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ABSTRACTS OF CONTRIBUTED PAPERS

TOPIC 1: SOLAR SYSTEM — EXTRASOLAR PLANETS

THE FLUX OF LONG-PERIOD COMETS IN JUPITER-CROSSING ORBITS AND THE POPULATION OF THE OORT CLOUD

J. A. Fernández[1]

We analyze the flux of long-period comets (orbital periods $P > 10^3$ yr) and "new" comets (semimajor axes $a > 10^4$ AU) in the region interior to Jupiter's orbit with the aim of evaluating the population of the Oort cloud. New comets are those considered to come from the Oort cloud to the inner planetary region by the first time. Dynamical studies show that the powerful gravitational fields of Jupiter and Saturn prevent most Oort cloud comets from reaching the inner planetary region, so only a small fraction reach the inner planetary region, coming from distant regions (semimajor axes $a > 3.5 \times 10^4$ AU) that we shall call the outer Oort cloud. These comets are subject to stellar perturbations and the tidal force of the galactic disk that can decrease their perihelion distances from distances greater than Neptune's to less than a few AU after a revolution (e.g. Fernández 2005, ASSL, 328; Rickman et al. 2008, CeMDA, 102, 111). Preliminary estimates give an influx rate of about 1 new comet every 4 years within Earth's orbit with an absolute total magnitude brighter than 9 (that roughly corresponds to a radius greater than about 1 km). We find that the distribution of perihelion distances of the new comets coming from the outer Oort cloud is more or less constant within Jupiter's region, but that it tends to increase for comets with smaller semimajor axes believed to have more than one passage. The estimated mass of the outer Oort cloud is found to be a function of the degree of thermalization of the Oort cloud population. A primordial –old– population will be by now thermalized, a larger mass of the order of 2 Earth's mass, is required to keep the observed flux of new comets. A fresher, near-ecliptic Oort cloud population from the Scattered Disk (Fernández et al. 2004, Icarus, 172, 372) would provide the observed comet flux more efficiently with only about 10^{-2} Earth's mass.

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SOLAR SYSTEM RESEARCH WITH HERSCHEL

P. Hartogh[1] and the Herschel Solar System Team

Herschel is a 3.5 m far infrared space telescope. It is going to be launched in the second half of 2008 and is the next ESA (European Space Agency) cornerstone mission after Rosetta. Herschel provides unique capabilities for submm/THz investigations of the universe, since most of its spectral coverage is not accessible from the Earth due to the strong atmospheric absorption. Herschel science will address star formation, AGB/Post-main sequence stars, the interstellar medium, local, high-redshift and dwarf galaxies, the dusty universe and last not least the solar system. This presentation will give an overview about a Herschel key project dealing with water and related chemistry in the solar system. It addresses the broad topic of water and its isotopologues in planetary and cometary atmospheres with emphasis on the water cycle of Mars and the evolution of its atmosphere, sources of external water in the atmospheres of the Giant planets/moons, and water studies in cometary atmospheres.

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PROPERTIES OF COMETARY NUCLEI

H. U. Keller[1]

During the past 20 years four fly-bys of cometary nuclei took place. The images revealed bodies that looked seemingly different even though three of the comets (Borelly, Wild 2, Tempel 1) belong to the Jupiter family. Only the first target, comet Halley, is an Oort cloud comet. The cometary surfaces are very dark (albedo 0.04) and rough on all scales. They are much hotter (around 340 to 350 K) than the equilibrium temperature of subliming water ice. Consequently water ice does not exist on the surface and was not found (except minor amounts in small patches of comet Tempel 1). The by far most abundant volatile component of comets is water. While it is not on the surface it needs to be found very close below the surface. The top layer cannot be thick or the sublimation would be quenched. On the other hand it is thick enough to obscure the ice. The observed small heat capacity (Deep Impact) suggests a thermal skin depth of a few centimetres. The constraints of the observations for the physics of cometary activity will be discussed based on model calculations.

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DYNAMICAL EVOLUTION OF OBJECTS BETWEEN 3:2 RESONANCE WITH NEPTUNE AND 2:3 RESONANCE WITH URANUS

F. López García[1]

We have analyzed the dynamical behavior of objects located in a position $22 < a < 26$ AU which corresponds to the mean motion resonances 3:2 and 2:3 with Neptune and Uranus respectively. Mostly of the studied objects migrate toward the external part of the Solar System, called Kuiper belt, a scattered disk in the $a > 30$ AU region. Some are ejected from the Solar System with $e = \infty$. Of the test particles studied, less than 10% migrate toward the inner part, in some cases becoming Earth and Mars crossing. This fact may be a source of near-Earth objects (NEOs), as asteroids in the Main Belt lying near the 3:1 resonance with Jupiter. Many objects make numerous close approaches to Jupiter and Saturn. Other clones, a few, can reach the region $a \sim 500$ au, $e \sim 0.78$, $i \sim 15°$ (Sedna: $a = 509$ au, $e = 0.851$, $i = 11.9$). This behavior of some clones occur when Neptune has $a = 28$ au.

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PHOTOMETRY OF SIX ASTEROIDS

M. J. López-González[1] and E. Rodríguez[1]

Lightcurves in the *uvby* Strömgren filters have been obtained for the asteroids 12 Victoria, 30 Urania, 93 Minerva, 230 Athamantis and 192 Nausikaa during their oppositions in 2000. Synodic periods of 8.66, 13.69, 24.04 and 13.62 hours and y filter amplitudes of $0.^{\rm m}2$, $0.^{\rm m}3$, $0.^{\rm m}14$ and $0.^{\rm m}2$, have been found for 12 Victoria, 30 Urania, 230 Athamantis and 192 Nausikaa, respectively. Lightcurve amplitude smaller than $0.^{\rm m}03$ in the y filter has been found for 93 Minerva. Lightcurves in the BVI filters have been obtained for the asteroid 7357 1995 UJ7 during its opposition this year. A synodic period of 2.856 hours and an amplitude of $0.^{\rm m}18$ in the V filter have been derived.

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PROSPECTS FOR THE DETECTION OF PLANETS AROUND VERY LOW-MASS PRIMARIES

E. Martín[1] and C. V. Urania Cabral[2]

Progress in the understanding of very low-mass stars and brown dwarfs has developed at a fast pace in the last decade. Several pieces of evidence indicate that these very low-mass objects form in a manner similar to stars, and hence it appears natural to that they could host planetary systems. We are carrying out studies of the binary properties of very low-mass primaries, some new results will be presented. We have also embarked on a project to design, build and exploit a high-precision near-infrared echelle spectrograph for planet dection around very low-mass primaries. This instrument, called NAHUAL, is being designed for installation at the 10.4 m Gran Telescopio Canarias in La Palma, Canary Islands. The current status of the project will be discussed, as well as opportunities for the latino-american scientific community to participate.

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GAUSSIAN PULSE PROPAGATION IN CORONAL LOOPS

C. A. Mendoza-Briceño,[1] L. Di G. Sigalotti,[2] and J. A. Guerra[3]

We study the linear evolution of a Gaussian pulse injected at different locations along a one-dimensional (1D) hot ($T \geq 6.3$ MK) coronal loop, including the dissipative effects of thermal conduction, viscosity, heating, and radiative cooling. We consider perfectly homogeneous loops of different lengths ($50 \leq L \leq 400$ Mm) and values of the pulse witdth (or standard deviation, β_g/L) between 0.005 and 0.02. We find that a Gaussian velocity pulse can generate standing oscillations that exhibit a phase shift between 1/5 and 1/3 period between velocity and density. Since a Gaussian pulse is made up of many harmonics, the wave shape is rather irregular because it may be the result of the superposition of several harmonics. Wave damping is faster in the shortest and hottest loops because of the increasing effects of thermal conduction and viscosity. The decay times and periods of the waves are within the observed values of decaying modes of hot SUMMER loop oscillations.

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MILLIMAGNITUDE PHOTOMETRY FOR TRANSITING EXOPLANETS CANDIDATES

S. H. Miranda,[1] S. Ramírez,[2] V. D. Ivanov,[3] D. Minniti,[2] and G. Pietrzynski[4]

We present precise new V, I, and K-band photometry for the planetary transit candidate star OGLE-TR-82. Good seeing V-band images acquired with the VIMOS instrument at ESO Very Large Telescope (VLT) allowed us to measure $V = 20.6 \pm 0.03$ mag star in spite of the presence of a brighter neighbour about $1''$ away. This faint magnitude answers the question why it has not been possible to measure radial velocities for this object. One transit of this star has been observed with the GMOS-S instrument of GEMINI-South telescope in the i and g-bands. The measurement of the transit allows us to verify that this is not a false positive, to confirm the transit amplitude measured by OGLE, and to improve the ephemeris. The transit is well defined in the i-band light curve, with a depth of $A_i = 0.034$ mag. It is less well defined, but deeper ($A_g = 0.1$ mag) in the g-band, in which the star is significantly fainter. The near-infrared photometry obtained with the SOFI array at the ESO New Technology Telescope (NTT) yields $K = 12.2 \pm 0.1$, and $V - K = 8.4 \pm 0.1$, so red that it is unlike any other transit candidate studied before. Due to the extreme nature of this object, we have not yet been able to measure velocities for this star, but based on the new data we consider two different possible configurations: (1) a nearby M7V star, or (2) a blend with a very reddened distant red giant. The nearby M7V dwarf hypothesis would give a radius for the companion of $R_p = 0.3 \pm 0.1\ R_J$, i.e. the size of Neptune. Near-IR spectroscopy finally shows that OGLE-TR-82 is a distant, reddened giant of spectral type K3III, with $A_V = 6$ mag. Therefore, we discard the planetary nature of the companion. We conclude that this system is a main-sequence binary blended with a background red giant.

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LIGHTNING GENERATION IN TITAN DUE TO THE ELECTRICAL SELF-POLARIZATION PROPERTIES OF METHANE

A. Quintero[1] and N. Falcón[1]

We describe an electrical charge process in Titan's thunderclouds, due to the self-polarization properties or pyroelectricity of methane, which increases the internal electric field in thunderclouds and facilitates the charge generation and separation processes. Microphysics that generates lightning flashes is associated with the physical and chemical properties of the local atmosphere, so methane could be the principal agent of the electrical activity because of its great concentration in Titan's atmosphere. Besides, Titan's electrical activity should not be very influenced by Saturn's magnetosphere because lightning occurs at very low altitude above Titan's surface, compared with the greater distance of Saturn's magnetosphere and Titan's troposphere. Using an electrostatic treatment, we calculate the internal electric field of Titan's thunderclouds due to methane's

pyroelectrical properties, 7.05×10^{11} Vm^{-1}; and using the telluric capacitor approximation for thunderclouds, we calculate the total charge obtained for a typical Titan thundercloud, 2.67×10^9 C. However, it is not right to use an electrostatic treatment because charge times are very fast due to the large methane concentration in Titan's clouds and the life time of thunderclouds is very low (around 2 hours). We consider a time dependent mechanism, employing common Earth atmospheric approaches, because of the similitude in chemical composition of both atmospheres (mainly nitrogen), so the typical charge of a thundercloud in Titan should reach between 20 C to 40 C, like on Earth. We obtain that lightning occurs with a frequency between 2 and 6 KHz. In Titan's atmosphere, methane concentration is higher than on Earth, and atmospheric electrical activity is stronger, so this model could be consistent with the observed phenomenology.

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WHICH ARE THE DWARFS IN THE SOLAR SYSTEM?

G. Tancredi[1,2] and S. Favre[1,2]

The international Astronomical Union recently adopted in its XXVI General Assembly a definition of planets in the Solar System. Changing 76 years of tradition, our Solar System has 8 planets and an increasing number of a new category of bodies named "dwarf planets". According to the resolution: 'A "dwarf planet" is a celestial body that has sufficient mass for its self-gravity to overcome rigid body forces so that it assumes a hydrostatic equilibrium (nearly round) shape and has not cleared the neighborhood around its orbit'. In a footnote, the resolution says: 'An IAU process will be established to assign borderline objects into either "dwarf planet" and other categories.' In order to contribute to the establishment of this classification procedure, we analyze the problem of the minimum mass required to become a "dwarf planet", either from the theoretical and the observational perspective. We propose a classification criteria based on the available information on the shape and size of asteroids and TNOs, principally the direct or indirect estimates of the diameter and the estimate of the shapes from the lightcurves. We compile the available observational data on large asteroids and TNOs. According to our classification scheme there is only one rocky "dwarf planet" and 12 icy "dwarf planets" among the already discovered objects.

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TOPIC 2: STAR FORMATION — ISM

STUDY OF THE OUTFLOW ACTIVITY IN THE LAGOON NEBULA (M8) USING GEMINI SOUTH AND MAGELLAN BAADE FACILITIES

J. I. Arias[1] and R. H. Barbá[1]

Although the specific knowledge of the star formation in Orion and a few other nearby star forming regions has been systematically growing during the last decade, the fact of having high quality observations in only a small number of regions in the Galaxy prevents a full progress in the general comprehension of massive star forming processes. M8 is a prime example of active star forming region that can provide important insights into the birth and development of protostars under different physical conditions. Recently, nine Herbig-Haro (HH) objects have been identified in M8, using HST and ESO 2p2/WFI images. In order to prove the nature of the newly discovered HH features, we have obtained Magellan/IMACS longslit spectra and Gemini South/GMOS narrow-band imaging. From the analysis of the data, we confirm that HH896 and HH897 indeed constitute a single parsec-scale bipolar jet. We also investigate the kinematics and excitation conditions of the rest of the outflows. Finally, we discover a well nourished population of small-sized HH objects and faint emission line stars. These observations provide new valuable information about the star forming activity in the inner part of the Galaxy.

