



Comisión Nacional de Investigación
Científica y Tecnológica - CONICYT

Resultados del Concurso 2014A para Observaciones en Gemini-Sur

Propuesta: G/2014A/027

Investigador Principal: Thomas H. Puzia, Pontificia Universidad Católica de Chile

Título: The GeMS/GSAOI Galactic Globular Cluster Survey (G4CS)

Resumen: Galactic globular clusters are crucial laboratories and benchmarks for our understanding of the nearby and distant universe. We will use the GeMS/GSAOI instrument to obtain deep zJHK photometry of all observing time request summary Milky Way globular clusters that were previously observed by the HST/ACS Galactic Globular Cluster Survey in optical filters and that are accessible to GSAOI in period 2013B. With these data we will i) study the morphology of near-IR CMDs and determine the internal consistency of model CMD predictions for various zJHK filter combinations and test the influence of molecular absorption band variations on theoretical isochrone predictions in the near-IR using abundance measurements from high-resolution spectroscopy, ii) derive absolute GC ages with %-level accuracy and corresponding metallicities with uncertainties $\Delta(Z) \sim 0.1$ dex, iii) search for correlations between GC stellar population parameters with global GC properties, such as structural parameters, orbital parameters including 3-D location in the Milky Way, chemical variance of their constituent stellar populations, and iv) use the combined optical/near-IR CMDs to investigate the internal consistency and calibration of various stellar evolution models.

Tiempo asignado: 5.9 horas

Propuesta: G/2014A/023

Investigador Principal: Maria Teresa Ruiz, Universidad de Chile

Título: Discovering and Characterizing new Y Dwarfs at the Faint Limits of WISE

Resumen: We propose to continue our near-IR followup of ultracool dwarf candidates in the WISE survey. We identify candidate late-T and Y dwarfs at the faint limits of the survey by using WISE multiple measurements and photometric profile fits to identify non-variable point sources detected only in W2. Photometry at J identifies likely cool objects, and H is measured for confirmation. Spectroscopy is then obtained of the probable T9-Y dwarfs. In followup to date, we find about half the W2-only sources are brown dwarfs cooler than 700K ($>T8$), about 40% are warmer brown dwarfs, and about 10% are contaminants. In 13B we were awarded time to followup 60 candidates. In 14A we will obtain additional data on ~ 30 13B targets of interest, plus 17 new sources. We have already increased the number of WISE T9-Y dwarf by $\sim 30\%$, and expect to double the number of 400K Y dwarfs when Gemini followup of the 13B and 14A samples is complete. This work allows the WISE mission to reach its full potential for one of its key goals: discovery of the nearest and coolest brown dwarfs.

Tiempo asignado: 5.0 horas

Propuesta: G/2014A/011

Investigador Principal: Roger Cohen, Universidad de Concepción

Título: Deep IR Photometry of Galactic Globular Clusters: Opening the Window to Galaxy Assembly

Resumen: It is currently impossible to measure ages of Galactic globular clusters (GCs) using near-infrared photometry. This is due to a lack of deep photometry of well-studied calibrating clusters, and the failure of existing models to reproduce observed infrared and optical-infrared colors. We propose to solve both of these problems by obtaining infrared photometry extending below the cluster main sequence turnoffs for a set of optically well-studied GCs. These observations will allow ages to be obtained for the heavily extinguished GCs of the Galactic bulge, completing for the first time the picture of Milky Way assembly via the age-metallicity relation of its GCs. Meanwhile, the resulting VIJHK fiducial sequences will be made publicly available, and can be used to address the shortcomings of current evolutionary models as well as applied to future extragalactic resolved stellar population studies.

