Annual Report 2013

Instituto de Astrofísica
Facultad de Física
Pontificia Universidad Católica de Chile

Av. Vicuña Mackenna 4860, 782-0436 Macul, Santiago, Chile
www.astro.puc.cl

Abstract

The Institute of Astrophysics (IA) at PUC currently has 15 faculty members and hosted 41 postdoctoral researchers through 2013. The IA members published 148 refereed articles during 2013, and benefited from around 45 grants. In the academic year 2013, 13 students received their *Licenciatura* degree, seven obtained an M.Sc., and one a Ph.D.

1 Introduction

The *Instituto de Astrofísica* (Institute of Astrophysics, IA) is one of the two academic divisions of the Faculty of Physics of *Pontificia Universidad Católica de Chile* (PUC). This faculty offers undergraduate (*Licenciatura*) degrees in Astronomy and in Physics, and Ph.D. and Master's programs in Astrophysics and in Physics.

In view of the large growth in size, research, and teaching activities of both of the Departments of the Faculty of Physics, the Higher Council (*Consejo Superior*) of the University approved their promotion to become Institutes, so the former Department of Astronomy and Astrophysics (DAA) became the Institute of Astrophysics as of June 13, 2013

The mission of the IA is to be an international centre of excellence for studies in the field of Astronomy and Astrophysics, covering a broad range of topics in observational and theoretical astrophysics, and to prepare the next generations of students that will profit from the superb observational facilities available to Chilean astronomers and their collaborators. In addition, the IA together with the associated Center for Astro-Engineering (AIUC) are engaged in innovative telescope instrumentation projects and high-performance computing programs. In this report, we review the main activities at IA from January until December 2013.

2 Personnel

2.1 Changes in 2013

2.1.1 New Postdocs

- Dr. P. Arévalo arrived from Universidad Andrés Bello, Chile.
- Dr. M. Booth arrived from the University of Victoria, Canada.
- Dr. R. Contreras Ramos arrived from the University of Bologna, Italy.
- Dr. J.M. Corral-Santana arrived from the IAC, Spain.
- Dr. A. Dunhill arrived from the University of Leicester, UK.
- Dr. C. Espinoza arrived from the University of Manchester, UK.
- Dr. R. González arrived from the University of Chicago, USA.
- Dr. M. Jones arrived from Universidad de Chile.
- Dr. L. Maurin arrived from Université Paris Diderot, France.
- Dr. K. Peña arrived from the IAC, Spain.
- Dr. C. Romero-Cañizales arrived from the University of Turku, Finland.
- Dr. P. Troncoso arrived from Ruhr Universität Bochum, Germany.
- Dr. A.A.R. Valcarce arrived from Universidade Federal do Rio Grande do Norte (UFRN), Brazil.
- Dr. M. Valenzuela arrived from Servicio Nacional de Geología y Minería (Sernageomin), Chile.

2.1.2 Postdoc Departures

- Dr. T. Anguita left to take on a faculty position at Universidad Andrés Bello, Chile.
- Dr. H. Francke left to take on a Archive Support Scientist position at ALMA, Chile.
- Dr. K. Hełminiak left to take on a Support Scientist position at Subaru, Hawaii, US.
- Dr. R. Saito left to take on a faculty position at Universidade Federal de Sergipe, Brazil.

- Dr. D. Salter left to complete her joint postdoctoral position at the University of Maryland, US.

2.1.3 Retirement

Prof. H. Quintana retired and was named Professor Emeritus.

2.2 IA Faculty

- Dr. Felipe Barrientos, Associate Professor (Ph.D. University of Toronto, Canada, 1999) – *Galaxy evolution and morphology. Elliptical galaxies. Clusters of galaxies. Observational cosmology.*
- Dr. Franz E. Bauer, Associate Professor (Ph.D. University of Virginia, USA, 2001) – *AGN Demographics, Feeding, and Evolution. Coeval Growth of Galaxies and Super-Massive Black Holes. Deep Blank-field Surveys (Radio through X-ray). Nearby Supernovae and X-ray Binaries. Structure Formation and Galaxy Cluster Evolution.*
- Dr. Márcio Catelan, Full Professor (Ph.D. Universidade de São Paulo, Brazil, 1996) – *Stellar structure and evolution. Globular clusters. Variable stars. Stellar Populations. Galaxy formation and evolution.*
- Dr. Julio Chanamé, Assistant Professor (Ph.D. The Ohio State University, USA, 2005) – *Stellar dynamics. The Milky Way and the Local Group. Stellar structure and evolution.*
- Dr. Alejandro Clocchiatti, Full Professor (Ph.D. University of Texas at Austin, USA, 1995) – *Supernovae, near and far. Radiative Transfer. Galaxy Clusters. Cosmology.*
- Dr. Jorge Cuadra, Assistant Professor (Ph.D. Ludwig-Maximilians-Universität München, Germany, 2006) – *Numerical astrophysics. Galactic nuclei. Super-massive black holes. Planet–disc interactions.*
- Dr. Rolando Dünner, Adjunct Assistant Professor, (Ph.D. PUC, 2009) – *Large scale structure and cosmology. Astronomical instrumentation.*
- Dr. Gaspar Galaz, Associate Professor (Ph.D. Université de Paris, France, 1998) – *Stellar population in galaxies. Galaxy evolution. Statistical properties of the galaxy distribution.*
- Dr. Leopoldo Infante, Full Professor (Ph.D. University of Victoria, Canada, 1990) – *Galaxy and structure evolution. Pairs, groups and clusters of galaxies. LSB, dwarf and star forming galaxies in relation to environment. High-z QSOs. Correlation functions.*
- Dr. Andrés Jordán, Associate Professor (Ph.D. Rutgers University, USA, 2004) – *Search and characterization of transiting exoplanets. Galaxies in nearby clusters. Star clusters.*
- Dr. Dante Minniti, Full Professor (Ph.D. University of Arizona, USA, 1993) – *Globular clusters. Stellar populations and evolution. Extrasolar planets. Galaxy formation. Galactic structure. Gravitational microlensing. Astrobiology.*
- Dr. Nelson Padilla, Associate Professor (Ph.D. Universidad Nacional de Córdoba, Argentina, 2001) – *Numerical astrophysics. Galaxy and Structure Formation. Cosmology.*
- Dr. Thomas H. Puzia, Assistant Professor (Ph.D. Ludwig-Maximilians-Universität München, Germany, 2003) – *Star clusters and star cluster systems. Chemical evolution and enrichment histories of galaxies. Galaxy formation and evolution. Stellar dynamics. Stellar populations. Population synthesis models. Stellar abundances. Hierarchical structure formation. Mass assembly of galaxies.*
- Dr. Andreas Reisenegger, Full Professor and IA Chairman (Ph.D. Caltech, USA, 1993) – *Theoretical Astrophysics and Cosmology. Neutron Stars. Stellar Magnetic Fields. Structure Formation. Clusters and Superclusters of Galaxies.*
- Dr. Manuela Zoccali, Associate Professor, (Ph.D. Università degli Studi di Padova, Italy, 2000) – *Stellar Populations in the Milky Way. The Galactic Bulge. Star Clusters. Chemical Abundances.*

2.3 Postdoctoral Fellows 2013

The following scientists held postdoctoral positions at the IA during the reported period.

