity by AGN feedback scenario

**Martes 11 Noviembre 2014, 15:30 - 17:00**

**Dr. Mauricio Araya, Doctor en Cs. de la Computación, Docente Universidad Federico Santa Maria, Valparaíso**

**"Breve introducción al aprendizaje de máquina para astronomía"**

En esta charla, se presenta una vista rápida a los conceptos fundamentales del aprendizaje de máquina en el contexto de la astronomía. Los principales temas a tratar son regresión y clasificación en aprendizaje supervisado, clustering y estimación de densidad en aprendizaje no-supervisado, y una breve discusión sobre modelos de varias capas, como las cadenas de Markov o las redes neuronales artificiales. Además, discutiremos los principales

desafíos de utilizar estos métodos en datos de tipo ALMA, y en general los problemas de utilizar estas herramientas en grandes conjuntos de datos astronómicos. [Noviembre 11, 2014]

**Martes 18 Noviembre 2014, 15:30 - 17:00**

**Mark Booth, Pontificia Universidad Católica De Chile**

**"HR 8799: Giant Planets, Giant Debris Disc"**

giant planets HR 8799 is well known for being the only star to host multiple planets discovered through direct imaging. HR 8799 also hosts a debris disc first discovered by IRAS. This disc was one of the few resolved by Spitzer showing that dust is present out to a few thousand AU. The Spitzer data also showed that there must be multiple components to the dust both inside and outside the orbits of the planets. Naturally, this system has been a prime target for observations from various telescopes in recent years. I will focus on the results of imaging with Herschel, ALMA cycle 0 and JCMT/SCUBA-2. The disc is found to be resolved at 70, 100, 160, 250 and 850  $\mu\text{m}$ . The resolution of the Herschel data has allowed us to determine the inclination of the disc for the first time, showing it to be coplanar with the planets and star. Both Herschel and ALMA observations do not detect any clumpiness that might be expected due to interactions between the planets and the disc. Combined analysis of the spectral energy distribution and the resolved images presents new questions since the dust is seen to be distributed over a wide range of radii and yet only a narrow range of temperatures is seen.

**Martes 25 Noviembre 2014, 15:30 - 17:00**

**Dr. Jaime E. Forero -Romero, Universidad de los Andes, Bogotá, Colombia**

**"Galaxias en la Red Cósmica"**

La distribución de galaxias a grandes escalas sigue un patrón filamentar conocido como la red cósmica. Su emergencia es el resultado de la inestabilidad gravitacional en escalas cosmológicas. Dentro de la red cósmica las galaxias se forman, crecen y se fusionan. En el modelo cosmológico estándar, donde la componente de materia dominante es oscura y no-colisional, es posible simular con gran precisión la formación de estas superestructuras así como de los halos de materia oscura que albergan las galaxias. En esta línea de investigación hay dos preguntas abiertas: ¿cuál es la influencia de la red cósmica sobre las galaxias? y ¿hay algún rastro observable de esta influencia? En esta charla presentaré resultados de simulaciones y algoritmos para detectar la red cósmica. En la primera parte hablaré de las alineaciones de halos/galaxias con respecto a los filamentos de la red. En una segunda parte hablaré sobre un par especial de galaxias, el Grupo Local, y su lugar en la red cósmica. Mostraré cómo, desde esta perspectiva, la Vía Láctea y Andrómeda no son una pareja común en el contexto cosmológico. [Noviembre 25, 2014]

**Jueves 27 Noviembre 2014, 14:00 - 15:00**

**Dr. Felix Mirabel, CEA-Saclay-France & CONICET-Argentina**

**"Black Holes At The Dawn Of The Universe"**

The end of the dark age of the universe is one of the major frontiers in cosmology. Until recently most models assumed that the ultraviolet radiation from the first generations of massive stars was the main (and in some models the only) cause of re-ionization of the intergalactic medium. Based on recent observational and theoretical results I will show that during the first billion years, sources of X-rays, such as stellar black holes, determined the early thermal history of the universe, as well as the re-ionization of the intergalactic medium over large volumes of space. X-rays from the fossils of massive stars had a direct impact on the properties of the faintest galaxies at high redshifts and on the smallest dwarf galaxies in the local universe. In this context, feedback from compact high mass X-ray binaries can provide additional clues to understand the tension between the numbers of dwarf galaxies observed in the local universe and the numbers of those galaxies predicted by the cold dark matter model (  $\Lambda$ CDM) of the Universe.