Tiempo asignado: 9 horas

Propuesta: G/2014A/06

Investigador Principal: Matthias Schreiber, Universidad de Valparaíso

Título: Towards a global understanding of close binary evolution

Resumen: Close compact binaries make up a wide variety of objects, some of which are SN Ia progenitors. The evolution of all close compact binaries depends crucially on the rate at which angular momentum is extracted from the binary orbit during common envelope (CE) evolution. CE evolution is the most important but also least understood phase of close compact binary star formation. We are carrying out a large scale study of white dwarf/main sequence binaries from SDSS, with more than 200 post-CE binaries (PCEBs) identified and 79 systems characterized in detail. Using this unprecedented sample we are deriving the much-needed observational constraints for improving the theories of CE. A crucial remaining question is whether atomic recombination energy plays an important role in ejecting the CE. We have demonstrated that, in order for that to be the case, PCEBs containing massive white dwarfs ($M_{wd} \sim > 0.7 M_{sun}$) at long orbital periods ($P_{orb} \sim > 2-5$ days; depending on the white dwarf mass) should exist. We aim here at accurately measuring the orbital period of SDSSJ0830-0536, the only PCEB in our sample with a high-mass white dwarf ($0.72 M_{sun}$) and a relatively long period ($P_{orb} \sim > 1.5$ days). If the orbital period is of the order of 5 days or longer, then we are able to clearly demonstrate that recombination energy must contribute during CE evolution. If, conversely, the orbital period is shorter than 5 days, recombination energy becomes very unlikely to play an important role in the formation of all close compact binaries.

Tiempo asignado: 10 horas

Propuesta: G/2014A/026

Investigador Principal: Steve Schulze, Pontificia Universidad Catolica de Chile

Título: Connecting GRBs and the Star-Formation-Rate Density: An Unbiased Optical/NIR Host-Galaxy Survey

Resumen: Long-duration gamma-ray bursts (GRBs), luminous explosions of massive stars, illuminate and reveal sites of intense star-formation from the nearby Universe to the era of reionization. However, the GRB rate appears significantly suppressed in massive galaxies, creating significant ambiguities for the application of GRB studies to the high-redshift frontiers. We propose the first large public survey of long-duration GRB hosts, designed to determine not just whether but why GRBs prefer certain environments. We will target hosts of an optically-unbiased uniformly selected subsample of 137 Swift GRBs, representative of all Swift GRBs yet already 80% redshift complete. To achieve this we formed a collaboration with access to Gemini, GTC, Keck, and LBT. Deep rest-frame UV/optical photometry, complementing our approved Spitzer 3.6-micron observations, will allow to constrain the physical properties of GRB hosts and compare to other galaxies in an unbiased way at every redshift range from $z=0-3.5$. Thanks to the strategic suite of instruments available at Gemini-South, we propose to observe 12 galaxies with known redshifts and host priors. Our observations will constrain the nature of the GRB progenitor, to what extent GRBs can be reliably used to probe the high-redshift Universe, and provide a long-term legacy sample for future GRB-host studies.

Tiempo asignado: 12 horas

Propuesta: G/2014A/017

Investigador Principal: Lucas Cieza, Universidad Diego Portales

Título: Transition Disks Across the Stellar/substellar boundary

Resumen: We request 8.4 hs of GMOS time to obtain low-resolution spectra of very faint (R-band between 17 and 22 mag) young stellar objects in nearby molecular clouds that show Spitzer colors consistent with transition disks (i.e., disks with inner holes possibly due to forming planets). This proposal is part of a multi-stage project to study transition disks around very-low-mass stars (VLMSs) and Brown Dwarfs (BDs). The GMOS data will be used to confirm the pre-main-sequence status of the targets and estimate (sub)stellar masses and ages. We will then perform radiative transfer modeling to calculate the inner hole sizes. In a second stage of this project, we will use ALMA to measure the disk mass distribution of the confirmed VLMS and BD transition disks and assess their planet formation potential. In the final stage of the project, we will obtain high-resolution images of the most interesting objects with ALMA to study them in detail. This program will result in the first comprehensive study of transition disks around VLMSs and BDs aiming to investigate their connection to planet formation.