- Dr. Javier Alonso-García (Ph.D. University of Michigan, USA, 2010) – *Stellar populations. Galactic astronomy. Stellar evolution. Stellar variability. Photometry.*
- Dr. Rodolfo Angeloni (Ph.D. University of Padova, Italy, 2009) – *Symbiotic Stars. Interstellar Dust. Stellar variability. Photometry. Nebular Spectroscopy.*
- Dr. Timo Anguita (Ph.D. Ruprecht Karls Universität Heidelberg, Germany, 2009) – *Gravitational lensing. Galaxy evolution. Galaxy clusters.*
- Dr. Patricia Arévalo (Ph.D. Ludwig-Maximilians-Universität München, Germany, 2006) – *AGN structure. X-ray/optical/IR variability. Galaxy clusters.*

- Dr. Mark Booth (Ph.D. Cambridge University, UK, 2010) – *Debris discs. Planetary systems. Small Solar System Bodies. Astrobiology.*
- Dr. Mia Bovill (Ph.D. University of Maryland, USA, 2011) – *Galaxy formation.*
- Dr. Rodrigo Contreras Ramos (Ph.D. University of Bologna, Italy, 2010) – *Stellar structure and evolution. Globular clusters. Variable stars. Stellar Populations. Galaxy formation and evolution. Photometry.*
- Dr. Jesús M. Corral-Santana (Ph.D. IAC, Spain, 2012) – *Observational studies of compact objects in X-ray binaries. Stellar evolution: Dynamical confirmation of stellar-mass black holes. Transient X-ray binaries. Photometry. Spectroscopy.*
- Dr. István Dékány (Ph.D. Eötvös Loránd University, Hungary, 2010) – *Photometry. Time-series analysis. Stellar pulsation. Stellar evolution.*
- Dr. Alex Dunhill (Ph.D. University of Leicester, UK, 2013) – *Planet–disc interactions. Binary supermassive black holes. Numerical hydrodynamics.*
- Dr. Paul Eigenthaler (Ph.D. University of Vienna, Austria, 2011) – *Fossil Galaxy Groups, Compact Galaxy Groups, Stellar populations, Tidal Dwarf Galaxies, Spectroscopy.*
- Dr. Cristóbal Espinoza (Ph.D. University of Manchester, UK, 2010) – *Pulsar Astronomy: timing, spin evolution, glitches and timing noise.*
- Dr. Harold Francke (Ph.D. Universidad de Chile, 2009) – *Galaxy formation and evolution. Cosmology and large scale structure of the universe.*
- Dr. Roberto González (Ph.D. PUC, 2009) – *Cosmology: Large scale structure, DM–galaxy connection, environment. Computational Astrophysics: N-body codes, initial conditions, LSS and cluster/single galaxy zoom simulations, halo and structure identification.*
- Dr. Krzysztof Hełminiak (Ph.D. Nicolaus Copernicus Astronomical Center, Poland, 2010) – *Derivation of fundamental parameters of late-type stars in binaries using precise photometry. High-resolution spectroscopy. Imaging with adaptive optics and optical interferometry.*
- Dr. Maren Hempel (Ph.D. Ludwig-Maximilians-Universität München, Germany, 2004) – *Globular cluster systems. Stellar Populations. Galaxy formation and evolution.*
- Dr. Eduardo Ibar (Ph.D. University of Edinburgh, UK, 2009) – *Observational cosmology, including: galaxy formation and evolution, star-forming galaxies and active galactic nuclei, submm galaxies, deep radio, X-ray surveys and cosmic star-formation rate.*
- Dr. Matías Jones (Ph.D. Universidad de Chile, 2013) – *Stellar spectroscopy. Extrasolar planets. Instrumentation.*
- Dr. Sam Kim (Ph.D. University of California at Irvine, USA, 2012) – *Compact overdensity and protocluster study. High redshift galaxy evolution. Strong lensing phenomena of submm bright galaxies. Cosmological mass assembly.*
- Dr. Régis Lachaume (Ph.D. Université de Grenoble, France, 2003) – *Optical long-baseline interferometry. Young stellar objects. Multiple stellar systems.*
- Dr. Loïc Maurin (Ph.D. Université Paris Diderot, France, 2013) – *Cosmology. Polarization of the cosmic microwave background.*
- Dr. Adal Mesa-Delgado (Ph.D. Instituto de Astrofísica de Canarias, Spain, 2010) – *Interstellar Medium. HII regions. Chemical abundances.*
- Dr. Joe Mitchell (Ph.D. Florida State University, USA, 2012) – *Simulations of the singly degenerate progenitors of SNe Ia. Nuclear Astrophysics. Nuclear structure. MHD simulations, stellar magnetic fields.*
- Dr. Matías Montesinos Armijo (Ph.D. Observatoire de la Côte d'Azur, France, 2011) – *Accretion disks. Active Galactic Nuclei. Supermassive black holes. Numerical Simulations.*
- Dr. Marcelo Mora (Ph.D. Ludwig-Maximilians-Universität München, Germany, 2008) – *Stellar populations. Extragalactic star clusters systems*
- Dr. Roberto Muñoz (Ph.D. PUC, 2009) – *Galaxy evolution. Galaxy dynamics. Galaxy clusters. Dark matter mass profiles. Gravitational lensing.*
- Dr. David Murphy (Ph.D. Durham University, UK, 2011) – *Large-scale structure & extragalactic physics. Filaments and clusters of galaxies. Galaxy evolution*
- Dr. Álvaro Orsi (Ph.D. Durham University, UK, 2010) – *Galaxy formation. Large Scale structure. Semi-analytical modelling. High redshift galaxies. Lyα radiative transfer.*
- Dr. Karla Peña (Ph.D. Instituto de Astrofísica de Canarias, Spain, 2010) – *Brown dwarfs and planetary mass objects: circumstellar matter, luminosity*

function, mass function, open clusters and associations.