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SIX MYTHS ON THE VIRIAL THEOREM APPLIED TO INTERSTELLAR CLOUDS

J. Ballesteros-Paredes[1]

The interstellar medium is highly dynamic and turbulent. However, little or no attention has been paid in the literature to the implications that this fact has on the validity of at least six common assumptions on the Virial Theorem (VT), which are: (i) the only role of turbulent motions within a cloud is to provide support against collapse, (ii) the surface terms are negligible compared to the volumetric ones, (iii) the gravitational term is a binding source for the clouds since it can be approximated by the gravitational energy, (iv) the sign of the second-time derivative of the moment of inertia determines whether the cloud is contracting ($\ddot{I} < 0$) or expanding ($\ddot{I} > 0$), (v) interstellar clouds are in Virial Equilibrium (VE), and (vi) Larson's (1981) relations (mean density-size and velocity dispersion-size) are the observational proof that clouds are in VE. Turbulent, supersonic interstellar clouds cannot fulfill these assumptions, however, because turbulent fragmentation will induce flux of mass, moment and energy between the clouds and their environment, and will favor local collapse while may disrupt the clouds within a dynamical timescale. It is argued that, although the observational and numerical evidence suggests that interstellar clouds are not in VE, the so-called "Virial Mass" estimations, which actually should be called "energy-equipartition mass" estimations, are good order-of magnitude estimations of the actual mass of the clouds just because observational surveys will tend to detect interstellar clouds appearing to be close to energy equipartition. Similarly, order of magnitude estimations of the energy content of the clouds are reasonable. However, since clouds are actually out of VE, as suggested by asymmetrical line profiles, they should be transient entities. These results are compatible with observationally-based estimations for rapid star formation, and call into question the models for the star formation efficiency based on clouds being in VE.

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ATOMIC PROCESSES IN H II REGIONS AND PLANETARY NEBULAE

M. Bautista[1]

Historically, H II region and Planetary Nebula research has been a ground for much development in atomic physics. In the last five years the combination of a generation of powerful observatories, the development of ever more sophisticated spectral modeling codes, and important efforts on mass production of high quality atomic data have led to important progress in our understanding of the atomic spectra of PNe. In this paper I review such progress, including identification of heavy species (beyond the iron peak elements), observations of hyperfine emission lines and analysis of isotopic abundances, fluorescent processes, and new techniques for diagnosing physical conditions based on recombination spectra. Finally I discuss the new trends on the research of atomic processes in PNe.

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MOLECULAR CLOUD PROPERTIES AND STAR FORMATION IN PRIMITIVE GALAXIES

A. D. Bolatto,[1] A. K. Leroy,[2] and F. Walter[1]

With the advent of ALMA astronomers will be able to routinely use millimeter-wave observations of molecules and dust to study galaxies at cosmological distances. Open questions remain, however, on how CO relates to H_2, and how HI and H_2 relate to star formation activity in local systems. In an ongoing effort to understand how the tracers of molecular gas relate to the total molecular mass and to other properties of galaxies, we will discuss the analysis of resolved molecular cloud properties from combined single-dish and interferometric data in nearby dwarf galaxies — the closest primitive systems. This analysis shows that, despite a variety of underlying physical conditions, Giant Molecular Clouds have very similar properties from galaxy to galaxy, including the Milky Way. However, we find that CO is not a good tracer of total molecular mass in low metallicity systems. In the Small Magellanic Cloud (SMC), the galaxy with lowest heavy element abundance where CO has been detected, we analyze a combination of Spitzer and IRAS data to obtain a map of H_2 accross the galaxy and compare it to CO. We use this measurement of total molecular mass to place the SMC in star formation rate/molecular mass space, and we find that it falls on the same Schmidt-Law relationship as larger galaxies when only H_2 is considered.

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THE LOW RADIO FREQUENCY PROPERTIES OF THE SNR KES 79

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Observations of the supernova remnants (SNRs) at meter and longer wavelengths are powerful tools to differentiate physical processes taking place either in the SNRs (e.g. shock acceleration) or in the interstellar medium intervening along the line of sight towards them (e.g. thermal absorption). Kes 79 (G33.6+0.1) is a Galactic SNR rich in spatial structures in both, radio and X-ray bands, that make it ideal for addressing questions of SNR physics. Its radio morphology at 1.5 GHz is dominated by a system of two concentric incomplete shells with diameters about 8′ and 12′. *Chandra* observations of Kes 79 reveal many filaments, multiple partial shells, a loop, and a protrusion. The X-ray point source, CXOUJ 185238.6+004020, located close to the geometric center of the remnant was proposed to be the compact stellar remnant formed in the supernova event, although no evidence for a surrounding pulsar wind nebula was found in the X-rays. It has also been suggested that Kes 79 is interacting with a molecular cloud that appears to be partially surrounding its east and southeast borders. In this work we present new high quality images of Kes 79 obtained at low radio frequencies. The observations at 74 and 324 MHz were carried out using multiple-configurations of the Very Large Array (VLA) of the NRAO. We use these data and existing VLA observations at 1.5 GHz to perform an accurate study of the spectral index behaviour over the remnant and its relationship with the properties in the X-ray band of Kes 79. In addition, using HI and CO data from public databases we investigate the influence of the surrounding gas on the morphology of Kes 79.

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SEMIEMPIRICAL AND THEORETICAL ANALYSIS OF LINE OPACITIES AS A DIAGNOSTIC TOOL OF PROPERTIES OF ASTROPHYSICAL AND LABORATORY PLASMA

A. Cruzado,[1] L. Mercanti,[1] A. Ringuelet,[1] and H. Di Rocco[2]

The present work deals with opacities in observed line emission of early type stars, as a tool to infer physical properties of the emitting regions. With the emphasis put on Be stars, the observed spectrum are first analyzed by means the intensity/linewidth method (Kastner & Bhatia 1998, MNRAS, 298, 763). This is a semiempirical method that assume emission lines associated with a constant source function in a homogeneous medium, plane-parallel geometry and complete frequency redistribution in the scattering processes. It is appropriate for analyzing both astrophysical and laboratory plasmas, and allows us to derive optical thicknesses and associated quantities, such as escape probabilities and atomic level populations. Once these quantities are obtained through the intensity/linewidth semiempirical method, we intend to compare them with theoretical predictions from spectroscopic models. In this way, the statistical equilibrium equations are solved by assuming a collisional radiative steady state model. By adopting suitable atomic models and rate coefficients for the different atomic processes taking place in the considered plasma, we are able to obtain intensity lines and populations of the involved atomic levels, as well as departures from ideal conditions (local thermodynamical equilibrium and transparent medium). Comparison between observational data and theoretical predictions permits us to impose constraints on physical parameters describing astrophysical and laboratory plasma.

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WAVELET TECHNIQUE APPLICATIONS IN PLANETARY NEBULAE IMAGES

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Through the application of the wavelet technique to a planetary nebulae image, we are able to identify different scale sizes structures present in its wavelet coefficient decompositions. In a multiscale vision model, an object is defined as a hierarchical set of these structures. We can then use this model to independently reconstruct the different objects that compose the nebulae. The result is the separation and identification of superposed objects, some of them with very low surface brightness, what makes them, in general, very difficult to be seen in the original images due to the presence of noise. This allows us

to make a more detailed analysis of brightness distribution in these sources. In this project, we use this method to perform a detailed morphological study of some planetary nebulae and to investigate whether one of them indeed shows internal temperature fluctuations. We have also conducted a series of tests concerning the reliability of the method and the confidence level of the objects detected. The wavelet code used in this project is called OV_WAV and was developed by the UFRJ's Astronomy Departament team.

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IRON-PEAK ELEMENTS IN THE STRONTIUM FILAMENT OF ETA CARINAE

M. Martínez[1] and M. Bautista[2]

We investigate the nature of the emission lines spectrum of ions of the iron group, such as ScII, CrII, TiII and VII, observed in the so-called strontium filament found in the ejecta of Carinae. We calculate the atomic parameters for these systems and model the spectrum. We use the theoretical and observed spectrum to investigate the physical condition of the strontium filament and the excitation mechanisms of the lines observed. We use the line intensity ratios to diagnostic temperature, electronic density and radiation field, but the combined contributions of collisional excitation and fluorescence make spectral diagnostics much more difficult than with traditional collisionally excited lines. Once the temperature and density are known, we can calculate the abundances of the elements in the nebula.

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THE EFFECT OF PRESSURE FLUCTUATIONS IN THE INTERSTELLAR GAS

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We examine the evolution of the thermochemical state of the interstellar gas subject to pressure fluctuations. At the typical pressure of the interstellar medium the thermal balance of the neutral gas results in cold clouds, warm neutral medium, or a combination of the two (the two phase ISM). Pressure fluctuations destroy the thermal equilibrium and the resulting evolution is sensitive to the amplitude and frequency of the fluctuation. For periodic fluctuations we calculate the work done on the gas in a cyclic trajectory and determine its dependence on frequency. In particular, there are critical values of the amplitude and frequency that result in large trajectories in the phase diagram and maximize the average rate at wich mechanical energy is deposited in the gas.

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RADIATIVE DATA FOR H-LIKE IONS

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The radiative lines of cosmically abundant H-like ions ($Z < 30$) are observed in most astronomical spectra where they are used to determine the properties of the emitting plasma (electronic temperature, density, abundance, and structure). With the launching in the late 90s of the space probes Chandra and XMM-Newton to observe X-ray spectra, the radiative properties (wavelength, transition probability and electron excitation collision strength) of hydrogenic lines in highly ionized elements with nuclear charges in the range $8 < Z < 30$ have acquired a singular importance.

The computation of the atomic properties of H-like ions in intermediate coupling implies solutions of the Dirac equation or the use of an approximate relativistic Hamiltonian such as the the one by Breit-Pauli. Despite the simplicity of these systems, there is not a complete ($n < 10$, say) and accurate atomic database, as required in X-ray astrophysical applications.

We report a calculation of relativistic A-values for E_i ($i \leq 3$) and M_j ($j \leq 2$) transitions in H-like ions with $Z \leq 30$ using the atomic structure codes AUTOSTRUCTURE and GRASP. Detailed comparisons are carried out with previous data sets in order to determine accuracy levels. This database

will help to revaluate the spectra of standard astronomical X-ray sources, such as active galactic nuclei, X-ray binaries and black hole candidates.

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OPSERVER: OPACITIES AND RADIATIVE ACCELERATIONS ON DEMAND

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We report on developments carried out within the Opacity Project (OP) to upgrade atomic database services to comply with e-infrastructure requirements. We give a detailed description of an interactive, online server for astrophysical opacities, referred to as `OPserver`, to be used in sophisticated stellar modelling where Rosseland mean opacities and radiative accelerations are computed at every depth point and each evolution cycle. This is crucial, for instance, in chemically peculiar stars and in the exploitation of the new asteroseismological data. `OPserver`, downloadable with the new OPCD_3.0 release from the Centre de Données Astronomiques de Strasbourg, France, computes mean opacities and radiative data for arbitrary chemical mixtures from the OP monochromatic opacities. It is essentially a client-server network restructuring and optimization of the suite of codes included in the earlier OPCD_2.0 release. The server can be installed locally or, alternatively, accessed remotely from the Ohio Supercomputer Center, Columbus, Ohio, USA. The client is an interactive web page or a subroutine library that can be linked to the user code. The suitability of this scheme in grid computing environments is emphasized, and its extension to other atomic database services for astrophysical purposes is discussed.

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MEASURING THE DENSITY PROFILE BEHIND THE SUPERNOVA SHOCK WAVE USING NEUTRINO SPECTROSCOPY

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Neutrinos emitted from a collapsing stellar core after core bounce, pass through a non monotonous density profile created by the emerging shock wave and a reverse shock produced by the material heated by neutrinos before the onset of the collapse. When the shock wave reaches the resonant region corresponding to the atmospheric mass-square difference (H region) the adiabatic condition is modified, and the neutrino spectrum changes in virtue of phase effects in the oscillation phenomena. We present in this work the results of the application of a method proposed by Dighe et al. to estimate the density profile behind the shock using spectroscopy of realistic neutrino signals from a Galactic supernova in present and future detectors. We test the method and show how a supernova signal can be used not only to constrain neutrino properties but also to reveal astrophysical details of the structure of the collapsing stellar core.

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EMBEDDED YOUNG STELLAR POPULATION IN THE MOLECULAR REGION TOWARDS IRAS 18236-1205 SOURCE

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We selected the molecular region towards IRAS 18236-1205 source, for the purpose of studying the stellar population and define embedded young stellar objects (YSOs). We selected the molecular region using the Galactic Ring Survey (GRS) in ^{13}CO and observations of high-density molecular gas, CS. The IRAS 18236-1205 source has IR colors as an Ultra Compact HII region. That makes this region a good candidate to investigate massive star formation. To study the stellar component we used

point source catalogues in the near (2MASS), middle (MSX/Spitzer) and far infrared (IRAS), respectively. From the color-color and color-magnitude diagrams with 2MASS and IRAC-SPITZER data, we developed a photometric criterion to identify embedded YSOs in the molecular region. Applying a model to the spectral energy distribution (SED) of some objects, we have noted that the best fitting are for those models of young stellar objects embedded in its progenitor envelope. This photometric analysis allowed us to select embedded YSOs of massive, medium and low mass in the molecular region, as well as their precursors (dense molecular cores, Infrared Dark Clouds) and effects on the interstellar medium (HII regions and objects associated with outflows, HH objects). Spectroscopy and observations on narrow band photometry (Brγ, [FeII]) and molecular lines (H_2) are future work that will support our selection.