**Martes 02 Diciembre 2014, 15:30 - 17:00**

**Dr. Cristian Nitschelm,**

**"Study of the duplicity and the multiplicity in the Sco-Cen Complex (Sco OB2)"**

The Sco-Cen Complex is composed of three nearby southern OB associations: Lower Centaurus Crux, Upper Centaurus Lupus and Upper Scorpius. Using the literature, the Simbad database, the results from the Hipparcos astrometry satellite and our own high-resolution observations with the spectrographs Giraffe (1.9-m telescope, Sutherland Observatory, South Africa), Hercules (1.0-m telescope, Mount John University Observatory, New Zealand) and FEROS (2.2-m telescope, La Silla Observatory, Chile), we were studying the binary and multiple star population of the Sco-Cen Complex. Among the studied sample, we were observing several confirmed and suspected spectroscopic binaries, in order to improve the knowledge of these peculiar objects. During this talk, we present our new catalogue and some results we were able to derive from it, mainly about the present knowledge of the duplicity and the multiplicity throughout the Sco-Cen Complex. We are also explaining the way for the selection process of the members and we are presenting some already known and yet unknown interesting spectroscopic binaries in the Sco-Cen Complex, SB1 and SB2, and proposing a few of them (mainly SB2) for a further disentangling study



**Martes 09 Diciembre 2014, 15:30 - 17:00**

**Dr. Eric Jullo, Laboratoire d'Astrophysique de Marseille**

**"Lens modeling with the HST Frontier Fields galaxy clusters"**

In 2013 has started the HST Frontier Fields legacy program driven by the STScI. The goal is to observe 6 massive lens galaxy clusters, and detect through gravitational lensing magnification several  $z > 8$  galaxies. So far, Abell 2744 and MACSJ0416 have been observed both with ACS and WFC3, for 70 HST orbits each. In this talk, I will present our recent lens models of these 2 clusters. With such exquisite data, we were able to identify 4 times more strongly lensed multiple images than before the HFF program started, leading to the percent accuracy on the mass estimates. With more than 150 multiple images per cluster, we can now investigate in details systematic errors in the cluster lens modeling activity

**Martes 16 Diciembre 2014, 15:30 - 17:00**

**Dr. Matías Jones, Pontificia Universidad Católica, Santiago**

**"Planets around Giant Stars"**

Evolved stars (subgiants and giants) are suited targets for precision radial velocity (RV) studies by two main reasons: 1) they are cooler and rotate slower than their former main-sequence progenitor, which allow us to achieve RV precision at the m/s level for intermediate-mass stars (e.g. former A-type stars), and 2) we can use them to study the dynamical evolution of planetary orbits due to the interaction with the expanding stellar envelope. Since 2009, we have been conducting a radial velocity survey called EXPRESS (EXoPlanets aRound Evolved StarS) aimed at studying the population of close-in planets orbiting giant stars. So far, we have collected multi-epoch spectra for a sample of 166 bright giant stars, using FEROS, FECH and CHIRON, resulting in the detection of three super-Jupiters in relatively close-in orbits, a highly eccentric Brown Dwarf, several new binary systems plus a number of exciting planetary and brown dwarf candidates that still have to be confirmed. In this talk I will describe our project and show the results that we have obtained. Finally I will discuss about the peculiar properties (semimajor-axis, mass and eccentricity distributions) of planets around giant stars and the role of the stellar evolution on these properties.

**Martes 23 Diciembre 2014, 15:30 - 17:00**

**Angela Cortes, Pontificia Universidad Católica de Chile**

**"Perfil de turbulencias en un sistema de optica adaptativa multiconjugada"**

Uno de los principales problemas de la astronomía, es que al observar desde la tierra, se sufre de pérdida de resolución angular al observar a través de turbulencia atmosférica. Para el diseño de nuevos instrumentos y para el procesamiento de las imágenes, es de vital importancia el conocimiento de la distribución de las turbulencias en altura. Para esto se han diseñado diversos instrumentos. El problema de estos instrumentos es que no observan la misma turbulencia que afecta las observaciones astronómicas, por lo que basándonos en uno de estos instrumentos SLODAR, nuestro objetivo fue determinar un algoritmo, usando datos de un sistema de óptica adaptativa multiconjugada (MCAO), para obtener la información del perfil de turbulencias. La hipótesis del trabajo fue que era posible utilizar los datos de este sistema MCAO, para obtener la misma información de la distribución de turbulencias en alturas. Se tomaron datos de GeMS, un instrumento ubicado en el telescopio de 8 mt en Gemini Sur, para demostrar que era posible. Los resultados fueron ampliamente satisfactorios, ya que no solo se pudo estimar el perfil de turbulencias, sino que se pudo determinar la velocidad de algunas de estas capas de turbulencias, determinando la velocidad del viento que la desplaza y su dirección. Los resultados de esta tesis, no solo han sido útiles para hacer mediciones en el observatorio de Gemini, también se han probado en otros observatorios/telescopios como Subaru/Raven y en el MMT. Aún es posible realizar más estudios con esta información, como lo es realizar estudios sobre el tipo de turbulencias y determinar las características de las mismas en los diferentes sitios