- Dr. Sibilla Perina (Ph.D. University of Bologna, Italy, 2010) – *Stellar populations. Star clusters. Stellar evolution. Population synthesis models. Photometry.*

- Dr. Markus Rabus (Ph.D. Universidad de la Laguna, Spain, 2009) – *Search and characterization of exoplanets.*

- Dr. Cristina Romero-Cañizales (Ph.D. Universidad de Granada, Spain, 2011) – *AGN and star formation activity in luminous infrared galaxies. Core-collapse supernovae. Astronomical masers.*

- Dr. Cristián Sáez (Ph.D. Penn State University, USA, 2010) – *Active Galactic Nuclei. AGN X-ray evolution. AGN winds in broad absorption line (BAL) quasars.*

- Dr. Roberto K. Saito (Ph.D. Universidade Federal de Santa Catarina, Brasil, 2008) – *Cataclysmic Variable Stars. Stellar Astrophysics. Astronomical Data Processing.*

- Dr. Demerese Salter (Ph.D. Leiden University, Netherlands, 2010) – *Low-mass star formation. Millimeter interferometry.*

- Dr. Steve Schulze (Ph.D. University of Iceland, 2012) – *Gamma-ray bursts. Core-collapse Supernovae. High-redshift galaxies. Photometry. Spectroscopy.*

- Dr. Tomás E. Tecce (Ph.D. Universidad de Buenos Aires, Argentina, 2011) – *Galaxy formation. Extragalactic astronomy. Galaxy clusters. Cosmology. Numerical methods.*

- Dr. Paulina Troncoso (Ph.D. La Sapienza Università di Roma, Italy, 2013) – *Galaxy evolution. High redshift galaxies. 3D spectroscopy.*

- Dr. Aldo A.R. Valcarce (Ph.D. PUC, 2011) – *Stellar Evolution: Modelling, Chemical Abundances. Star Clusters: Formation, Evolution, Multiple Populations. Stellar Populations. Galaxy: Formation.*

- Dr. Millarca Valenzuela (Ph.D. Universidad de Chile, 2011) – *Flux of extraterrestrial matter to Earth (meteorites, micromiteorites and cosmic spherules). Petrology and geochemistry of ordinary and carbonaceous chondrites. Weathering processes in deserts. Atacama Desert Meteorite Collection. Antarctic multidisciplinary studies on Geology, Astrobiology, Astronomy and Glaciology. Impact cratering. Cosmogenic nuclides (10Be, 36Cl, 14C).*

- Dr. Jingcheng Yu (Ph.D. Shanghai Astronomical Observatory, China, 2012) – *Star Clusters. N-body Simulations.*

Support for the postdoctoral fellows comes from the FONDECYT programme, grants from the Joint ESO–Chile Committee for the Development of Astronomy in Chile, the ALMA–CONICYT and Gemini–CONICYT funds, the Millennium Scientific Initiative, and the Basal programme (see § 6).

2.4 Technical Staff and Assistants

- Luis Mauricio Barz *Caretaker.*

- Carmen Gloria Cordovez *Administrative Assistant.*

- Lorena Guzmán (Journalist) *Outreach activities.*

- Lilena Montenegro *Administrative Assistant.*

- Joyce Pullen *Administrative Assistant???*

- Gladys Reineking *Secretary*

- Vincent Suc (Electrical Engineer, INSA, Lyon, France) *Local engineer for HAT-South and Megacam / MMIRS. Engineer at Teaching Observatory at Santa Martina.*

- Dr. José Miguel Fernández (Ph.D. PUC, 2009) *Astronomer at Teaching Observatory at Santa Martina.*

- Giselle Ulloa *Administrative Coordinator of the Department.*

- Juan Véliz *System Manager. Software Specialist.*

- Mariela Villanueva *IT Assistant.*

2.5 Recognitions, Awards and Sabbaticals

P. Arévalo received the Chilean Academy of Sciences' Prize for Young Female Researchers.

A. Clocchiatti finished his sabbatical period in July 2013. He spent extended periods as a Visiting Scholar at the Instituto Argentino de Física del Espacio (National University of Buenos Aires, Argentina), the Specola Vaticana (Vatican State), the European Southern Observatory in Chile, and the Physics Department of Harvard University (USA).

N. Padilla started his sabbatical period in August 2013 at the Max-Planck-Institut für Astrophysik (Garching, Germany).

H. Quintana was named Professor Emeritus after his retirement.

3 Academic Programmes and Teaching

The IA offers graduate and undergraduate programmes in Astrophysics, as detailed below. Our faculty members are in charge of all Astrophysics courses, both for our programmes and for students from other majors, plus some courses on Physics.

During 2013, we taught 30 semester-long courses, which can be categorised as follows:

- Astrophysics undergrad core courses (7)
- Astrophysics graduate core courses (5)
- Astrophysics elective courses (10)
- sections of the Astronomy course for non-majors (6)
- Physics elective courses (2)
- Physics service courses (2)

From these courses we could highlight the creation of a new elective course, *History of Astronomy*, open to all students in the University, and that each semester we offer a section of the basic Astronomy course in English. Most of the graduate courses are also taught in English.

3.1 Graduate Programme

The IA offers Ph.D. and Master programmes in Astrophysics. They include core courses on Physical Processes in Astrophysics, Advanced Stellar Astrophysics, and Advanced Extragalactic Astrophysics. The programmes are completed with elective courses, supervised research, and a thesis. Students typically start research projects during their first year.

3.1.1 Degrees obtained

- Daniela Carrasco obtained her Master's Degree, defending her thesis entitled "*Photometric selection of quasars and search of pairs from the Red Sequence Cluster Survey 2*", supervised by F. Barrientos. She then moved to the University of Melbourne, Australia, to start a Ph.D. program.
- Gustavo Morales obtained his Master's Degree, defending his thesis entitled "*The Atacama Cosmology Telescope: Extragalactic Sources in 3 bands*", supervised by R. Dünner. He then moved to the Astronomisches Rechen-Institut (ARI), Germany, to start a Ph.D. program.
- Ósmar Rodríguez obtained his Master's Degree, defending his thesis entitled "*Photospheric magnitude diagrams for type II supernovae*", supervised by A. Clocchiatti.
- Alejandra Rojas obtained her Master's Degree, defending her thesis entitled "*Identificación de fuentes de alta energía usando el survey VVV y espectroscopía óptica en CTIO* ", supervised by D. Minniti.
- Álvaro Rojas obtained his Master's Degree, defending his thesis entitled "*Distribución de metalicidad a través del semieje mayor del bulbo Galáctico* ", supervised by M. Zoccali. He then moved to the University of Nice Sophia Antipolis, France, to start a Ph.D. program.
- Gabriel Torrealba obtained his Master's Degree, defending his thesis entitled "*RR Lyrae Stars as Probes of Structure in the Milky Way Galaxy: Tools and Applications*", supervised by M. Catelan. He then moved to the University of Cambridge, UK, to start a Ph.D. program.
- Martin Tourneboeuf obtained his Master's Degree, defending his thesis entitled "*Searching for I-Band dropout galaxies lensed by galaxy clusters*", supervised by F. Barrientos.
- Dr. Nicolás Viaux obtained his Ph.D. Degree, defending his thesis entitled "*Astrophysical Constraints on Particle Physics beyond the Standard Model*", supervised by M. Catelan. He moved to the Institute of Physics, PUC, to take on a postdoctoral position.

3.2 Undergraduate Programme

The PUC undergraduate programme in Astronomy currently has ∼100 students, who are consistently drawn from the top 2% of the ∼300,000 high school seniors who take the nationally administered entrance examination (PSU) each year.

A group of 32 new students registered in the programme through the regular admission process to start in March 2014. The last admitted student scored 704.5 points at the PSU. Additionally, four students registered through the *Beca de Excelencia Académica* initiative, and five through *Admisión Especial*.