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CARBON MONOXIDE OBSERVATIONS OF ARA OB1 MOLECULAR COMPLEX

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We present a study of the molecular gas towards two particular regions of Ara OB1 which are related to stellar formation activity. They are the bright Rim Nebula (NGC 6188) and the dark cloud Sandqvist 182. Both regions signal the presence of a "Photo Dominated Region" (PDR) between the HII region and nearby dark clouds. For the case of NGC 6188 the PDR is seen projected onto the plane of the sky almost edge on, clearly showing the interface between the ionized medium (RCW 108) and the molecular complex. Based on ^{12}CO (HPBW=$2'.7$) and ^{13}CO (HPBW=$2'.6$) (J=1$\rightarrow$0) lines observations carried out with the NANTEN telescope, the molecular gas distribution is analyzed. Along NGC 6188 several well defined molecular clumps are found and it is revealed a clear velocity gradient of -0.25 km s^{-1} pc^{-1} along the north-south direction.

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MASERS IN HIGH MASS STAR FORMING REGIONS: TRACERS OF DISKS AND/OR JETS?

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Recent observations of high angular resolution have allowed to detect emissions of masers of several molecular species around young stellar objects of high mass. At the present time, several investigations are trying to establish the roll that masers might play in the formation process of such stars. Studies of individual regions indicate that masers may trace the disk or the jet associated with young massive protostars. In some cases, masers can also trace both type of structures (disks and jets) at the same time. In this contribution we present results of a statistical study of the distributions of masers emissions of methanol, hydroxyl and water in a sample of 29 massive star forming regions. Individual alignments and physical relations with disk and/or jet structures for each case are especially analyzed. The results of our study indicate that the emissions of masers surrounding young massive protostars tend to form groups that in a very high percentage show linear or elongated morphologies. The linearity of the distributions of masers is a frequent phenomenon and is consistent with the fact that masers tend to align or are physically related to disks and jets. However we did not find a significant preference of masers of methanol, hydroxyl and water to align with disks or jets. In general, masers tend to align with both type of structures (disks and jets) in similar proportions. We only found a slight tendency of water masers to trace jets. This tendency should be confirmed analyzing a larger sample of regions.

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ON THE IR PROPERTIES OF DUSTY TORUS

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In order to explain the differences observed between type 1 and type 2 AGN it has been proposed that an axially symmetric dusty structure (the torus) beyond the accretion disk absorbes a considerable fraction of the radiation emitted at wavelengths shorter than 1 micron (the AGN Unified Scheme). The dust in this torus typically reaches temperatures of a few hundred degrees and therefore its emission peaks somewhere at IR wavelengths. It is therefore in this wavelength regime that the torus can be detected. We performed imaging on 49 type 2 Seyfert galaxies in 6 near- and mid-infrared bands (1–10 microns). We separated the contribution of the torus from the host galaxy by radial profile fitting techniques and we are comparing the observed spectral energy distributions with theoretical models of torus emission to statistically constrain the geometrical and physical parameters.

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TOPIC 3: GALACTIC STRUCTURE — ASTROMETRY — LOCAL GROUP GALAXIES

THE DOUBLE-ASTROGRAPH TELESCOPE IS WORKING AT THE OBSERVATORIO ASTRONÓMICO NACIONAL OF VENEZUELA

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The Double Astrograph telescope (two 0.5 m lenses) in the Observatorio Astronómico Nacional of Venezuela (OAN) will soon be available for observations to the astronomical comunity. Despite of being placed at the OAN since thirty years ago, together with the three other telescopes installed there, it was not fully assembled. Recent engineering work on it, has got to mecanically balance the telescope and set control of the electric motors for the motion of this instrument. The current positioning and guided motions of the telescope allow for an observational quantification of the different aberrations of the optical system of the instrument. With this in mind, selected fields of stars have been observed with a CCD camera, that was installed at different locations on the focal plane. Here we show a summary of the technical operations and the first observational results, aimed at evaluating the potential of the Double Astrograph for future scientific investigations.

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I-BAND SURFACE BRIGHTNESS FLUCTUATIONS OF MAGELLANIC STAR CLUSTERS

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Surface brightness fluctuations (SBF) measurements are a powerful and now very well established tool for determining cosmological distances. In addition, they can provide unique information about the brightest stars in a population. In a series of papers, González-Lópezlira et al. have advanced in the calibration of model SBF luminosities for the study of unresolved stellar populations, through a comparison with data of Magellanic star clusters.

Here, we propose to study the relation between absolute I-band fluctuation magnitude and (V-I) color in Magallanic stellar clusters, using data from the Deep Near-Infrared Southern Sky Survey (DENIS), and from the literature.

We also compare our results with data of early-type galaxies and spiral bulges obtained by Tonry et al.

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SMALL STELLAR SYSTEMS IN ANTLIA: GLOBULAR CLUSTERS AND DWARF GALAXIES

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We present the combined results of two investigations of the Antlia galaxy cluster: (1) A study of the globular cluster (GC) systems around NGC 3258 and NGC 3268 (Bassino et al. 2008, MNRAS, 386, 1145), on the basis of V, I photometry performed on FORS1-VLT images. The distance to the galaxies are determined by means of the GC luminosity functions. The GC colour distributions are bimodal, except for the brightest clusters which show unimodal distributions. The radial density profiles of the red (metal-rich) GCs follow closely the V brightness profiles of the galaxies. The existence of intracluster GCs is also discussed.

(2) A study of Antlia early-type galaxies in the central region of the cluster (Smith Castelli et al. 2008, MNRAS, 386, 2311), based on wide-field MOSAIC-CTIO images, obtained in the Washington photometric system. We analyze the colour-magnitude relation of early-type dwarf galaxies, previously listed in the Ferguson & Sandage's (1990, AJ, 100, 1) photographic catalog, which follow a very tight sequence. We have found several new dwarf candidates not included in the catalog. In addition, we are studying the properties of several blue compact dwarfs (BCDs) located in the field.

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DETERMINATION OF THE TOTAL NUMBER OF ISOLATING INTEGRALS USING THE CORRELATION INTEGRAL

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There are several available numerical tools that can be used to ascertain how many isolating integrals of the movement has a stellar orbit. The Lyapunov exponents, for example, allow to determine whether a 3D orbit has zero, one, two or more than two isolating integrals (zero, one or more than one for 2D orbits). That is, it cannot be specified how many isolating integrals are satisfied by a regular orbit. This is a common feature shared by any chaos-finder numerical algorithm. On the other hand, there are techniques that allow to determine how many isolating integrals a regular orbit has (v.g., spectral stellar dynamics, frequency maps, etc.), but that are useless in order to specify the number of isolating integrals possessed by a chaotic orbit. The correlation integral is an easy-to-use tool that allows to compute the dimension of the phase space which an orbit in an arbitrary dynamical system is moving in. In a stellar dynamical context, this can be used to compute how many isolating integrals has the orbit, irrespective of it being regular or chaotic. However, its implementation should be done with care, due to numerical subtleties that may conceal the true result.

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SPACE-DENSITY AND LUMINOSITY FUNCTION OF RGB AND AGB STARS IN THE GALACTIC PLANE TOWARDS THE MCCUSKEY'S LF REGIONS

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The aim of this paper is to report on results of a going-on project to determine the space-density function and the luminosity function of RGB and AGB stars in the galactic plane toward the selected areas designated as McCuskey's Luminosity function Fields (LF). For this purpose I have carried out observations and used archival observations obtained by the QUEST I camera installed at the Stock Schmidt telescope of the Observatorio Nacional de Venezuela operated by CIDA. Here I present preliminary results for a few of these fields. This project builds on a series of investigations carried out in the 60s and 70s by McCuskey and collaborators, and the present author, starting in the 80s, at the Warner & Swasey Observatory of the Case Western Reserve University. Recently, Thé & Fluks, at the University of Amsterdam, carried a thorough study of red giant stars in the galactic plane towards 10 of the McCuskey's LF regions. The Case survey resulted in the very well known isodensity maps of stars in the spectral range B5-F0, for the MS stars, and F8-K3, for the giant stars, up to distances of 3–5 kpc, in the galactic plane. The Dutch survey produced isodensity maps for giant M stars in the spectral range M0–M10, up to distances of 5 kpc. I have proposed to use the capabilities of the QUEST I camera to carry out spectroscopic surveys in the red (R) and near infrared (I) in as many of the McCuskey's fields as possible, in both hemispheres, to produce isodensity maps of RGB and AGB stars, up to distances of 5–10 kpc; this survey will also allow to provide, in addition, precise positions, magnitudes, and spectral types for all the observed stars.

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RADIAL VELOCITY DETERMINATION OF TWO SUPERGIANT STARS

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Two high resolution spectra of the supergiant stars HR 4912 and HD 74180, obtained in 2001 and 2003, respectively, have been analyzed. These spectra were obtained with a CCD coupled to the HERCULES spectrograph, attached to the 1 m reflector telescope of the University of Canterbury, New Zealand. The spectrum of HR 4912, covers the region $\lambda \sim 4550 - 7150$ Å, with a resolving power of 41000 and dispersion of ~ 2 Å/mm. On the other hand, the spectrum of HD 74180 covers the region $\lambda \sim 4300 - 7100$ Å, with a resolving power of R=82000 and the same dispersion of ~ 2 Å/mm. A total of 439 photospheric lines have been identified in the spectrum of HR 4912, but only 347 were selected to derive its radial velocity, whose value is $\sim -24,5 + 0,1$ km s^{-1}. Also, Hα y Hβ were identified with a radial velocity of $-28{,}4$ km s^{-1} and $-20{,}7$ km s^{-1}, respectively. These values are comparable with the result obtained for the rest of the photospheric lines derived in the present work. With respect to the spectrum of HD 74180, a total of 390 photospheric lines were identified, but only 208 were selected to derive its radial velocity. From these, a value of $\sim 26,2 \pm 0,1$ km s^{-1} was obtained for the radial velocity. Among the observations performed for this star during 100 years, the result obtained in this work is within the variability range obtained by other authors. Also, the Hβ line was identified and its radial velocity is $45{,}3$ km s^{-1}. This value indicates a relative instability in the atmosphere of HD 74180.

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METALLICITIES AND RADIAL VELOCITIES OF SMC CLUSTERS AND FIELD GIANTS USING THE CA II TRIPLET

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A. Sarajedini,[4] and J. J. Clariá[1]

We have obtained near-infrared spectra for approximately 300 red giants in 16 SMC clusters as well as roughly 180 field giants in the areas surrounding the clusters using the FORS2 instrument on the Very Large Telescope. The spectra cover a range of ~ 1600 Å space in the region of the Ca II Triplet (CaT). We use these strong absorption lines to measure radial velocities and equivalent widths, from which we derive metallicities. We derive mean radial velocities and metallicities of each cluster to ~ 3 km s^{-1} and 0.05 dex from an average of 6 member per cluster. We will use this information, together with that available for other clusters studied with the same technique, to analyze the SMC age-metallicity relation. Although most clusters of our sample already have photometric metallicity determinations, they have not been spectroscopically studied. Consequently, our work provides independent and more reliable information than the photometric studies and provides for the first time information about cluster radial velocity and membership. We are currentrly analyzing the field giants to compare the chemical evolution in clusters to that of the field and to perform a reliable analysis of the chemical evolution of the SMC.

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DSPH-LIKE MW SATELLITES FROM MASSIVE DARK MATTER FREE PROGENITORS

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We study the evolution of initially spherical satellites of a galaxy that resembles the Milky Way using N-Body simulations. The initial satellites come from a Plummer sphere model with 10^6 particles, they are dark matter free and have typical masses of $10^7 - 10^9\, M_\odot$. The satellite is bounded by a galactic potential: A Miyamoto-Nagai potential for the disc, a Hernquist potential for the bulge and a logaritmic potential for the dark matter halo. The initial satellite is introduced into the potential with certain apogalactic distance and velocity. We present a map of initial conditions for the orbit that lead to disrupted satellites, using only those that remain bound with 1% of the initial mass for a long enough period, which could be interpreted as dSph's by an observer on earth.

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FAR ULTRAVIOLET SPECTROSCOPIC EXPLORER OBSERVATIONS OF OB STARS IN THE MAGELLANIC CLOUDS

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The Far Ultraviolet Spectroscopic Explorer has provided an extensive sample of spectra of OB stars in the Magellanic Clouds in the 900–1200 Å range. The shorter wavelengths are more accesible in the Clouds than in the Galaxy, because of the lower interstellar extinction and absorption. Many additional objects have been observed since the initial compilation by Walborn et al. (2002, ApJS, 141, 443). These new data have been reduced and organized into spectral-type sequences, including additional very early O stars, some with CNO anomalies (see Walborn 2009, RevMexAA (SC), 35, 170); late-O supergiants; and late WN stars.

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SURFACE BRIGHTNESS PROFILES AND STRUCTURAL PARAMETERS FOR STELLAR CLUSTERS IN MAGELLANIC CLOUDS

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We present CCD photometry for a sample of 20 Large Magellanic Cloud and 18 Small Cloud star clusters. The coordinates of the center of symmetry for every cluster have been obtained, with a mean error less than $0.5''$, using an implementation of the autocorrelation mirror algorithm. The surface brightness profile for each cluster, obtained from CCD images in the V band, were fitted with the EFF model (Elson et al. 1987, ApJ, 323, 54). The structural parameters of the EFF model have been used to estimate the luminosity and mass of the clusters using synthetic mass-to-light ratio. The derived masses are in agreement with those found in the literature, and for 9 clusters we present the first estimates of these quantities. Masses are in the range 10^4 to 10^5 $M_\odot$, thus confirming the massive nature of blue and intermediate age Cloud clusters.