Tiempo asignado: 8 horas

Propuesta: G/2014A/021

Investigador Principal: Paul Eigenthaler, Pontificia Universidad Católica de Chile

Título: On the 2D structure and kinematics of the tidal dwarf candidate in the gas-rich interacting galaxy pair NGC 3166/9

Resumen: Interacting galaxies are ideal laboratories to study the formation of new stellar systems, which span from small HII regions to Tidal Dwarf Galaxies (TDG). We propose to study the 2-D kinematics of the ionized gas in the prominent TDG candidate in the interacting gas-rich galaxy pair NGC3166/9, detected in HI and UV. This information will allow us to study the velocity field of the whole system and, at the same time, we will be able to search for gas flows within the object. We will analyse its internal kinematics to determine if it is gravitationally bound and measure its dynamical mass to constrain its dark matter content. These measurements will allow us to verify the nature of the TDG candidate and confirm or falsify its tidal origin.

Tiempo asignado: 3.4 horas

Propuesta: G/2014A/08

Investigador Principal: Claus Tappert, Universidad de Valparaíso

Título: Recovery of old novae

Resumen: Nova eruptions are thermonuclear runaways on the surface of the white dwarf in a cataclysmic variable (CV). A few decades after the nova eruption, the characteristics of the underlying CV become dominant. Population studies of post-novae would therefore provide observational information on the importance of certain properties (magnetic field, mass-transfer rate, etc.) for the CV to undergo a nova eruption, as well as the impact of the eruption on those parameters. However, such research is severely limited by our incomplete knowledge of post-novae and their properties. The main reason is that almost two thirds of all Galactic novae that were reported before 1980 still lack identification of the post-nova. We here propose to use long-slit spectroscopy on post-nova candidates to confirm their nature.

Tiempo asignado: 11 horas

Propuesta: G/2014A/02

Investigador Principal: David Rodriguez, Universidad de Chile

Título: Characterising New Young Stars Near Earth

Resumen: Recent work has led to the discovery of many young stars (ages <100 Myr) in moving groups less than 100 pc from the Earth. Our own research with the GALEX and WISE satellites has revealed many candidate young, low-mass stars throughout the whole sky. The measurement of spectral features such as H α and Helium emission as well as Lithium and Sodium absorption are key in estimating the ages of these late-type stars. We propose to use GMOS-S on the Gemini telescope to identify spectral features of youth for a sample of young star candidates that may be members of nearby moving groups with ages of ~10, 30, and 100 Myr. At present, the low-mass membership of these groups is poorly constrained; this proposal directly addresses this objective. Furthermore, it is important to pursue a more complete census of young, low-mass stars near Earth that can serve as excellent targets for direct imaging searches of young, massive planets.

Tiempo asignado: 12 horas

Propuesta: G/2014A/03

Investigador Principal: Mariusz Gromadzki, Universidad de Valparaíso

Título: A search for molecular bands in the stellar-merger remnant of OGLE-2012-BLG-360

Resumen: OGLE-2012-BLG-360 is an eruptive object which exploded in 2003-2005, but was discovered in 2013 in archival data. The observational characteristics of the object during and after the eruption indicates it belongs to a rare class of optical transients called red novae. They are thought to be stellar merger events. We propose to obtain spectra of OGLE-2012-BLG-360 in the HK bands using Flamings-2 at Gemini South. These spectra will allow us to study the physical state of its dusty envelope, namely the dust temperature and composition, molecular ingredients, and kinematics of the envelope. Remnant material evidencing the mass loss history of the progenitor may also be detected and characterized. These observations will have implications for our understanding of red novae and evolution of close binaries.