Undergraduate students work full time during the last semester of the program on a research project under the supervision of a faculty member, sometimes a member of a neighbouring institute. The 13 students who obtained their degree during this period, the subject of their theses, and their supervisors are:

- Simón Ángel: *Characterization of the Galactic Foreground Stellar Populations along the Sightlines of the NGVS-IR and CFHT-LS Survey Fields* – (T. Puzia)
- Francisco Aros: *A Jeans equation analysis of the mass content of dwarf spheroidal galaxies* – (J. Chanamé)

- Luis Busta: *Galaxias de bajo brillo superficial en el RCS 2* – (G. Galaz)
- Diego Farías: *Eta Carinae; A Geometric Distance and Polarimetric Study* – (A. Clocchiatti)
- Pedro Fluxá: *Polarizing effect of panel gaps in ACT* – (R. Dünner)
- Felipe Gran: *Long-period variable stars in the VVV Survey* – (D. Minniti)
- Antonio Henríquez: *Lorentz Forces on a Neutron Star Crust* – (A. Reisenegger)
- Daniela Iglesias: *The search for exoplanetary transit candidates around M dwarf stars using VVV survey data* – (D. Minniti)
- Fabrizzio Merello: *Recubrimientos de titanio usando implantación de iones por inmersión en plasma de radio frecuencia* – (M. Favre, Physics)
- Josefina Michea: *SNe rate in Red-Sequence cluster survey 2 luminous red galaxies* – (F. Barrientos)
- Gabriela Muro: *Microlensing Events in the central region of our Galaxy discovered by the VVV project* – (D. Minniti)
- Francisco Surot: *Búsqueda de tránsitos planetarios en el VVV Survey* – (D. Minniti)
- Bryan Townsend: *Eclipsing binaries in the VVV Survey* – (M. Catelan)

4 Interdisciplinary Center

The UC Center for AstroEngineering, AIUC

AIUC was created in 2009 as a joint venture between the IA and the PUC Faculty of Engineering. The Center's mission is to serve as channel to carry out research and to generate new technological and computational opportunities in the areas of astronomy and engineering in Chile. Currently the AIUC includes three main parts: a Laboratory of Astronomical Instrumentation, a Center of data mining and numerical computation and a Astronomical Service area. The purpose of the first is to generate alliances with international observatories present in Chile, participate in the construction of optical and infrared instruments and trigger technological transfer to the country. The Computer Lab offers to the astronomical community a powerful tool for numerical computation and data analysis and provides the computing capability needed to handle large amounts of data collected by telescopes in Chile. Finally, the mission of the Service Area is to provide astronomical and engineering support to the international observatories located in Chile and facilitate specialized human resources.

5 Colloquia, seminars and science activities

Starting in 2012, the IA organises a series of astronomy colloquia that, modelled after similar programs with long traditions at major astronomical institutions in the world, targets outstanding speakers selected not only for their scientific achievements but also for their ability to communicate them well to a diverse audience. Among the obvious advantages of a Colloquium series of such characteristics, this plan is part of an integral effort by our Department to improve the quality of our Graduate program, adding even more stimulating experiences to our daily scientific atmosphere.

Below is the programme of our Colloquia during 2013:

- 12/03: Cole Miller (Maryland, USA) "Hearing The Universe With Gravitational Waves"
- 19/03: Krzysztof Stanek (Ohio State, USA) "Drinking Coffee, Writing Papers"
- 26/03: Georg Raffelt (Max-Planck-Institut für Physik, Germany) "Neutrinos In Astrophysics And Cosmology"
- 02/04: Stefan Gillessen (MPE, Germany) "Watching In Real-time How A Gas Cloud Gets Disrupted By Sgr A*"
- 09/04: Magda Arnaboldi (ESO, Germany) "Planetary Nebulae As Tracers Of Mass And Stellar Populations In The Outer Halos Of Early Type Galaxies"
- 16/04: Carlos Frenk (Durham, UK) "Cosmology In Our Backyard"
- 23/04: Mercedes López-Morales (CfA, USA) "Exoplanet Atmospheres With Ground-based Observatories"
- 30/04: Elisabete de Gouveia dal Pino (IAG, Sao Paulo, Brazil) "CTA - Cherenkov Telescope Array: A New Era For Gamma Ray Astronomy"
- 07/05: Ryan Quadri (Carnegie, USA) "The Role Of Environment In The Buildup Of The Red Sequence"
- 14/05: Ezequiel Treister (Concepción) "The Cosmic History Of Black Hole Growth"
- 22/05: Catherine Dougados (UMI, France/Chile) "The Accretion-ejection Connection In Young Stars"
- 28/05: Ricardo Muñoz (U de Chile) "Challenges In The Exploration Of The Darkest Galaxies"
- 04/06: Kevin Luhman (Penn State, USA) "The Formation Of Brown Dwarfs And Wide Planetary Companions"

- 11/06: Xavier Bertou (Centro Atómico Bariloche, Argentina) "Observing The Universe From An Underground Laboratory Deep In The Andes"
- 18/06: Jorge Meléndez (IAG, Sao Paulo, Brazil) "Signatures Of Rocky And Giant Planets In The Chemical Composition Of Solar-type Stars"
- 25/06: Claudio Melo (ESO, Chile) "My God, It's Full Of (young) Stars"
- 13/08 Keren Sharon (Michigan, USA) "Gravitational Lensing: Nature's Most Powerful Telescopes"
- 27/08 Jennifer Patience (Arizona State, USA) "Companions To A-stars – From Stars To Planets"
- 03/09 Josh Simon (Carnegie, USA) "The High Redshift Universe Next Door"
- 10/09 Christine Wilson (McMaster, Canada) "Gas And Star Formation In Nearby Galaxies: New Results From The Herschel Space Observatory"
- 24/09 Simón Casassus (U de Chile) "Observing Planet Formation"
- 01/10 Manuela Zoccali (IA, PUC) "Exploring the Heart of the Milky Way"
- 08/10 Matthew Bayliss (CfA, USA) "Building The Strongest Gravitational Lenses In The Universe"
- 15/10 Stuart Ryder (AAO, Australia) "Seeing Supernovae With Lasers"
- 22/10 Luis Aguilar (UNAM, Mexico) "Detecting Substructure In The Galactic Halo With Gaia"
- 29/10 Reynier Peletier (Groningen, The Netherlands) "The Buildup Of Central Disks In Elliptical Galaxies, Spirals And Dwarfs"
- 05/11 Ricardo Demarco (Concepción) "Early-type Galaxy Formation: Understanding The Role Of The Environment"
- 12/11 Max Bañados (Physics, PUC) "Early Universe Fluctuations"
- 19/11 Jackie Faherty (U de Chile) "To Be Or Not To Be (a Planet): Isolated Brown Dwarfs At The Exoplanet Mass Boundary"
- 03/12 Pierre Cox (ALMA) "ALMA And The Early Universe"
- 10/12 Kartik Sheth (NRAO, USA) "Reconstructing The Mass Assembly Of Galaxy Disks Over The Last 7 Billion Years With ALMA, HST And Spitzer"

In addition to the colloquium series, we continuously host talks from collaborators visiting the IA, and from astronomers stopping by before or after their observing runs at one of the observatories based in Chile. During 2013 more than 40 such seminars were held; for a complete list check
`http://www.astro.puc.cl:8080/astropuc/seminars`.