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TOPIC 4: STELLAR EVOLUTION — STELLAR CLUSTERS — EVOLUTION OF STELLAR POPULATIONS

REDDENING AND AGE OF 15 SOUTHERN GALACTIC OPEN CLUSTERS DETERMINED FROM INTEGRATED SPECTROSCOPY

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We present flux-calibrated integrated spectra obtained at CASLEO (Argentina) in the range 3800–6800 Å for 15 small angular diameter Galactic open clusters. Using the equivalent widths of the Balmer lines and comparing the cluster spectra with solar-metallicity template spectra of Galactic star clusters with known properties, we derive both foreground $E(B-V)$ colour excesses and ages. Five out of the 15 studied clusters had not been the subject of previous studies so that the fundamental parameters determined in the current work turn out to be the first of their kind. For the remaining clusters, we provide independent information of that derived from colour-magnitude diagram studies. Five clusters are found to be very young (BH 121, BH 205, Bochum 14, Tr 15 and Tr 27), four are moderately young (Collinder 258, BH 92, Pismis 23 and NGC 6268), three are Hyades-like age clusters (Ruprecht 158, BH 55 and BH 90), one is an intermediate-age cluster (Ruprecht 164) and two are definitely old (ESO 65-SC7 and Ruprecht 159). The $E(B-V)$ colour excesses derived for the whole sample range from ~ 0.0 in Ruprecht 158 to ~ 2.40 in Tr 27, while the ages vary from ~ 3 Myr to ~ 2 Gyr. The age and reddening distributions of the present cluster sample match those of open clusters with known parameters in a 110° sector centered at $l = 310°$.

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THE CLUSTER OF GALAXIES LCDCS-S001: BASIC SPECTROSCOPIC AND PHOTOMETRIC DATA AND STELLAR POPULATION ANALYSIS

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The dynamical and populational properties of the high-redshift ($z = 0.7$) galaxy cluster LCDCS-S001, are analyzed through imaging and multi object spectroscopy obtained with the GMOS instrument in the Gemini South Observatory. The objects were selected in an i'-band cluster field image, and multi-object spectroscopic observations centered at 7500 Å were performed for 40 objects. Spectral features were successfully identified for 20 objects, and used to determine the redshift of the cluster. We found that 12 objects are cluster members and estimate a median redshift of 0.709 for this cluster. The relative velocities of the cluster members were used to estimate the projected cluster mass, which was found to be 3.54×10^{14} $M_\odot$. Lick and $D_n(4000)$ indices were measured and used to determine the stellar population properties of the galaxies, by means of a spectral synthesis through Bruzual & Charlot evolutive models. We found that the bulk of stellar population for the cluster members has a spectrum compatible with solar metallicity and an age between 3.0 and 7.0 Gyrs; with only one exception, the flux contribution of younger ($t \leq 1.0$ Gyrs) stars in the spectra does not exceed 25% at 4200 Å. Emission [OII] lines were detected for 4 galaxies, all of which showing a stronger contribution of young stars compared with other cluster galaxies. The equivalent width of the [OII]λ3727 line was compared with Magris, Bruzual, & Binette models for HII regions. We found good correspondence between our values and the theoretical predictions for solar metallicity and with star formation timescales $1.0 < \tau < 3.0$ Gyrs. In morphological terms we have found that the spheroids map better the structure of the cluster, the disk galaxies populating preferably the peripherical regions, and we have concluded that around 10% of the cluster of galaxies are spheroids with the typical effective radius of 10–15 kpc. The bidimensional distribution of the objects shows an elongated morphology of the cluster. Local overdensities identified in the i' image, one of which being part of the cluster, suggests that the cluster is undergoing a fusion process. This hypothesis is strengthened by the identification of the radio source in the 1.4 GHz at the cluster center, characteristic of radio halos found in cluster which undergo dynamical instabilities.

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FINE STRUCTURE IN SURFACE BRIGHTNESS PROFILES OF LMC AND SMC STAR CLUSTERS: EVIDENCE OF MERGERS?

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Surface photometry of nine Magellanic Cloud star clusters is presented. Three star clusters are binaries with double peak in the profiles. Four appear to have a significant fine structure in the observed light profiles in terms of bumps, while the remaining ones are taken as comparison clusters with smooth profiles. A double peak is also observed in NGC 376, K 50 and K 54 but these clusters do not a have a companion. Together with NGC 1810 which has an unusual profile EFF profiles do not describe them. Isophotal maps are complex for them. NGC 376, K 50 and K 54 present apparently triangular outer isophots, while NGC 376, K 50 and NGC 1810 have isophotal gaps that extend to the cluster central parts. In the numerical simulations of cluster encounters by de Oliveira, Bica, & Dottori (2000, MNRAS, 311, 589) similar structures can be seen. We conclude that unusual cluster profiles and isophotal distributions may be related to star cluster mergers.

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SNRS IN THE SEDOV PHASE: EFFECTS OF EFFECTIVE PARTICLE ACCELERATION ON THE REMANANT DYNAMICS

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Shell-type supernova remnants in the adiabatic expansion stage can be described by the Sedov solutions set, which leads to estimates of some of the SNR parameters, like age, explosion energy and ISM

density, from certain observed quantities of these objects. However, effective particle acceleration may affect considerably the evolution and X-ray emission from SNRs. Using hydrodynamic simulations coupled with diffusive shock acceleration, we investigate the effects of cosmic ray acceleration on the spectrum and radius of the SNRs, and hence we establish how cosmic-ray production affects the Sedov predictions for the original parameters. Furthermore, we explore how these simulated spectra fit SNR observations, and look for possible modifications to the estimated parameters established assuming no particle acceleration has taken place.

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CCD WASHINGTON PHOTOMETRY OF GALACTIC OPEN CLUSTERSS: THE MODERATELY METAL-POOR CLUSTER NGC 2236

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We present CCD Washington CT_1 photometry for 1162 stars in the field of the rich open cluster NGC 2236. These data were supplemented with photoelectric CMT_1T_2 photometry of 13 red giant candidates. The comparison of the cluster (T_1,C-T_1) colour-magnitude diagram with theoretical isochrones computed for the Washington system yields E(C-T_1) $= 1.10 \pm 0.10$, equivalent to $E(B-V) = 0.55 \pm 0.05$, and $T_1 - M_{T_1} = 13.45 \pm 0.25$ for $\log t = 8.80$ and $Z = 0.008$. NGC 2236 is then located at 2.5 ± 0.5 kpc from the Sun beyond the Perseus spiral arm. A cluster core radius of 1.2 pc and an annular corona of 2.2 pc were derived from the stellar density radial profile. A metal abundance $[Fe/H] = -0.3 \pm 0.2$ was estimated from 5 independent Washington abundance indices, which is not only in reasonably good agreement with the one obtained from the isochrone fit, but also compatible with the existence of a radial abundance gradient in the Galactic disc. We examined the properties of a sample of 20 known open clusters aligned along the line-of-sight to NGC 2236. Berkeley 27 appears as the farthest and oldest cluster of the studied sample (Clariá et al. 2007, MNRAS, 379, 159).

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ELEMENTAL ABUNDANCE STUDIES OF THE ULTRAVIOLET GALLIUM CP STAR HD 168733

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We report elemental abundance studies of the ultraviolet gallium CP star HD 168733. It is neither a silicon, nor a mercury-manganese star and a longitudinal magnetic field of the order of −594 gauss has been detected in it. The high resolution spectra were obtained with the EBASIM spectrograph attached to the 2.10 m telescope at CASLEO Observatory. The abundances results obtained show that Si es normal, Ti Cr and Fe are rich, PII, SII, GaII, SrII, YII, ZrII are present and its abundances are being determined. The presence of RE will be also investigated.

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THE Hα LINE EMISSION CONTRIBUTION TO STAR FORMATION HISTORY DETERMINATION IN GALAXIES

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Recently, Mateu, Bruzual, & Magris (2006) developed a non parametric algorithm called GASPEX (GAlaxy Spectrum Parameter EXtraction) to recover a galaxy star formation history (SFH) and chemical evolution from its spectral energy distribution (SED). Nevertheless, in late type galaxies the youngest population contribution to the SED could be hidden in the optical continuum, which is mainly dominated by old and evolved stars; therefore the SFH obtained from an optical SED may not include an important fraction of the recent star formation events in the galaxy. In this work we show that imposing restrictions on the calculations, based on the Hα line emission as a tracer of recent star formation events, we improve the determination of the SFR in the last 100 Myr.

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ADVECTION OF MAGNETIC FLUX BY ACCRETION DISKS AROUND NEUTRON STARS

S. Flores-Tulián[1] and A. Reisenegger[1]

The aim of our research will be to address why millisecond pulsars have relatively weak surface magnetic fields, of about 10^8, with a narrow spread. We propose that the accretion of plasma from the companion star fully screens the original neutron star field, but the accretion disk carries additional magnetic flux from the companion star, or itself can generate field by means of dynamo processes. This might lead to an asymptotic magnetic field of 10^8, as inferred from observations. When we are around a strongly magnetized star, the field prevents the disk from approaching the star. The accretion is along the field lines and deposits the matter on the polar cap of the star. Then, the accreted plasma flows, dragging with itself the magnetic field lines, from the pole to the equator. On the other hand, when the star becomes non magnetic, because the field has been buried, the disk is close to the star's surface and the transport is from the equator to the pole. We are interested in describing both processes and the final stationary state.

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LITHIUM ISOTOPES AND SOLID BODY ACCRETION IN STARS WITH PLANETS

L. Ghezzi,[1] K. Cunha,[1,2] F. X. de Araújo,[1] V. V. Smith,[2] R. de la Reza,[1] S. C. Schuler,[2] and S. J. Margheim[3]

We present ^{3}Li abundances for a sample of 5 stars with planets. This isotope is a strategic probe of the dynamic interactions between stars and their surrounding protoplanetary disks or retinue of planetesimals or planets. The results were derived from extremely high resolution ($R \sim 150,000$) and high signal-to-noise (S/N $>$ 700) spectra obtained with the bHROS spectrograph on Gemini-South and the analysis was done via spectral synthesis, using MOOG code and a detailed line list for the spectral region around 6708 Å.

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NEW HG-MN BINARY STARS IN OPEN CLUSTERS

J. F. González[1] and H. Levato[1]

We report the discovery of three new binary systems containing Hg-Mn stars in open clusters: NGC 2546-10, NGC 3532-155, and NGC 6025-14. We study also the peculiar binary NGC 2287-105 previously known. In the binary system NGC 2546-10 both components are HgMn stars. Besides Hg and Mn overabundance, NGC 6025-14 presents strong P and Ga lines, while NGC 3532-155 and NGC 2287-105 present enhanced Pt and Y. We present radial velocity curves and derive spectroscopic orbits. Their orbital periods are between 14 and 41 days and all of them are kinematic cluster members.

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THE CENTRAL REGIONS AND THE GLOBULAR CLUSTERS OF EARLY-TYPE GALAXIES

A. Jordán[1]

The ACS Virgo and Fornax cluster surveys present homogeneous HST/ACS observations of 143 early-type galaxies and their globular cluster systems in the Virgo and Fornax clusters. I will describe these surveys and will present some of their recent results. Finally, I will present novel trends of properties of the size and luminosity distributions of globular clusters and discuss their implications for star cluster formation and evolution.

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PRECISE REDETERMINATION OF PROJECTED ROTATIONAL VELOCITIES AMONG A-TYPE STARS

H. Levato,[1] J. F. González,[1] M. Grosso,[1] S. Malaroda[1,2] and G. Díaz[1]

We have obtained echelle spectra of all southern A type stars from the Bright Star Catalogue with a resolution of 0.04 Å. More than 1,200 spectra were taken. We have review the different methods to derive $v \sin i$. We have discussed the systematic effects involved. We selected a Fourier transform-based method to derive $v \sin i$ in the present redetermination. A statistical analysis will follow.

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THE UV EMISSION IN GLOBULAR CLUSTERS

C. López[1,2] and G. Bruzual[1]

The Hubble New Generation Spectral Library (HNGSL) provides a unique opportunity to explore evolutionary population synthesis models in the UV. The library contains spectra for a few hundred stars with fundamental parameters known from analysis of the visual spectrum. The spectra cover fully the wavelength range from 1700 Å to 10,200 Å with spectral resolution close to 5 Å providing excellent coverage of the near-UV and the range from 9000 Å to 10,200 Å. In this paper we explore the dependence of the UV flux emitted by Globular Cluster size stellar populations using the traditional evolutionary synthesis algorithms and also taking into account stochastic fluctuations in the number of stars present in different evolutionary phases. The model predictions are compared to existing UV observations of Globular Clusters.

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FIRST RESULTS WITH BHROS: ISOTOPIC ANOMALIES OF PT, CA, AND HG AMONG HG-MN STARS

S. Malaroda,[1] J. F. González,[1] H. Levato,[1] and N. Nuñez[1]

We have analyzed the spectra of 6 Hg-Mn stars taken with bHROS at Gemini South in order to review some the isotopic abundances of Pt, Ca and Hg, which are non solar. We discuss some of the reduction problems of the bHROS data.

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RECOVERING STELLAR POPULATION PROPERTIES FROM THE SDSS

D. Martínez[1] and J. Mateu[1]

A galaxy spectrum can be represented as a linear combination of its stellar population components. In this work we design a new algorithm with a dynamical base (not static) of 2 Simple Stellar Population spectrum, which are used to recover the linear combination coefficients and also the age of the base of spectra that produce the best fitting. The Dynamical Base algorithm (DINBAS2D) was applied to a sample of 21290 galaxy spectra from the Sloan Digital Sky Survey (SDSS) with redshift between 0.15 and 0.16, as a result, a catalog of stellar population properties such as: Star formation History, metallicity, mass and mean age, was made. We also found a Mass-Age relation where older galaxies are more massive than younger ones.

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BLACK HOLES IN THE UNIVERSE

F. Mirabel[1]

I will review the observational evidences on stellar mass and supermassive black holes in the dynamic center of galaxies. I will also discuss the new horizons being opened for black hole astrophysics.