Tiempo asignado: 3 horas

Propuesta: G/2014A/07

Investigador Principal: Sebastián Ramírez Alegría, Universidad de Valparaíso

Título: Constraining massive star evolution from massive clusters

Resumen: Massive stars play a key role in several fields of astrophysics, but their exact evolution is not accurately known at present. The fate of a star of a given mass is not well known. The study of massive clusters is a golden opportunity to establish evolutionary sequences of massive stars. Indeed, the turn-off mass of massive clusters can be directly translated into the mass, and hence the nature, of the progenitors of their evolved objects contents. Here, we propose to observe the main sequence OB population of embedded (most of them newly discovered) open clusters. From the determination of the age and distance from near-infrared photometry, and of the turn-off mass using spectroscopy of the OB stars, combined with a quantitative analysis with atmosphere models, we will constrain the nature of the progenitor of the Wolf-Rayet stars and/or supergiant in those clusters, contributing to the definition of accurate evolutionary sequences for massive stars. This will more than double the number of clusters for which such sequences are obtained.

Tiempo asignado: 4 horas

Propuesta: G/2014A/020

Investigador Principal: Franz Bauer, Pontificia Universidad Católica de Chile

Título: Resolving the peak of the Cosmic X-ray Background: Optical Follow-up for the NuSTAR Serendipitous Survey

Resumen: One of the key goals of high-energy astrophysics is to determine the detailed composition of the cosmic X-ray background (CXB) at $\sim 20-30$ keV in order to understand the evolution of AGNs. NASA's recently launched NuSTAR, the first focusing X-ray observatory with good sensitivity between 3-79 keV, provides a major breakthrough in studying the CXB through targeted extragalactic deep-field and serendipitous surveys. To obtain a full census of these sources, however, requires optical redshifts and classifications. Here we propose for GMOS observations in 2014A to obtain modest resolution spectra for southern targets from the serendipitous component of the NuSTAR wedding-cake CXB survey. Redshifts and spectral classifications are needed to characterize

this complete sample of hard X-ray selected AGN and model the hard CXB population in detail.

Tiempo asignado: 3 horas

Propuesta: G/2014A/025

Investigador Principal: Roberto Assef, Universidad Diego Portales

Título: Infrared Spectroscopy of WISE-selected Hot, Dust-Obscured Galaxies

Resumen: The WISE mission has recently discovered a rare population of high redshift, hyper-luminous infrared galaxies, all with bolometric luminosities exceeding $10^{13} L_{\text{Sun}}$, and many beyond $10^{14} L_{\text{Sun}}$. Characterized by their extremely red mid-IR colors and very hot dust temperatures, these hot, dust-obscured galaxies (Hot DOGs) likely probe a key stage in the galaxy evolution paradigm. We propose here to use FLAMINGOS-2 to observe a sample of these objects. FLAMINGOS-2 observations may allow us to estimate their central super-massive black hole masses, as well as learn about the dust distribution from ionization line diagnostics.

Tiempo asignado: 11 horas

Propuesta: G/2014A/016

Investigador Principal: Thomas Puzia, Pontificia Universidad Católica de Chile

Título: Populating the Virgo Velocity Function with Early-Type Galaxies at Gemini

Resumen: We propose to sample the circular velocity function (CVF) and stellar-to-halo mass relation (SHMR) of Virgo early-type galaxies (ETGs) in the stellar mass range $M^* = 10^{(7-10)} M_{\text{sol}}$. This proposal is part of a large effort to characterize the dynamical and stellar population properties of a representative sample of Virgo ETGs for which deep near-UV/optical/near-IR imaging exists. The proposed sample will significantly augment the crucial low-mass range below $M^* < 10^9 M_{\text{sol}}$, where the sharp LCDM predictions for the CVF and SHMR (abundance matching) are fully unconstrained due to significant incompleteness (0-20%) of current data bases. Numerous tantalizing trends, such as bifurcations and possible bimodalities of mass relations for ETGs and LTGs, may prove transformational for galaxy structure studies and must be confirmed with a study like ours. We seek GMOS absorption spectra of 35 faint ETGs for a total of 100 hours of Canadian, US, and Chilean Gemini time. Our program exploits synergies of the Gemini and VLT observatories and will deliver a benchmark dataset of lasting legacy value, building upon our large Virgo cluster team expertise.

Tiempo asignado: 15 horas