Additionally, every day after lunch, graduate students, postdocs, and faculty meet for an informal, 30-minute discussion of the latest developments in astronomy. Usually 2–4 topics are debated each day, and these are typically based on papers posted during the last few days on the `arXiv` Preprint Server (astro-ph) and on astronomy news appearing in the public press. These daily meetings are also used to introduce our many visitors and colleagues upon their arrival to the IA.

6 Grants

6.1 Department Grants

The BASAL Center for Astrophysics and Associated Technologies is a large institutional grant from CONICYT, Chile, awarded to the IA, the Astronomy Department of Universidad de Chile, and the Astrophysics Department of Universidad de Concepción. This Center supports research in astrophysics, national and international academic exchange, and collaborations with the Observatories in Chile, providing funds for research, graduate student fellowships, organization of workshops and conferences, and travel.

6.2 Group Grants

6.2.1 Instituto Milenio

The Millennium Institute of Astrophysics (MAS) is lead by Mario Hamuy (Universidad de Chile) and Dante Minniti (Universidad Católica), and would be dedicated to the study of stellar populations and supernovae, and the observation of the central regions of the Milky Way. One of the main characteristics of MAS is the multidisciplinary approach, because the team is composed not only by astronomers but also by statisticians, who would help to handle and exploit large observational databases becoming available. The members of MAS at Universidad Católica are Susana Eyheramendy, Márcio Catelan, Alejandro Clocchiatti, Franz Bauer, Andrés Jordán, Manuela Zoccali, Felipe Barrientos, Julio Chanamé and Dante Minniti.

6.2.2 Anillos

Development of technologies for astronomical observations. Chile: from host to active partner in the construction of the next generation astronomical telescopes is a grant from CONICYT awarded to a team of scientists from the PUC School of Engineering (L. Vanzi (PI), A.

Guesalaga, D. Celentano, et al.) and the IA (L. Infante, A. Jordán, et al.). The goal of the project is to acquire and develop front line technologies in a number of selected areas of science and engineering to be employed in the next generation astronomical telescopes, to make the institutes involved competitive in the specific fields selected, and to convert them in attractive partners for the international organizations leading the design and construction of the next generation telescopes, in Chile as well as abroad.

Establishing the Role of Mergers in Black Hole Growth and Galaxy Evolution is a grant from CONICYT awarded to a team of astronomers from U de Concepción (E. Treiester (PI), N. Nagar, et al.), PUC (F. Bauer, J. Cuadra) and U de Chile (A. Escala). The goal of the project is to understand the role of black hole growth in galaxy evolution, by characterizing this growth observationally and interpreting it through comparisons with simulations. Using the new facilities and instruments such as ALMA, NuSTAR, and optical/NIR IFUs, as well as start-of-the-art simulations, the project seeks to refine our knowledge about how and when this growth occurs, and what the observable effects on galaxy evolution are.

ATLAS Andino is a CONICYT grant awarded to a team of scientists of the PUC Department of Physics (M.A. Díaz [PI], J. Alfaro, M. Bañados, B. Koch, and U. Volkmann), the IA (G. Galaz, A. Reisenegger), and external collaborators. Its goals are: a better understanding of the elementary particles, to be studied by means of the ATLAS Detector of the Large Hadron Collider (LHC); the understanding of the nature of Dark Matter and its effects on Astrophysics and Cosmology; the creation of an ATLAS Grid node at PUC, including the expansion of the Grid technology to other areas; and the study of ATLAS muon chambers in view of the LHC upgrade.

6.2.3 Núcleos Milenio

The Milky Way Millennium Nucleus is a grant from the Chilean Ministry of Economy awarded to a team of scientists from the IA (M. Catelan (PI), D. Minniti, A. Jordán, M. Zoccali) and the Universidad de Valparaíso (J. Borissova). The main aim is to support research related with the formation and evolution of the Milky Way. Specifically, the research project has its core in the VISTA Variables in the Via Lactea ESO Public Survey, which will obtain a time series map of the whole Bulge and a large fraction of the Disk of our Galaxy. This grant provides funding for research, postdoctoral fellowships, studentships, outreach, organization of conferences and other networking activities. (`www.milenio-vialactea.cl`)

The Millennium Center for Supernova Studies is a triennial grant originally from MIDEPLAN, now administered by MINECON, awarded in 2008 to a team of astronomers from the Department of Astronomy of Universidad de Chile (M. Hamuy, PI) and the IA (A. Clocchiatti). The goal of the project is to further the study of SNe from Chile, both in detail to better know the astrophysics of progenitors and the physics of explosions, and to improve their usage as cosmologically relevant distance estimators. The grant was competitively renewed in early 2011 for an additional period of three years. The team has been enlarged to include G. Pignata (U. Andrés Bello) and F. Bauer (IA).

6.3 Individual Research Grants

The lists below include all individual research grants that were active as of April 2013.

6.3.1 FONDECYT Regular Projects

- F. Barrientos: *Massive Objects Through Cosmic Time.*
- F. Bauer: *The Role of AGN Feedback in the Coeval Growth of Supermassive Black Holes and Galaxies.*
- M. Catelan: *Low-Mass Stars in Stellar Systems as Astrophysical Laboratories.*
- J. Chanamé: *Local Group Dwarf Galaxies and the Properties of Dark Matter.*
- G. Galaz: *Unveiling The Physical Properties Of The Interstellar Medium In Low Surface Brightness Galaxies.*
- A. Jordán: *Discovering and characterizing exoplanetary systems*
- D. Minniti: *Variability and Proper Motions in the Inner Milky Way: Completion of the VVV Survey*
- N. Padilla: *Lighting Up the Dark Universe.*
- T. Puzia: *The Next Generation Stellar Population Synthesis Models.*
- A. Reisenegger: *Thermal and Magnetic Evolution of Neutron Stars.*
- M. Zoccali: *A Complete Characterization of the Galactic Bulge Stellar Population.*

6.3.2 FONDECYT Initiation into Research Projects

- J. Cuadra: *Black Hole Mergers and Kicks in Gas-Rich Galaxies.*
- R. Dünner: *Chile ACT Ultradeep Survey.*