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THE IMPACT OF THE INTEGRATED GALAXY IMF ON SUPERNOVAE RATE

F. Molina,[1] C. Weidner,[1] and M. Zoccali[1]

Recent research regarding the star formation in star clusters on galaxy wide scales indicates that, in the hypothesis that all stars are born within clusters, the supposedly universal initial stellar mass function (IMF) within young star clusters, does not necessarily yield the same IMF for whole galaxies. As star clusters also follow an embedded cluster mass function (ECMF), the whole integrated galaxy initial stellar mass function (IGIMF) has to be steeper than the individual IMFs of star clusters — depending on the steepness of the ECMF (Kroupa & Weidner 2003, ApJ, 598, 1076; Weidner & Kroupa 2005, ApJ, 625, 754). This result has found to be able to explain the mass-metallicity relation of galaxies (Köppen et al. 2007, MNRAS, 375, 673).

Investigating the effects of the IGIMF further, this project concentrates on the expected temporal evolution of the supernova rate in comparison with a rate for a single-slope Salpeter-like IMF, for a wide range of galaxies with different masses and star-formation histories. Type II and type Ia supernovae are included at a later stage, as well as the influence of massive starbursts.

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INTEGRATED SPECTRAL PROPERTIES OF 4 PREVIOUSLY UNSTUDIED CONCENTRATED GALACTIC OPEN CLUSTERS

T. Palma,[1] A. V. Ahumada,[1] J. J. Clariá,[1] and E. Bica[2]

We have derived fundamental parameters for the previously unstudied concentrated galactic open clusters Berkeley 77, NGC 2587, BH 58 and ESO324-SC15 by means of integrated spectroscopy in the range 3800–6800 Å. The cluster integrated spectra are compared with those of solar-metallicity template spectra of Galactic open clusters with known parameters. The spectra were obtained at CASLEO (San Juan, Argentina) with a resolution of 14 Å. We performed simultaneous estimates of age and foreground interstellar reddening by comparing the continuum distribution and line strengths of the cluster spectra with those of the template spectra. Berkeley 77 is found to be an old cluster of 3–4 Gyr, while the remaining three clusters are between 400 and 1000 Myr old. The derived foreground reddening values range from $E(B-V) = 0.0$ in NGC 2587 and ESO324-SC15 to approximately 0.3 in Berkeley 77.

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SPECTROSCOPIC ANALYSIS OF THE SUPERGIANT STAR HD 54605

L. Peña,[1] P. Rosenzweig,[1] E. Guzmán,[1] and J. Hearnshaw[2]

The main purpose of the present study is to analyze a high resolution spectrum of the supergiant star HD 54605, obtained in the year 2003, with a CCD coupled with the spectrograph HERCULES, attached to the 1m reflector telescope of Mt. John Observatory of the University of Canterbury (New Zealand). This spectrum covers the region $\lambda\lambda \approx 4505 - 7080$ Å, with $R = 41000$ and a dispersion of ≈ 2 Å/mm. According to previous spectroscopic observations, of low dispersion, the radial velocity of this star showed that it does not vary in periods of time relatively short. Until the present, we have identified five hundred photospheric lines, from which, with no doubt, we will obtain a satisfactory result that will give an important contribution to the database of the values of the radial velocity of HD 54605. We observe that Hβ, shows a relatively wide and deep profile and is in complete absorption.

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DETERMINATION OF INSTABILITIES IN THE NGC 5427 CIRCUMNUCLEAR DISK

V. J. Peña-Suárez,[1] N. Vera-Villamizar,[2] J. A. Hernández-Jiménez,[1] and A. Plata-Gómez[1]

We have applied photometric methods to calculate the Toomre parameter of the circumnuclear region of NGC 5427 using visible and near-infrared Hubble Space Telescope images. We study the types of instability that appear in the dynamics, and determine the morphology of this circumnuclear region, from the point of view of a density wave scenario.

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OPTICAL PHOTOMETRY AND CORAVEL OBSERVATIONS OF STARS IN THE FIELD OF THE HYADES-LIKE AGE OPEN CLUSTER NGC 2489

A. E. Piatti,[1] J. J. Clariá,[2] J.-C. Mermilliod,[3] M. C. Parisi,[2] and A. V. Ahumada[2]

We present CCD BVI photometry of 2182 stars in the field of the open cluster NGC 2489, supplemented with Coravel radial-velocity observations for 7 red giant candidates. The comparison of the cluster colour-magnitude diagram with isochrones of the Padova group yields $E(B-V) = 0.30 \pm 0.05$, $E(V-I) = 0.40 \pm 0.05$, and V-M$_V$ $= 12.20 \pm 0.25$ for $\log t = 8.70$ and $Z = 0.019$. NGC 2489 is then located at 1.8 ± 0.3 kpc from the Sun and 25 pc below the Galactic plane. A cluster angular radius of $6.7' \pm 0.6'$, equivalent to (3.5 ± 0.3) pc, is estimated from star counts carried out inside and outside the cluster region. The analysis of the kinematical data allowed us to confirm cluster membership for 6 red giants, one of them being a spectroscopic binary. A mean radial velocity of 38.13 ± 0.33 km s^{-1} was derived for these stars. The properties of a sample of open clusters aligned along the line-of-sight to NGC 2489 are examined (Piatti et al. 2007, MNRAS, 377, 1737).

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ABUNDANCE CALCULATIONS USING SYNTHETIC SPECTRA

O. Pintado[1] and S. Adelman[2]

Elemental abundance analysis are derived for the Mercury-Manganese star HR4817 (B8II/III), using CCD recorded exposures obtained with the EBASIM echelle spectrograph in the CASLEO (Complejo Astronómico El Leoncito) 2.1 m telescope in Argentina. The spectra coverage is 390–900 nm. The abundances and microturbulence are calculated using synthetic spectra. The results are compared with previous analyses made with spectra taken using the REOSC echelle spectrograph at CASLEO. With this method we make better determinations of abundances and microturbulence, and identify new chemical elements.

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IMF OF POP III STARS

J. Prieto Brito[1]

I performed a perturbation analysis of matter's overdensity in high redshift halos in order to know the distribution in size of objects that can collapse at first. In order to see which objects can form stars, I performed an analysis of the molecular cooling inside the first formed structures. This analysis gives a possible IMF for the first stars in the Univese.

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SPECTRAL SYNTHESIS OF ACCRETION DISK WINDS IN CATACLYSMIC VARIABLES

R. E. Puebla,[1] M. P. Diaz,[1] and D. J. Hillier[2]

Cataclysmic Variables (CV's) are semi-detached binary systems. Mass is transferred between the system components and accreted onto a white dwarf. When the white dwarf's magnetic field is weak, that transfer is done through an accretion disk which radiates mostly in the ultraviolet (UV). There is observational evidence of mass loss through a wind that comes from the accretion disk. In this work, a new spectral synthesis method for disks is developed. The disk is divided into concentric rings with a standard disk radial temperature distribution. For each ring the statistical equilibrium and radiative transfer equations are solved in the wind. The code CMFGEN by Hillier and Miller is used in a plane parallel geometry, and a single atmosphere of this kind is

associated with each ring. Also, a modified velocity field in the wind is derived in order to take into account the depth-dependence of gravity. The ring emissions, thus calculated, are co-added and linearly corrected for aspect, limb darkening and differential rotation. This spectral synthesis model for a disk wind is parametrized by the mass loss rate $\dot{M}_{wind}$, that is ∼1% of the $\dot{M}_{acc}$. An extra fiducial function is used in order to parametrize the mass loss radial distribution. This function follows the radial viscous dissipation distribution of a standard disk. The dependence of UV emission line profiles on the mass loss rate and accretion rate is analysed and the physical properties of the wind such as temperature, density and terminal velocity are studied.

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COMPACT DUST SHELLS AROUND MASSIVE EVOLVED STARS

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Long baseline interferometric measurements in the 8–13 micron band using VLTI-MIDI have resolved dust around the Wolf-Rayet stars WR 106 and WR 95, the enigmatic NaSt1 which is likely a post-Luminous Blue Variable (LBV), and the prototypical LBV, AG Car. The dust shells around the WR stars gave gaussian half-widths of ∼ 25 to 45 mas and radiative transfer modeling of these shells show the dust being very close (tens of AU) to the star, existing in hostile conditions. The dust around NaSt1 seems to be a compact source embedded in an extended structure indicating current or very recent dust formation. NaSt1 may be a nascent WR emerging from a recent LBV stage and dust formation at this juncture is intriguing and may be a vital clue for the eventual identification of the evolutionary stage of this object. In the case of AG Car as well we marginally resolve dust very close to the central star, distinct from the detached nebula. Here also current dust formation is indicated and may be associated with a previously noted equatorial disk of molecular gas.

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H_2 IN THE QUADRUPOLAR PLANETARY NEBULA NGC 6881

G. Ramos-Larios[1,2], M. A. Guerrero[2] and L. F. Miranda[2]

NGC 6881 is one of the very few quadrupolar PNe, which is constituted by 2 pairs of bipolar lobes oriented towards different directions. This morphology is indicative of changes in the direction of the ejection of material, suggesting the precession of the equatorial ring. The H_2 and optical morphology of NGC 6881 are very different. To investigate in detail the spatial distribution of molecular and ionized material within NGC 6881 and to determine the prevalent excitation mechanism of the H_2 emission, we have obtained new near-IR Brγ and H_2 $\lambda = 2.1218$ μm with WHT, optical Hα and [NII] images with NOT, as well as intermediate resolution JHK spectra with TNG. These observations show that NGC 6881 has multiple bipolar lobes formed at different phases of the nebular evolution.

The H_2 images show bipolar lobes resembling an hourglass. Although these lobes are oriented along the mayor axis of the ionized lobes, they are much less collimated. Additionally, the detected northeast lobe is 3−4 times more extended than the ionized lobes. The central region is resolved in our new H_2 images and show the spatial distribution expected for a ring lying outside the ionized material. The different spectral diagnostics indicate that the H_2 emission is produced by shock excitation in the molecule.

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THE EVOLUTION TOWARDS CATACLYSMIC VARIABLES

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Close but detached binaries consisting of a white dwarf and a main sequence star are important objects for the understanding of the evolution of compact binaries such as cataclysmic variables (CVs), supersoft X-ray sources, and X-ray binaries. Since they are still detached, no accretion takes place, and both stars can be studied without the strong light contamination from an accretion disc. In CVs themselves, it has so far only been possible for a few special systems to get spectral information for the secondary star (i.e. the donor star). These systems, in fact, show peculiar abundances. If it can be confirmed from the study of pre-CVs, that the secondary stars are much more evolved than theoretically predicted, this could be a way to explain the still present mismatch between the observed and predicted period distribution of CVs. We have a large ongoing project to examine these binaries with the special aims of finding those systems which will eventually evolve into cataclysmic variables and to study their secondary stars via optical and IR spectroscopy. Here we show some recent results of this project and present the binary parameters and the analysis of the secondary stars for several Pre-CV systems.

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THE CIRCUMSTELLAR ENVELOPE OF THE ABE STAR HD 76534

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HD 76534 is a B2Ve visual binary star, usually classified as Herbig Be, although there are indications that it could be a classical Be, due to its low NIR excess. The few observations made until today are basically in Hα and show a quick and irregular variability in its profile, generating different suggestions for the circumstellar envelope. Recently, FUSE observations confirmed HD 76534 as a Herbig star, with a clearing of the dust in the inner region of the CS environment (due to the intense radioactive field or planet formation), and revealed the existence of circumstellar gas (H2). In this work we present two high resolution spectra obtained with FEROS La Silla spectrograph, ESO, in observations six months apart from the other. The Hα profiles in these spectra are very diverse from what has been observed until now. The photospherical absorption wings are clearly visible, having a central emission with a well delineated double peak (FWHM > 600 km s^{-1}). The V/R reason is the same and V > R, which leads to the conclusion that the disc is not stable, differently of what has already been published. In addition, there are signals of activity in one of the spectra: an extra emission component, with a larger FWHM (> 600 km s^{-1}), but with a blueshifted absorption. Eventually, this can mean quick matter ejections.

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STRÖMGREN PHOTOMETRY OF THE δ SCT STAR HR 4555

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We present preliminary results derived from the data obtained during three observing campaigns in 2000, 2001 and 2007, of the δ Sct-type variable star HR 4555, at Sierra Nevada Observatory, Spain. In all the cases, simultaneous uvbyβ photometry was carried out. The analysis of the data was performed in the v band, by means of the Fourier Transform method, and results are shown. The intrinsic b-y, m_1 and c_1 values are derived and the physical parameters of this star are determined.

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NEAR INFRARED PHOTOMETRIC AND OPTICAL SPECTROSCOPIC STUDY OF 22 LOW MASS STAR CLUSTERS EMBEDDED IN NEBULAE

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J. J. Clariá[3]

Among the star clusters in the Galaxy, those embedded in nebulae represent the youngest group that has only recently been explored. The analysis of a sample of 22 candidate embedded stellar systems in reflection nebulae and/or HII environments is presented. We employed optical spectroscopic observations of stars in the directions of the clusters together with near infrared photometry from the 2MASS catalogue. Our analysis is based on source surface density, colour-colour diagram and on theoretical pre-main sequence isochrones. We take into account the field star contamination by carrying out a statistical subtraction. The studied objects have the characteristics of low mass systems. We derive their fundamental parameters. Most of the cluster ages turned out to be younger than 2 Myr. The studied embedded stellar systems in reflection nebulae and/or HII region complexes do not have stars of spectral types earlier than B. The total stellar masses locked in the clusters are in the range 20-220 solar masses. They are found to be gravitationally unstable and are expected to dissolve in a timescale of a few Myr (Soares et al. 2008, A&A, 478, 419).