6.3.3 FONDECYT Postdoctoral Grants

- J. Alonso: *Disentangling the multiple stellar populations in the inner galactic.*
- M. Bovill: *Galactic Paleontology: Reionization and the Fate of the First Galaxies.*
- R. Contreras Ramos: *The history of the Milky Way told by its variable stars.*
- P. Eigenthaler: *Probing the assembly of galaxy groups with intragroup light.*
- C. Espinoza: *Physics under extreme conditions via observations of neutron stars.*
- K. Hełminiak: *Detached eclipsing binaries in large photometric surveys – precise characterization for a new level of stellar astrophysics.*
- E. Ibar: *Using ALMA to reveal the star-formation and AGN activity in samples of Herschel-detected galaxies.*
- S. Kim: *Study of the relation between compact overdensity regions and protoclusters detected in submillimeter survey.*
- M. Montesinos Armijo: *Dynamics of astrophysical accretion disks.*
- R. Muñoz: *Obtaining the deepest-ever Galaxy Mass Function in a High-Density Environment.*
- D. Murphy: *Probing the nature and content of the universe with galaxy clusters.*
- Á. Orsi: *Galaxy formation in the LSST era.*
- C. Sáez: *A multiwavelength study of AGN evolution and quasar outflows.*
- M. Rabus: *Rising exoplanets: a major chilean contribution to the emerging field of exoplanetology.*
- P. Troncoso: *On the evolution of the galaxy population in clusters over seventy percent of the Universe's lifetime.*
- J. Yu: *Dynamical properties of star clusters.*

6.3.4 ALMA–CONICYT Projects

- F. Bauer: *The PUC–ALMA Initiative.*
- J. Cuadra: *Postdoctoral position on ALMA-related Numerical Astrophysics.*
- R. Dünner: *Post-doctoral Position to Analyse the CACTUS-XMM Dataset.*
- A. Jordán: *Postdoctoral Support for Protoplanetary Disk Science with Alma at PUC.*
- T.H. Puzia: *Population Synthesis at High Spectral Resolution.*

6.3.5 Gemini–CONICYT Projects

- F. Bauer: *Postdoctoral Position Using Chile's New NIR MOS Capabilities to Obtain Rest-Frame Optical Constraints of $z \sim 2$ Populations.*

6.3.6 Other External Grants

- R. Dünner: Quimal project *An Optical Alignment and Characterization System for the CLASS and ACT Telescopes.*

6.3.7 PUC-funded Grants

- J. Chanamé: *Astronomy Colloquium Series 2013*

7 Exchange Agreements and International Networks

7.1 Bilateral agreements

The IA has agreements with several institutions with the goal of strengthening its research activity and its graduate program. These agreements allow exchange visits of researchers and students. In some cases, the thesis is recognised by both institutions, resulting in a double PhD degree. Currently, we have agreements with the Universities of Heidelberg, Johns Hopkins, Maryland, Padova, and Princeton.

As a result of these agreements, PUC–Heidelberg PhD students Mauricio Carrasco, Cristina García, Jorge González and Mirko Šimunović have spent one year working in Heidelberg, Maryland–PUC PhD student Jonathan Fraine spent several months at PUC, and joint Maryland–PUC Postdoctoral Scientist Dr. Demerese Salter spent 14 months at PUC.

7.2 Marie Curie network LACEGAL

The Latin American–Chinese–European Galaxy Formation (LACEGAL) network was approved in November 2010 to bring together internationally recognised experts in the theory of galaxy formation and the modelling of the growth of cosmic structure. The network allows new research collaborations to be made between the main groups working in the subject in Latin America and China, and the principal centres in computational galaxy formation and astrophysics in Europe. The local coordinator is Nelson Padilla.

Visiting trips during the year 2013 were awarded to P. Arévalo (MPA), F. Bauer (Durham), S. Contreras (Durham), J. Cuadra (MPA), J. Véliz (Durham).

7.3 DFG–Conicyt Joint Project

The research project "Magnetic Fields of Massive Stars and their Compact Remnants" is funded jointly by DFG (Germany) and CONICYT (Chile) over the 3-year period 2012–2014 as part of a program to strengthen collaboration between scientists of both countries. The German team is composed of Norbert Langer (German PI; University of Bonn), Henk Spruit (Max-Planck-Institut für Astrophysik), and Jon Braithwaite (University of Bonn), while the Chilean researchers are Andreas Reisenegger (Chilean PI; IA-PUC) and Juan Alejandro Valdivia (Universidad de Chile). The project funds a "Chile-Germany Postdoctoral Fellow in Stellar Magnetiss", Joseph Mitchell (PhD at Florida State University), who is spending half of his time at PUC and the other half in Bonn, as well as graduate students and trips in both directions. It joins expertise in stellar evolution (Langer), magnetohydrodynamics (Spruit), compact objects (Reisenegger), and numerical simulations (Braithwaite and Valdivia), in order to gain a fuller understanding of the co-evolution of massive stars and their magnetic fields from birth to death.

7.4 UMI-FCA

The French–Chilean Joint International Astronomy Unit (UMI-FCA) was established by agreement between the CNRS and PUC, U. de Chile and U. de Concepción. This "Joint International Unit" facilitates collaborations between astronomers of the participating institutions, and allows them to use the facilities of their counterpart.

8 Office, Computing and Teaching facilities

The IA occupies 1,887 m^2 of a building in the San Joaquín Campus of PUC, to the south of downtown Santiago. Of that surface, 1482 m^2 correspond to the IA proper, while the remaining 405 m^2 are occupied by the Centre for Astro-Engineering. This includes offices for faculty, postdocs, graduate students and administrative and technical staff, optics and electronics workshops, a special room for our super-computer, and conference rooms. The same building also hosts the "Ninoslav Bralić" auditorium, shared with Physics and Mathematics, which seats 100 people.

In the adjacent building, the "Gauss" Physics and Math library has a collection of ∼30,000 books and journal volumes. Staff members, students and visitors also have access to the University library system with more than 300,000 books and hundreds of periodical publications, including around 60 titles in different branches of physics. The University supports, in addition, on-line access to all major astrophysics journals. Finally, the IA hosts since 1998 the first Latin-American mirror of NASA's Astrophysical Data System (ADS).

The IA has a computer network maintained by a full-time software engineer and an assistant. It includes a cluster, managed by the AIUC, consisting of 64 nodes with a total of 128 Intel Xeon Quad-Core CPUs (512 cores), 1024 GB of RAM, 40 TB of disk space (iSCSI), and a Linux system for 64-bit architecture running over a 1 Gbps ethernet network. Development and execution tools include Intel Fortran and Intel C compilers (ifort, icc), mpich2, Distributed Resource Management (DRM) software SGE (Sun Grid Engine), and other standard tools (gcc, g++, gfortran, etc). As of early 2013, this cluster is being replaced by a brand-new 520-core CPU cluster, with 18 Tflops, 3 TB of memory and 30 TB of disk space, and the addition of a GPU cluster with 1792 NVidia Tesla Cores, with 96 GB of memory. Users at IA have access to the cluster via personal accounts and get access to the cluster resources by the DRM system that defines use and priority of each user to the total resources. Postdoctoral fellows Á. Orsi and T. Tecce dedicate a fraction of their time to help manage the use of the computing cluster.

8.1 Santa Martina Observatory

The IA maintains a small Observatory in the eastern outskirts of Santiago at an altitude of 1450 m, some 60-minute drive from Campus, mostly dedicated to teaching and astronomy laboratories for our undergraduate students. Permanently installed in a joint dome are a 50 cm telescope (the old ESO 50 cm), and a 40 cm telescope (one of the two old CTIO 16-inch telescopes) and, in a separate dome, a commercial Meade 40 cm used with a CCD camera for basic teaching. The two professional telescopes have locally-upgraded control systems and new instrumentation, including CCD cameras, spectrographs and a new, built in-house fibre spectrograph at the 50 cm. All three are controlled from a common control room when needed. The two professional telescopes are partly used for testing and developing instrumentation and for some advanced student research programs. A Meade 30 cm is available for visual observations by students and visitors. Besides, the site hosts the dome of one of the SLOOH world network telescopes, remotely controlled via the Web. A small planetarium is also available to teach students the celestial coordinate systems. Current activities take place three to four times weekly (weather permitting) and include teaching, scientific and outreach experiences.

8.2 Manuel Foster Historical Observatory

The IA also maintains this historical observatory in the Metropolitan Park on San Cristóbal hill near downtown Santiago. It was established in 1903 by an expedition from the Lick Observatory of the University of California, and purchased and donated to PUC in 1929 by the lawyer, politician, and PUC professor Manuel Foster,

in this way starting astronomical activities at the University. It was used on and off until the early 1990s, but is now no longer useful for research because of the strong light pollution. In 2010, it was declared a National Historic Monument. It is being opened to the public on selected days.

9 Meetings supported

One of the activities of the IA is to support meetings and graduate schools in Chile to foster the development of local professional astronomy. In the period reported, activities organized, sponsored, and/or supported were (name of meeting, organizing institution, place and date)

- *The 4th VVV Science Meeting* (IA; Viña del Mar, March 2013).
- *UC Observatory Science Day* (AIUC; Santiago, May 2013).
- *Exploring the Nature of the Evolving Universe III* (IA; Santiago, Aug. 2013).
- *ALMA–CASA community meeting* (IA; Santiago, Sept. 2013).
- *Astrobio 2013* (IA; Santiago, Dec. 2013).
- *Lectures on Star Formation by Dr. Hans Zinnecker* (IA; Santiago, Dec. 2013).

10 Outreach

The outreach activity at the IA was centered on appearances in mass media and in activities for schools and the general public. During 2013, several students and staff appeared in newspapers a total of 157 times, in press 53 times, in television 36 times, 18 in radio stations, 31 in web sites and 19 times in PUC media. At the University Outreach Center in downtown Santiago, we held the new edition of the course "Astronomía", which consisted in 10 astronomy talks by members of the Institute.

We participated in the national cultural heritage day opening the doors of the Foster observatory (§ 8.2) to the general public on May 27th, offering free guided tours of this historical observatory. Besides, we participated in "Semana Nacional de la Ciencia de Explora", opening the observatory to schools in September. We organized a workshop for teachers in January given by professors from Heidelberg and the IA, held at the Heidelberg Center in Santiago. We organized a public talk to deaf people by Dominique Proust, held at the Asociación de Sordos de Chile. We worked in a special solar observation program for schools in Easter Island and gave a public talk about astronomy there.

We delivered more than 200 series of videos documenting classes given by members of the department to schools from all over the country, reaching more than 130,000 students. We helped to edit and adjust the content of a video animation done by LOOPS to be shown in schools by NOVASUR-CNTV. By the end of the year, we published two outreach books" "Galaxias" and "Universo extremo".

11 Refereed Publications

Astronomers from the IA, including students, participated in 148 refereed papers published in 2013. The full list is given below.

1. **Aguirre P.**, Baker A. J., Menanteau F., Lutz D., Tacconi L. J.: *High-resolution Near-infrared Imaging of Submillimeter Galaxies.* ApJ 768, 164
   http://adsabs.harvard.edu/abs/2013ApJ...768..164A

2. **Akgün T.**, **Reisenegger A.**, Mastrano A., **Marchant P.**: *Stability of magnetic fields in non-barotropic stars: an analytic treatment.* MNRAS 433, 2445
   http://adsabs.harvard.edu/abs/2013MNRAS.433.2445A

3. Alamo-Martínez K. A., Blakeslee J. P., Jee M. J., Côté P., Ferrarese L., González-López lira R. A., **Jordán A.**, Meurer G. R., Peng E. W., West M. J.: *The Rich Globular Cluster System of Abell 1689 and the Radial Dependence of the Globular Cluster Formation Efficiency.* ApJ 775, 20
   http://adsabs.harvard.edu/abs/2013ApJ...775...20A

4. Alexander D. M., Stern D., Del Moro A., Lansbury G. B., Assef R. J., Aird J., Ajello M., Ballantyne D. R., **Bauer F. E.**, Boggs S. E., Brandt W. N., Christensen F. E., Civano F., Comastri A., Craig W. W., Elvis M., Grefenstette B. W., Hailey C. J., Harrison F. A., Hickox R. C., Luo B., Madsen K. K., Mullaney J. R., Perri M., Puccetti S., **Saez C.**, Treister E., Urry C. M., Zhang W. W., Bridge C. R., Eisenhardt P. R. M., Gonzalez A. H., Miller S. H., Tsai C. W.: *The NuSTAR Extragalactic Survey: A First Sensitive Look at the High-energy Cosmic X-Ray Background Population.* ApJ 773, 125
   http://adsabs.harvard.edu/abs/2013ApJ...773..125A

5. Amôres E. B., López-Corredoira M., González-Fernández C., Moitinho A., **Minniti D.**, Gurovich S.: *The long bar as seen by the VVV Survey. II. Star counts.* A&A 559, A11
   http://adsabs.harvard.edu/abs/2013A%26A...559A..11A

6. Amaro-Seoane P., Brem P., **Cuadra J.**: *Tidal Disruptions in Circumbinary Disks. I. Star Formation, Dynamics, and Binary Evolution.* ApJ 764, 14
   http://adsabs.harvard.edu/abs/2013ApJ...764...14A

7. Amaro-Seoane P., **Konstantinidis S.**, Brem P., **Catelan M.**: *Mergers of multimetallic globular clusters: the role of dynamics.* MNRAS 435, 809
http://adsabs.harvard.edu/abs/2013MNRAS.435..809A

8. **Amigo P.**, Stetson P. B., **Catelan M.**, **Zoccali M.**, Smith H. A.: *Time-series BVI Photometry for the Globular Cluster NGC 6981.* AJ 146, 130
http://adsabs.harvard.edu/abs/2013AJ....146..130A

9. **Andrews H.**, **Barrientos L. F.**, López S., Lira P., **Padilla N.**, Gilbank D. G., **Lacerna I.**, Maureira M. J., Ellingson E., Gladders M. D., Yee H. K. C.: *Galaxy Clusters in the Line of Sight to Background Quasars. III. Multi-object Spectroscopy.* ApJ 774, 40
http://adsabs.harvard.edu/abs/2013ApJ...774...40A