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SPECTROSCOPY IN OPEN CLUSTER REMNANTS

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The nature of NGC 1557, NGC 1963 y NGC 2017, catalogued as posssible clusters remnants (Bica et al. 2001, A&A, 366, 827) has been investigated combining infrared photometry and spectral classification. Another object, NGC 1520, an open cluster candidate (Dias et al. 2002, A&A, 389, 871), was also investigated. The four objects are located in poorly populated fields at galactic latitudes $|b| > 15°$. Spectra were obtained at CASLEO (Argentina), using a REOSC-DS spectrograph, during several runs from 2004 to 2006. The spectra cover a range from 3900 to 5500 Å. These observations were complemented with JHK photometry and proper motions from the 2MASS and UCAC 2 (Zacharias et al. 2003, IAUJD, 16, 45) catalogues respectively. We obtained spectral classification for 36 stars in the four fields. It allows us to clarify the nature of these objects, in the sense that no one of them is a real open cluster remnant. The available proper motion data and infrared color-magnitude diagrams analysis are not enough to give another interpretation when both are combined with spectral classification. In fact, the spectrophotometric distances derived for the bright stars in each region suggest that we are looking at just a handful of evolved stars superimposed along the line of sight. This is revealing that the simple strategy of superimposing isochrones to apparent main sequences and ilusory red giant branches can lead to wrong conclutions in the computation of survival rates of open clusters.

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SPECTROSCOPIC AGE AND METALLICITY FOR A SAMPLE OF GLOBULAR CLUSTERS FROM STELLAR POPULATION MODELS

M. J. Stock[1] and P. Calderón[1]

We present spectroscopic age and metallicity predictions for a sample of 20 Globular Clusters in the massive E0 galaxy NGC 1407 (data from Cenarro et al. 2007, AJ, 134, 391) and for the Galacic Globular Clusters data from the Library of Integrated Spectra of Galactic Globular Clusters (GGC's) from Schiavon et al. (2005, ApJS, 160, 163) including the widely studied 47 Tuc cluster. Using index-index plots we compared model Single Stellar Populations (SSP's) spectra to the integrated spectra of both samples of Globular Clusters using high resolution line strength indices (Stock, in prep.) and the syntethic SSP's models from P. Coelho (2007, private comm.) as well as the CB07 solar models. For the GC's in NGC1407, the predictions from the syntethic models's with $[\alpha/\mathrm{Fe}]$=0.4 are in good agreement with the results from Cenarro et al. (2007, AJ, 134, 391), taking into account that the dispersion is partially due to the fact that the mean $[\alpha/\mathrm{Fe}]$ ratio of the sample is ≈ 0.3 dex, resulting in younger ages and lower metallicities (Thomas et al. 2003, A&A, 401, 429). We observe a bimodal distribution of the Fe4383+ index which is in turn an indicator of metallicity, also seen in Cenarro et al. (2005). The CB07 models predict ages that are widely spread over the plot yielding ages greater than 14 Gyrs. The metallicity derived from these models are very low for almost all the objects ($Z < 0.008$). The distribution of the GGC's on the syntethic model grid shows a trend in the sense that metal poor clusters are younger than metal rich ones, but this effect might not be real (de Angeli et al. 2005, AJ, 130, 116). For 47 Tuc we estimate an age of ≈ 10 Gyr, and metallicity $Z < 0.011$

(<[Fe/H]= −0.5) which are both comparable with the values reported in the literature (Carretta et al. 2000; Liu & Chaboyer 2000, ApJ, 544, 818; Schiavon et al. 2002, ApJ, 580, 873; Gratton et al. 2003, A&A, 408, 529).

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DATING COMPACT STAR CLUSTERS IN THE SMALL MAGELLANIC CLOUD BY MEANS OF INTEGRATED SPECTRA

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We present Flux-calibrated integrated spectra in the optical range for 12 compact Small Magellanic Cloud (SMC) star clusters, approximately half of which are unstudied objects. The Sample includes objects in the surroundings and main body of the SMC. Cluster reddening values are estimated by interpolation between the extinction maps of Burnstein & Heiles (1982, AJ, 87, 1165). We used two different procedures to derive cluster ages: (i) template matching, and (ii) equivalent width (EW) method, in which diagnostic diagrams involving the sum of EWs of selected spectral lines were employed together with their calibrations with age and metallicity. A good agreement between ages derived from both procedures was found. The derived foreground $E(B-V)$ values are in the small range $0.03 \leq E(B-V) \leq 0.06$, while ages vary from $\sim$ 10 Myr in Bruck 164 to $\sim$ 400 Myr in IC 1641. The present data constitute a spectral library at the metallicity level of SMC clusters.

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SPECTROSCOPIC PERIODS FOR CVS FROM THE CALÁN-TOLOLO SURVEY

C. Tappert,[1] T. Augusteijn,[2] T. Dall,[3] and J. Maza[4]

We have searched the Calán-Tololo objective prism survey for cataclysmic variables (CVs). The properties of that survey, its limitation to galactic latitudes $|b| > 20°$ and its faint lower magnitude cut-off at $B \approx 18.5$, make it ideally suited to investigate the local population of CVs, avoiding the general observational bias towards bright, distant objects. With several follow-up observations, we have confirmed 21 systems, including 16 previously unknown systems of which 4 CVs have been independently discovered by other surveys in the meantime. Of the 14 CVs in this sample with unknown orbital period, 6 show photometric orbital modulation in the form of eclipses or humps. For the remaining 8 objects, the orbital period was derived by means of time-series spectroscopy. Of the 21 CVs, we find 15 objects below the period gap of 2–3 h, 1 system in the period gap (the known polar QS Tel), and 5 above the gap, 3 of them being magnetic CVs.

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CALCULATION OF PHYSICAL PARAMETERS FOR THE MEMBERS OF THE OPEN CLUSTER IC 2391

R. E. Velásquez,[1] J. García,[2] M. J. Stock,[1] and N. Sánchez[3]

In this work we perform the first test of a stellar classification method (Stock & Stock 1999, RevMexAA, 35, 143), using more than 20 absorption lines in the spectral range 3800–5500 Å. The sample of stars are members of the open cluster IC 2391, using high-resolution spectra from the UVES project of Paranal Observatory. We show that the absolute magnitudes M_V and intrinsic colors $(B-V)_0$ can be recovered within the errors predicted by the original calibration ($\sim$ 0.4 for magnitudes and $\sim$ 0.03 for colors), in comparison with previous measurements from the literature. This accuracy allows us to estimate distances and to infer membership of individual stars to obtain an average distance to the cluster of 156 ± 24 pc, which is in good agreement with previously reported determinations. We discuss the advantages

and difficulties of using this method and how it can be improved to be used in the future for similar studies.

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SPECTROSCOPIC-PHOTOMETRIC ANALYSIS OF THE BINARY SYSTEM V4089 SAGITARII

M. E. Veramendi[1] and J. F. González[1]

We present an observational analysis of the eclipsing double-lined spectroscopic binary HR 7422=V4089 Sgr. Nineteen spectra were obtained with the 2.15 m telescope and the bench echelle spectrograph EBASIM of the CASLEO observatory, while photometric observations in the Johnson V band were carried out with the 61 cm telescope at CASLEO. We measured radial velocities to a precision of 0.45 km s^{-1} for both stellar components using the method of separation of composite spectra by González & Levato (2006, A&A, 448, 283). From light and radial velocity curves we derived orbital and physical parameters for the system using the Wilson & Devinney code. With this aim, our light curve was complemented with the photometry in the V band of the Geneva system published by North et al. (1997, A&A, 324, 137). We obtained masses and radii to a precision of 0.45% and 0.9%, respectively. The system V4089 Sgr is very useful to test stellar models due to the great difference between the components. The comparison with theoretical stellar models of Lejeune & Schaerer (2001, A&A, 366, 538) suggest an age of $\log \tau = 8.695 \pm 0.007$ yr. Since the primary is close to the TAMS, we used this system to compare the predictions of standard and overshooting models.

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THE GLOBULAR CLUSTER NGC 5286: COLOR-MAGNITUDE DIAGRAM AND VARIABLE STARS

M. Zorotovic[1] and M. Catelan[1]

We present BV photometry of the globular cluster NGC 5286. The CMD was decontaminated and several HB and RGB parameters were calculated, finding a metallicity of [Fe/H] $= -1.69 \pm 0.07$. We also present the result of the search of variable stars. 56 variable stars were detected, 51 RR Lyrae (22 RRc and 29 RRab), 4 LPV's and 1 Type II cepheid (BL Herculis). 17 of the RR Lyrae are previously known. The mean period of the RRab variables is $\langle P_{\rm ab} \rangle = 0.654$ days, and the number fraction of RRc stars is $N_C/N_{\rm RR} = 0.43$, suggesting that NGC 5286 is an Oosterhoff type II (OoII) globular cluster. The physical parameters of the RRc and RRab variables were obtained from Fourier decomposition of their light curves, revealing a value for the metallicity of [Fe/H] $= -1.675 \pm 0.053$.

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TOPIC 5: GALAXIES — LARGE SCALE STRUCTURE — COSMOLOGY

THE VELOCITY FIELD IN THE NEIGHBOURHOOD OF CLUSTERS OF GALAXIES: A STUDY BASED ON PHOTOMETRIC REDSHIFTS

H. Capelato,[1] L. Sodré Jr.,[2] G. B. Lima Neto[2] and D. Proust[3]

We present a preliminary study of the velocity field in the neighbourhood of the Abell 1942 cluster of galaxies ($z \approx 0.22$), for which both photometric and spectroscopic redshifts are available. Besides characterizing the dynamical stage of this particular cluster, the aim of this work is to search for efficient tools capable to provide reliable representations of the infall velocity fields for samples of clusters of galaxies, based solely on photometric redshifts.

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ESTIMATIVE OF THE TEMPERATURE OF CENTRAL STARS FOR NPS OF DISTANT GALAXIES

R. E. Carlos Reyes[1,2] and G. G. Detthow[3,4]

We show that there is a strong correlation between the temperature of the ionization source and the emission lines observed in PNe for a sample of the Large and Small Magellanic Clouds. We use the principal component analysis to build an indicator of temperature from the emission lines observed. Such indicator can be used to estimate the temperature of the central star in PNe of distant galaxies, where is possible to observe emission lines.

λ	Ion	a_λ
3869	Ne III	20.32
4363	O III	96.25
4648	C III	24.94
4686	He II	26.81
4713	Ar IV	245.97
4740	Ar IV	253.53
5412	O I	286.63
6300	O I	88.52

Using data from the literature we define an index I for the lines that correlate best with temperature

$$I = \frac{1}{N}\left(\sum_{i=1}^{n} a_{\lambda_i} F_{\lambda_i} + C\right) \qquad (1)$$

where $C = 769.23$, $N = 18000$, and a_λ depends on the spectral line (see Table above).

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A MODEL FOR INTERACTING DARK ENERGY

B. M. de O. Fraga[1] and N. P. Neto[2]

In standard cosmology, dark energy and matter evolve independently, with no interaction. However, this seems to be a very special case. A much more generic approach would be that in which dark energy and matter actually interact, so the equations of conservation of energy for these components must be changed. We propose a model for this interaction together with a new model for the evolution of matter that lead to a bouncing universe, i.e., a universe that first goes through a phase of contraction before the expansion currently observed. We also try to model a universe without a bounce, but undergoing a phase of accelerated expansion, which is what is observed today.

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THE ARAUCARIA PROJECT: THE DISTANCES TO THE NGC 247 AND WLM GALAXIES FROM CEPHEID VARIABLES DISCOVERED IN A WIDE-FIELD IMAGING SURVEY

A. García,[1] W. Gieren,[1] and G. Pietrzynski[2]

Two different and extensive wide-field imaging surveys for Cepheid variables have been made in the Sculptor Group galaxy NGC 247 and in the Local Group Irregular galaxy WLM. We present the principal results obtained in this surveys in the context of the Araucaria project. We have discovered 60 Cepheids in WLM and 24 Cepheids in NGC 247. Our data define tight period-luminosity relations in V, I and the reddening-free Wesenheit magnitude W_I which are all extremely well fit by the corresponding slopes of the LMC Cepheid PL relation, suggesting no change of the PL relation slope down to a Cepheid metal abundance of about -1.0 dex, in agreement with other recent studies. We derive a true distance modulus to NGC 247 of 27.80 ± 0.09 (r) ± 0.06 (s) mag from our data, in good agreement with the earlier 27.9 ± 0.1 mag determination of Davidge (2006, ApJ, 641, 822) from TRGB I band magnitude. The true distance modulus to WLM derived from our data was 25.144 ± 0.03 (r) ± 0.07 (s) mag, in good agreement with the earlier 24.92 ± 0.21 mag determination of Lee, Freedman, & Madore (1993, ApJ, 417, 553) from Cepheid variables. Aditional information is available in The Araucaria Project homepage (`http://ezzelino.ifa.hawaii.edu/~bresolin/Araucaria/index.html`) and in the series of papers entitled: The Araucaria Project.

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MEASURING THE UNIVERSE WITH SUPERNOVAE

M. Hamuy[1]

This talk is a review of the methods to derive extragalactic distances using supernovae. I will discuss the techniques that involve both Type Ia and Type II supernovae. In each case I will summarize the status of the determination of cosmological parameters and the prospects to improve these measurements in the years to come.

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3D HYDRODYNAMIC SIMULATIONS WITH *YGUAZÚ-A* CODE TO MODEL A JET IN A GALAXY CLUSTER

S. A. R. Haro-Corzo,[1] P. Velazquez,[1] and A. Diaz[2]

We present preliminary results for a galaxy's jet expanding into an intra-cluster medium (ICM). We attempt to model the jet-gas interaction and the evolution of a extragalactic collimated jet placed at center of computational grid, which it is modeled as a cylinder ejecting gas in the z-axis direction with fixed velocity. It has precession motion around z-axis (period of 10^5 sec.) and orbital motion in XY-plane (period of 500 yr.). This jet is embedded in the ICM, which is modeled as surrounding wind in the XZ plane. We carried out 3D hydrodynamical simulations using *Yguazú-A* code. This simulation do not include radiative losses. In order to compare the numerical results with observations, we generated synthetic X-ray emission images.