10. Arellano Ferro A., Bramich D. M., Figuera Jaimes R., Giridhar S., Kains N., Kuppuswamy K., Jørgensen U. G., Alsubai K. A., Andersen J. M., Bozza V., Browne P., Calchi Novati S., Damerdji Y., Diehl C., Dominik M., Dreizler S., Elyiv A., Giannini E., Harpsøe K., Hessman F. V., Hinse T. C., Hundertmark M., Juncher D., Kerins E., Korhonen H., Liebig C., Mancini L., Mathiasen M., Penny M. T., **Rabus M.**, Rahvar S., Ricci D., Scarpetta G., Skottfelt J., Snodgrass C., Southworth J., Surdej J., Tregloan-Reed J., Vilela C., Wertz O., Mindstep Consortium: *A detailed census of variable stars in the globular cluster NGC 6333 (M9) from CCD differential photometry.* MNRAS 434, 1220
http://adsabs.harvard.edu/abs/2013MNRAS.434.1220A

11. **Arriagada P.**, Anglada-Escudé G., Butler R. P., Crane J. D., Shectman S. A., Thompson I., Wende S., **Minniti D.**: *Two Planetary Companions around the K7 Dwarf GJ 221: A Hot Super-Earth and a Candidate in the Sub-Saturn Desert Range.* ApJ 771, 42
http://adsabs.harvard.edu/abs/2013ApJ...771...42A

12. Balestra I., Vanzella E., Rosati P., Monna A., Grillo C., Nonino M., Mercurio A., Biviano A., Bradley L., Coe D., Fritz A., Postman M., Seitz S., Scodeggio M., Tozzi P., Zheng W., Ziegler B., Zitrin A., Annunziatella M., Bartelmann M., Benitez N., Broadhurst T., Bouwens R., Czoske O., Donahue M., Ford H., Girardi M., **Infante L.**, Jouvel S., Kelson D., Koekemoer A., Kuchner U., Lemze D., Lombardi M., Maier C., Medezinski E., Melchior P., Meneghetti M., Merten J., Molino A., Moustakas L., Presotto V., Smit R., Umetsu K.: *CLASH-VLT: spectroscopic confirmation of a $z = 6.11$ quintuply lensed galaxy in the Frontier Fields cluster RXC J2248.7-4431.* A&A 559, L9
http://adsabs.harvard.edu/abs/2013A%26A...559L...9B

13. Barbuy B., Hill V., **Zoccali M.**, **Minniti D.**, Renzini A., Ortolani S., Gómez A., Trevisan M., Dutra N.: *Manganese abundances in Galactic bulge red giants.* A&A 559, A5
http://adsabs.harvard.edu/abs/2013A%26A...559A...5B

14. Bayliss D., Zhou G., Penev K., Bakos G. Á., Hartman J. D., **Jordán A.**, Mancini L., Mohler-Fischer M., **Suc V.**, **Rabus M.**, Béky B., Csubry Z., Buchhave L., Henning T., Nikolov N., Csák B., **Brahm R.**, **Espinoza N.**, Noyes R. W., Schmidt B., Conroy P., Wright D. J., Tinney C. G., Addison B. C., Sackett P. D., Sasselov D. D., Lázár J., Papp I., Sári P.: *HATS-3b: An Inflated Hot Jupiter Transiting an F-type Star.* AJ 146, 113
http://adsabs.harvard.edu/abs/2013AJ....146..113B

15. **Beamín J. C.**, **Minniti D.**, Gromadzki M., Kurtev R., Ivanov V. D., Beletsky Y., Lucas P., **Saito R. K.**, Borissova J.: *One more neighbor: The first brown dwarf in the VVV survey.* A&A 557, L8
http://adsabs.harvard.edu/abs/2013A%26A...557L...8B

16. Benson B. A., de Haan T., Dudley J. P., Reichardt C. L., Aird K. A., Andersson K., Armstrong R., Ashby M. L. N., Bautz M., Bayliss M., Bazin G., Bleem L. E., Brodwin M., Carlstrom J. E., Chang C. L., Cho H. M., **Clocchiatti A.**, Crawford T. M., Crites A. T., Desai S., Dobbs M. A., Foley R. J., Forman W. R., George E. M., Gladders M. D., Gonzalez A. H., Halverson N. W., Harrington N., High F. W., Holder G. P., Holzapfel W. L., Hoover S., Hrubes J. D., Jones C., Joy M., Keisler R., Knox L., Lee A. T., Leitch E. M., Liu J., Lueker M., Luong-Van D., Mantz A., Marrone D. P., McDonald M., McMahon J. J., Mehl J., Meyer S. S., Mocanu L., Mohr J. J., Montroy T. E., Murray S. S., Natoli T., Padin S., Plagge T., Pryke C., Rest A., Ruel J., Ruhl J. E., Saliwanchik B. R., Saro A., Sayre J. T., Schaffer K. K., Shaw L., Shirokoff E., Song J., Spieler H. G., Stalder B., Staniszewski Z., Stark A. A., Story K., Stubbs C. W., Suhada R., van Engelen A., Vanderlinde K., Vieira J. D., Vikhlinin A., Williamson R., Zahn O., Zenteno A.: *Cosmological Constraints from Sunyaev-Zel'dovich-selected Clusters with X-Ray Observations in the First 178 deg^2 of the South Pole Telescope Survey.* ApJ 763, 147
http://adsabs.harvard.edu/abs/2013ApJ...763..147B

17. Bielby R., Hill M. D., Shanks T., Crighton N. H. M., **Infante L.**, Bornancini C. G., **Francke H.**, Héraudeau P., Lambas D. G., Metcalfe N., **Minniti D.**, **Padilla N.**, Theuns T., Tummuangpak

P., Weilbacher P.: *The VLT LBG Redshift Survey - III. The clustering and dynamics of Lyman-break galaxies at z∼3.* MNRAS 430, 425
http://adsabs.harvard.edu/abs/2013MNRAS.430..425B

18. Bothwell M. S., Aguirre J. E., Chapman S. C., Marrone D. P., Vieira J. D., Ashby M. L. N., Aravena M., Benson B. A., Bock J. J., Bradford C. M., Brodwin M., Carlstrom J. E., Crawford T. M., de Breuck C., Downes T. P., Fassnacht C. D., Gonzalez A. H., Greve T. R., Gullberg B., Hezaveh Y., Holder G. P., Holzapfel W. L., **Ibar E.**, Ivison R., Kamenetzky J., Keisler R., Lupu R. E., Ma J., Malkan M., McIntyre V., Murphy E. J., Nguyen H. T., Reichardt C. L., Rosenman M., Spilker J. S., Stalder B., Stark A. A., Strandet M., Vernet J., Weiß A., Welikala N.: *SPT 0538–50: Physical Conditions in the Interstellar Medium of a Strongly Lensed Dusty Star-forming Galaxy at z = 2.8.* ApJ 779, 67
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21. Burke M. J., Raychaudhury S., Kraft R. P., Maccarone T. J., Brassington N. J., Hardcastle M. J., Kainulainen J., Woodley K. A., Goodger J. L., Sivakoff G. R., Forman W. R., Jones C., Murray S. S., Birkinshaw M., Croston J. H., Evans D. A., Gilfanov M., **Jordán A.**, Sarazin C. L., Voss R., Worrall D. M., Zhang Z.: *Spectral Properties of X-Ray Binaries in Centaurus A.* ApJ 766, 88
http://adsabs.harvard.edu/abs/2013ApJ...766...88B

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