X-ray observations with high-resolution of rich cluster of galaxies show diffuse emission with filamentary structure (sometimes called as cooling flow or X-ray filament). Radio observations show a jet-like emission of the central region of the cluster. Joining these observations, in this work we explore the possibility that the jet-ambient gas interaction leads to a filamentary morphology in the X-ray domain.

We have found that simulation considering orbital motion offers the possibility to explain the diffuse emission observed in the X-ray domain. The circular orbital motion, additional to precession motion, contribute to disperse the shocked gas and the X-ray appearance of the 3D simulation reproduce some important details of Abel 1795 X-ray emission (Rodriguez-Martinez et al. 2006, A&A, 448, 15): A bright bow-shock at north (spot), where interact directly the jet and the ICM and which is observed in the X-ray image. Meanwhile, in the south side there is no bow-shock X-ray emission, but the wake appears as a X-ray source. This wake is part of the diffuse shocked ambient gas region.

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DISTANCE DETERMINATION TO TYPE II SUPERNOVAE USING THE EXPANDING PHOTOSPHERE METHOD (EPM)

M. Jones[1] and M. Hamuy[1]

The determination of extragalactic distances is very important because it allows us to determine cosmological parameters like the density of matter and the cosmological constant. Due to their high luminosities, type II supernovae have great potential as extragalactic distances indicators, and offer an independent way to check the accelerating expansion of the universe discovered using type Ia SNe. The expanding photosphere method (EPM) for type II supernovae is a geometrical technique that relates a photometric angular size and a spectroscopic physical size, from which a distance can be determined. In this work, we apply this method to ~ 25 type II supernovae in order to asses the internal consistency of this technique, the accuracy, and the precision in the derived distances. With these data we construct a Hubble diagram and obtain a measurement of the Hubble constant, independent of the extragalactic distances scale.

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KINEMATICS AND PHYSICAL PROPERTIES OF SOUTHERN INTERACTING GALAXIES: AM 2306-721

A. C. Krabbe,[1] M. G. Pastoriza,[1] C. Winge,[2] I. Rodrigues,[3] and D. L. Ferreiro[4]

We present the spectroscopic study of the interacting galaxies AM 2306-721, to obtain a more comprehensive picture of the effects of the interaction in the kinematics, stellar population characteristics and oxygen abundances of these galaxies. Optical spectroscopy in the range 3700–7200 was obtained with the Gemini Multi-Object Spectrograph at Gemini South for both galaxies, at different position angles. The gas kinematics and morphological information were used as constraints for numerical N-body simulations of the encounter, which predict that the situation that best reproduces the morphology and kinematics of AM 2306-721 system at the current stage is about 250 Myr after perigalacticum. We estimate a dynamical mass of $M(R) = 1.29 \times 10^{11}\ M_{\odot}$ within a radius of 18 kpc for the main galaxy and $M(R) = 8.56 \times 10^{10}\ M\odot$ within a radius of 10.7 kpc for the secondary galaxy. The disk of the main galaxy shows a clear radial oxygen abundance gradient, which is typical of spiral galaxies. The effects of the interaction were more clearly seen in the companion galaxy, which besides the morphological distortions show enhanced star-formation and smooth [O/H].

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ANALYSIS OF BULGES FROM SPECTRA OF LOW SURFACE BRIGHTNESS GALAXIES

I. Lacerna,[1] G. Galaz,[1] and L. Morelli[2]

Spectra from a sample of bulges hosted by low surface brightness galaxies (LSBGs) are analyzed. The goal is to study stellar population in LSBGs, through the metallicity and the age after an instantaneous burst of stellar formation. Several Lick/IDS indices are calculated using absorption lines, such as Hβ, Mgb and <Fe>=(Fe 5270+Fe 5335)/2, and also OIII (λ = 5007 Å) emission line. Models and absorption lines from some standard stars are used to estimate velocity dispersions in the nuclei of this galaxies. Global properties of spectra with different models are compared, adjusting initial mass function (IMF), star formation rate (SFR) and metallicity. A value of $[\alpha/\mathrm{Fe}] = 0.00$ is the best fit model. With this value, we find important correlations between Hβ and Mgb, besides Hβ and <Fe>.

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EFFECTS OF AGN FEEDBACK IN GALAXY GROUPS AND INTERGALACTIC MEDIUM

C. Lagos,[1] N. Padilla,[1] and S. Cora[2]

The combination of Cosmological numerical simulations and semi-analytical models of galaxy formation is a very appropriate method to study how different phenomena influence the galaxy and galaxy cluster formation. The main advantage of this combination consists in the fact that N-body simulations do not need to be rerun every time a change in the assumptions about baryonic processes is made since these are included in the semi-analytical models which run on the final N-Body simulation output. The Semi-analytic model takes into account radiative cooling of gas, stellar formation and different types of SN contribution, which eject energy and metals to the interstellar medium, allowing the chemical enrichment of the intergalactic medium. In this project we use the semi-analytic hybrid model by Cora (2006, MNRAS, 368, 1540) and implement the AGN feedback, in two modes, the QSO mode (which takes into account mergers and galactic disk instabilities), and the Radio mode, which modifies the cooling in the galaxies These two processes allow to suppress the super flows in the hybrid model, and allows the study of QSOs in galaxy groups. This new implementation opens different possibles studies including the QSO luminosity function, the anti-hierarchical evolution of Mass Function, the BH mass and bulge mass relation, Color-Magnitude diagrams, TF relation, the galaxy luminosity function, the effects of AGN in neighbor galaxies and the behavior of QSOs in the sub-millimeter window.

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CLASSIFICATION OF GALAXIES USING AUTOMATIC LEARNING ALGORITHMS: SEQUENTIAL SOLUTION AND PARALLEL DESIGN

E. R. Meneses Cuadros,[1] A. Plata Gómez,[1] and N. Vera-Villamizar[2]

We present an automated process for the morphological classification of galaxies in elliptical, spiral, and irregular types. The process can be divided in three stages: (1) Digital treatment of the image: which includes filtering (noise removal), segmentation (image centering and extraction), rotation (to a standard orientation), resizing (to a standard size), and decomposition (color, gray scale, or combined). (2) Parameter extraction: the galaxy is characterized by eigenvectors derived via principal component analysis. (3) Automatic learning using the following algorithms: artificial neural networks, K neighbor, regression locally weighed, and support vector machines, which produce the desired answer, the type of galaxy. The tests were developed with a group of 450 images with different galaxies types. A combination between the type becomes thef input image, the algorithm of extraction of parameters is fixed, and the algorithms of automatic learning are varied. The best combination of these algorthms provide an exactitude of 84%. Since the algorithm processes enormous amounts of data with thousands of calculations, the processing time is a problem. We are considering using parallel processing at various stages to improve this situation.

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STAR FORMATION AT HIGH REDSHIFT GALAXIES, A SEMI-ANALYTIC APPROACH

J. C. Muñoz [1] and J. I. Zuluaga[1]

We use semi-analytical models to analyze galaxy formation in low resolution cosmological N-body simulations and to study star formation rates in time. Our implementation follows the evolution of galaxies in halos through the fusion merger trees of halos in a similar way as presented in Kauffmann et al. (1993, MNRAS, 264, 201) and Kang et al. (2005, ApJ, 631, 21). Our procedure to model the evolution of baryons in halos includes star formation, radiative cooling, supernovae feedback and mergers of galaxies. In our first results we obtain properties of galaxies at redshift $z = 0$ with which we verify the results of our code, and present some results on the evolution of the star formation rate for the most massive halos in our simulations. Our results are in good agreement with other works and with observations, but star formation rates show deviations compared with some observations.

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THE STANDARDIZED CANDLE METHOD FOR TYPE II-PLATEAU SUPERNOVAE

F. A. Olivares Estay[1] and M. Hamuy[1]

The large luminosities of type II supernovae (SNe) (those with a hydrogen-rich envelope) make this class of objects an interesting distance indicator. Their luminosities can be standardized using the expansion velocity of the photosphere estimated from P-Cygni line profiles of Fe II (Hamuy & Pinto 2002, ApJ, 566, L63). However, one of the problems that hampers their use in distance determinations is the uncertainty in the host-galaxy extinction.

In this work we examine the usefulness of the $V - I$ color measured toward the end of the plateau phase (the optically thick era of the supernova) as a reddening estimator. For this purpose we first assume a standard reddening law ($R_V = 3.1$) and then we relax this constrain and solve for R_V by minimizing the dispersion in the Hubble diagram.

From a set of 30 type II plateau SNe we obtain a dispersion in the Hubble diagram of 0.4 mag when we fix R_V to 3.1, and 0.3 mag when we treat R_V as a free parameter. In the latter case we find $R_V = 1.71 \pm 0.11$, which suggests a significantly different extinction law than the Galactic case.

The calibration of the Hubble diagrams, using Cepheid distances for SN 1999em (Leonard et al. 2002, PASP, 114, 35) and SN 2004dj (Freedman et al. 2001, ApJ, 553, 47), yields a weighted mean of BVI filters for the Hubble constant of 71.3 ± 3.4 km s^{-1} Mpc^{-1} using the second technique for dereddening.

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BARYONIC MATTER AT SUPERCLUSTER SCALES: THE CASE OF CORONA BOREALIS II

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In a recent survey at 33 GHz for baryonic matter at large scales in the Corona Borealis Supercluster (CrB-SC) of galaxies ($z = 0.07$) using the Very Small Array interferometer (VSA), covering 24 deg^2, two strongs decrements in temperature (CrB-B and CrB-H) near the centre of the supercluster were detected. The amplitudes are -157 ± 27 and $-230 \pm 23\,\mu\,K$ for decrements CrB-B and CrB-H respectively. There are no known clusters of galaxies coincident with the position of either of these decrements. Monte-Carlo simulations show that only CrB-B can be produced by primary anisotropies in the Cosmic Microwave Background (CMB) radiation. To explain the origen of CrB-H, a combination of both CMB perturbations and the Sunyaev-Zel'dovich effect (SZE) is required. We explore the possibility that this SZE could be produced by warm/hot gas on superclusters scales. ROSAT images do not show X-ray emission in these regions. We study the distribution of galaxies down to $r \leq 20$ magnitudes in CrB-SC. Our analysis reveals in the region of CrB-H an overdensity of galaxies by a factor of two with respect to nearby control fields. No evidence for a new cluster is found, but the presece of a large number of galaxies in the intercluster region is suggestive that associated gas could be at least partially responsible for the observed temperature decrement in the CMB signal. We obtained spectroscopic redshifts for a sample of these galaxies and found first evidence for a substructure in the spot region extending from $z = 0.07 - 0.09$. This is suggestive of a dense filamentary structure of size several tens of Mpc.

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SURFACE PHOTOMETRIC PROPERTIES OF HII GALAXIES

B. Vajgel[1] and E. Telles[1]

HII galaxies are dwarf galaxies undergoing violent star formation. They were firstly selected by objective-prism spectroscopy and were object of extensive studies to characterize their physical conditions of the interstellar medium. Their SFR together with their low Z raised the question whether some of them can be truly "young" galaxies. To infer the SFH, one needs information in a large spectral range. We obtained images in the optical region of the spectrum with the 0.6 m B&C and the 1.6 m telescopes at the Laboratório Nacional de Astrofísica, for a sample of 50 objects in B, V, R and I, which combined with recent evolutionary models, enable us to deduce the stellar population content and its spatial distribution. These seem to be the nearest youngest galaxies that can be studied in detail, and their structural properties offer important indications about the evolutionary relation and the origin of dwarf galaxies in the universe. With this sample we built a morphological catalogue with broad-band photometry, including the structural analysis through the brightness profiles. The initial analysis suggests that the galaxies can be segregated in two broad classes, in agreement with what had already been proposed in the literature; Type I have irregular envelopes with signs of perturbation and turn out to the more luminous sub-sample; while Type II have regular external isophotes and are less luminous. The brightness profiles are well represented by exponential fits, as in irregular and elliptical dwarf galaxies. However, HII galaxies are more compact in comparison with their more diffuse counterparts. We study the behavior of the HII galaxies in the metallicity-luminosity plane. This relation, interpreted as a relation between the mass and the metallicity of dwarf galaxies of low surface brightness (dE and dIrr), has direct implications for their formation and evolution, and over the possible evolutionary links between HII galaxies and other types of dwarf galaxies.

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TOPIC 6: ASTRONOMICAL INSTRUMENTS — SURVEYS

ASTROLABE PHOTOELECTRIC PAII. AN EXPERIENCE OF 15 YEARS OF COOPERATION

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Following a cooperation agreement between the Chinese Academy of Sciences, CONICET, La Plata National University and the San Juan National University, on February 1992, the Photoelectric Astrolabe Mk 2 (PA2). was placed at the Félix Aguilar Astronomical Observatory in San Juan (Argentina). This instrument, designed and built in Nanging (China), is fully automatic and can observe stars brighter than 11.5 apparent magnitude. Similar instruments are simultaneously operated in China (Beijing, Shangai and Yunan) in order to obtain homogeneous Star Catalogues of great precision and extended to faint stars. It also brings secondary results as Catalogues of Optic Radio Sources, Planets, Minor Planets, Coordinates of the Instantaneous Pole and Earth Rotation Parameters. Some results obatined during these 15 years are: the 1st, 2nd, and 3rd San Juan Photoelectric Astrolabe Catalogues, which are referred to the Southern Hemisphere. These have been afterwards related to those observed in the Northern Hemisphere (China), producing the 1st Global Astrolabe Star Catalogue, which contains more than 10.000 stars with declinations from +80 to −80 degrees. Nowadays we are performing Astrogeodynamics Studies which consist in the analysis of anomalies of Time-Latitude variations, and then relate them to big earthquakes occurred in San Juan during that period.

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THE UNCERTAIN FUTURE OF ARECIBO OBSERVATORY

D. R. Altschuler[1]

After forty years of existence, Arecibo Observatory has an uncertain future. On November 3th, 2006 the "Senior Review" (SR), an advisory panel, recommended to the astronomy division of NSF that the anual budget destinated to astronomy in the Observatory, should be reduced from US$10.5 million annual to US$8 million during the first 3 years. The SR also indicated that the Observatory have to be closed in 2011, if an external financial source is not found. The SR panel was called to find near US$30 million in savings (approximately 25% of total budget of the five national observatories, including Arecibo) to redirect them to operate new future projects.

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A MULTI-PURPOSE ENVIRONMENT FOR THE TWO-DIMENSIONAL ANALYSIS OF WIDE-FIELD IMAGES

H. Capelato,[1] F. La Barbera,[2] R. R. de Carvalho,[1] and J. L. Kohl-Moreira[3]

We describe the 2DPHOT package, a general purpose environment for automated source detection and analysis in deep wide-field images. It was designed to be able to obtain both integrated and surface photometry of galaxies in an image, to perform reliable star-galaxy separation with accurate estimates of contamination at faint flux levels, to estimate completeness of the image catalog, and to detect clusters and groups of galaxies using the Voronoi tessellation method. This new environment is intended to be a dedicated tool to process the wealth of data from wide-field imaging surveys. The 2DPHOT package is part of the current efforts which are being made at INPE, for developing a Virtual Observatory structure (projet BRAVO: Brazilian Astrophysical Virtual Observatory).

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CLIMATOLOGY OF SIERRA NEGRA

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Sierra Negra, one of the highest peaks in central Mexico, is the site of the Large Millimeter Telescope, a 50 m antenna that will operate between 1–3 mm. The site combines high altitude (4600 m) and extremely low atmospheric water content. We report the results of a comprehensive analysis of the weather data measured in situ from October 2000 to December 2006. The conditions at the site are benign given its altitude: the median value for the temperature is 1.1°C, for the wind velocity is 3.6 m/s, for the relative humidity during the dry season is 56% and for the atmospheric pressure is 590.1 mbar.

We show that our measurements are consistent with a warm standard atmosphere model.

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DEVELOPMENT OF THE FIRST LATIN-AMERICAN RADIO INTERFEROMETER

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First Latin-American radio interferometer is being developed at INPE, Cachoeira Paulista, Brazil, in a collaborative program between several national and international institutions coordinated by a Brazilian team of scientists and engineers. The interferometer is designated as Brazilian Decimetric Array (BDA) and its 5 element prototype of 4 m diameter antennas (Phase-I) was put into operation by November 2004 at Cachoeira Paulista (Longitude: 45° 00′ 20″ W and Latitude: 22° 41′ 19″ S) for engineering and operational tests with a frequency range of 1.2–1.7 GHz, baselines up to 216 m in the E-W direction, and time resolution of 0.1 second. Observations of the Sun and strong calibration sources (Cygnus-A, Taurus-A) were carried out. Unidimensional solar map at 1.6 GHz was produced with a spatial resolution less than 3 arcminutes. Also, investigation of the solar brightness temperature (T_b) variation was possible on a day-to-day and hour-to-hour basis. This investigation show for example a steady increase on T_b starting from 15:00 UT on December 08, 2004. Interpretations of these results will be presented. In 2005, the first phase of development has finished. Now, Phase-II has begun during which the array will have 21 additional antennas and operate with increased frequency range as well as improved spatial resolution. It is planned to finish it by March 2009. Details of this will be presented.

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DESIGN OF A HELIOSTAT FOR CENTRO DE INVESTIGACIONES DE ASTRONOMÍA (CIDA)

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This paper explains the procedure used in the design of a heliostat to be installed at the headquarters of the Centro de Investigaciones de Astronomía, located in the city of Mérida, Venezuela. The heliostat will be used mainly for educational and public outreach programs, so the design specifications did not require compensation for rotation of the Sun's image at the focal point. The engineering computational tools CAD-CAE were used in order to allow a seamless interaction between the two disciplines involved, Mechanical Engineering and Astronomy. It has also been taken into consideration, as a starting requirement, that all materials be easily available and that all parts, excluding the optics, could be manufactured with the equipment available at the CIDA workshop. These considerations were intended to reduce the cost of the device and to increase the feasibility of construction with limited technological facilities and financial resources. The results obtained by means of the computing tools used were validated through comparison against the analytical calculations. As a result, a robust but low cost heliostat was designed which in the near future will be used to project the Sun's image on a screen for public viewing and student research projects.

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ESOPO A MEDIUM RESOLUTION OPTICAL SPECTROGRAPH

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The Instituto de Astronomía, of the Universidad Nacional Autónoma de México, after an internal licitation, determined to design and manufacture a Medium Resolution Optical Spectrograph. The instrument will be attached to the 2.1 m telescope at the National Astronomical Observatory at San Pedro Mártir, México. The project was granted to the ESOPO group, winner of the call for proposals. The basic purpose of the project is to equip the observatory with a modern and more efficient spectrograph. Its main goal is to solve astronomical problems that require an ample optical range with a spectral resolution between 500 and 5000. These projects include observations of extended stellar objects, external galaxies, and stars inside our galaxy. In this work we present the scientific goals of ESOPO spectrograph, its translation to high level requirements, its optical design as well as its mechanical design and optomechanics for 24 lenses. The error budget for image quality and motion are included. Finally, management, organization, and first light date of the project are described.

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ALMA OPPORTUNITIES DURING THE FIRST YEARS OF OPERATION

D. Mardones[1]

The first ALMA antennae arrived in Chile last month. Thus, the most visible part of the observatory construction is now underway. During the next two years a dozen antennas will be commissioned and a first call for proposals will be issued. Even the early-ALMA array, having 12–24 commissioned antennas in the years 2009–2010 will offer outstanding new research opportunities. By 2012 ALMA should be in full operations, allowing studies at submillimeter wavelengths matching the optical spatial resolution and offering unequaled sensitivity both in continuum and line studies. In this talk I will focus on the ALMA observatory from the observer's point of view. In particular, I will talk about some of the key issues during the first years of ALMA operations, and conclude with the expected capabilities of the complete ALMA observatory by 2012. The first few years of operations ALMA will not have the submillimeter imaging quality and sensitivity expected from the full ALMA array; however, it will still be much more sensitive than current instruments, and it will also open new atmospheric windows. I will draw on examples from the main ALMA science drivers, including the study of the ISM, disks, and galaxies. The next three years will be essential to ready the community for ALMA use and the first results will likely be reported in the next Regional Meeting.

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AUTOMATIZATION PROJECT FOR THE CARL-ZEISS-JENA COUDÉ TELESCOPE OF THE SIMÓN BOLÍVAR PLANETARIUM II. THE GRID INFRASTRUCTURE

A. G. Muñoz,[1,2] F. Luengo,[1] and S. Reverol[1]

In this work we present the schematics for the automatization project of the 150 mm aperture, 2250 mm focal length Carl-Zeiss-Jena Coudé Refractor Telescope belonging to the Complejo Científico, Cultural y Turístico Simón Bolívar (CCCTSB), located in Maracaibo, Venezuela, with special emphasis in the control software, user interface and the grid infrastructure that will be stablished for the data adquisition, data minning (KDD) and processing. We discuss several characteristics of the (secure) web-based user interface, the control and instrument utilities, the grid environment configuration and the hardware-related specifications.

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AUTOMATIZATION PROJECT FOR THE CARL-ZEISS-JENA COUDÈ TELESCOPE OF THE SIMÓN BOLÍVAR PLANETARIUM I. THE ELECTRO-MECHANIC SYSTEM

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The "Complejo Científico, Cultural y Turístico Simón Bolívar" (CCCTSB), located in Maracaibo, Venezuela, lodges the Simón Bolívar Planetarium and an 150 mm aperture, 2250 mm focal length Carl-Zeiss-Jena Coudè refractor telescope. In this work we discuss the schematics for the automatization project of this Telescope, the planned improvements, methodology, engines, micro-controllers, interfaces and the uptodate status of the project. This project is working on the first two levels of the automation pyramid, the sensor — actuator level and the control or Plant floor level. The Process control level correspond to the software related section. This mean that this project work immediately with the electrical, electronic and mechanical stuffs, and with the assembler micro controller language. All the pc related stuff, like GUI (Graphic user interfaces), remote control, Grid database, and others, correspond to the next two automation pyramid levels. The idea is that little human intervention will be required to manipulate the telescope, only giving a pair of coordinates to ubicate and follow an object on the sky. A set of three servomotors, coupling it with the telescope with a gear box, are going to manipulate right ascension, declination and focus movement. For the dome rotation, a three phase induction motor will be used. For dome aperture/closure it is suggested a DC motor powered with solar panels. All those actuators are controlled by a 8 bits micro-controller, which receive the coordinate imput, the signal from the position sensors and have the PID control algorithm. This algorithm is tuned based on the mathematical model of the telescope electro-mechanical instrumentation.

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CHARACTERISING THE VENEZUELAN TROPOSPHERE FOR RADIO-ASTRONOMY STUDIES

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Venezuela possesses a very useful geographical location for doing Radioastronomy. Recently, the Venezuelan Government (via FIDETEL-Ministerio de Ciencia y Tecnología) has aproved to the Laboratorio de Astronomía y Física Teórica (LAFT) of La Universidad del Zulia (Venezuela) the adquisition of four 3 meter diameter parabolic dishes that will be set as a radio-interferometer receiver and that can be used for certain Radioastronomy purposes. The specifications of the instrument will be treated elsewhere (Muñoz and Hernández 2007).

To this aim, as ussually, the first step is to characterize the losses due to the atmosphere, and their evolution over time. In previous works (Muñoz et al. 2004, Memoires of V RIAO/VIII OPTILAS, M10-5 Modelling Tropospheric Radio-Attenuation Parameters for Venezuela, 359; Muñoz et al. 2006, CIENCIA, Vol. 14, 4, 428) we have studied some relevant electromagnetic (e-m) attenuation parameters dueto hydrometeors and absortion gases in the lower atmosphere, focused in local telecommunication applications (surface e-m trajectories). In this work we extend our results to include the cenital and quasi-cenital e-m trajectories, characterizing thus the medium losses in the 0.4–4.0 GHz spectral window for several Venezuelan locations. We report refractivity values and their gradients, tropospheric indexes, extinction coefficients and the total rain attenuation for the whole territory under study.

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THE CHILEAN AUTOMATIC SUPERNOVA SEARCH (CHASE)

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One of the most important challenges in modern cosmology will be to figure out the origin of the dark energy, to measure its equation of state and the time rate with which it changes (described by parameters w and w'). The measurement of these parameters will require high levels of accuracy in the Supernova (SN) Type Ia distances and various sources of systematic error such as reddening corrections and possible evolution in the SN Ia characteristics which could couple with redshift and mimic the cosmological signal of interest. Fortunately, these concerns can be fully addressed through the comprehensive study of SNe in the local ($z < 0.05$) universe. Although Type II plateau SNe are not as luminous as SNe Ia, they afford two important, independent routes to cosmological distances using the Expanding Photosphere Method and the Standardized Candle Method. To assess the performance of these techniques a nearby sample of Type II SNe is necessary. With the purpose of addressing these issues the Millennium Center for Supernova Studies (MCSS) is teaming up with the Carnegie Supernova Project (CSP) to carry out an optical and near infrared (photometry, spectroscopy and polarimetry) follow up of nearby SNe. Unfortunately, the majority of the SNe observed by the MCSS and the CSP are discovered by searches carried out from the northern hemisphere. This entails a number of observational difficulties, in particular, it reduces the number of SNe for which the follow-up starts at very early epochs. The aim of the CHASE project is to remove this search bias by discovering young Southern SNe that will be extensively observed by the MCSS and the CSP. In the first nine-months of operation, CHASE has discovered two SNe: SN 2007oc (CBET 1114) and SN 2007pl (CBET 1130), thus demonstrating the feasibility of the survey.

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SAN JUAN SATELLITE LASER RANGING. PERFORMANCE AND PRECISSION IN THE OBSERVATIONS

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In this paper we present the San Juan Fixed Station SLR N 7406 in Argentina, installed according to an international agreement between the Astronomical Observatory Félix Aguilar (OAFA, belonging to the National University of San Juan) and the National Astronomical Observatory of China (NAOC, belonging to the Chinese Academy of Sciences), which has been working continually since 2006. We give the perfomance reached by this new telescope in precission and number of observations, regarding the standard satellite LAGEOS, and we carry out a comparison with the values given by the International Laser Ranging System (ILRS) with other instruments of the SLR world net. The results of the LAGEOS observations show that our determinations of the pass average normal points rms are in the order of 12 millimeters and the pass number full rate are very abundant. The San Juan Station is now the strongest station in South America and is becoming more crucial to both the evolution of the Terrestrial Reference Frame and the SLR precission orbit determination of the world.

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SITE TESTING IN THE NORTHWEST OF ARGENTINA

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We present results of the characterization of the Tolar Grande-Macon Range site in the North-West of Argentina. This project is being developed by the IATE in collaboration with ESO in the framework of the E-ELT project. We present and discuss one year of image quality measurements with MASS and DIMM, three years of meteorological data and detailed studies of seismic activity and geo-technical aspects as well as diverse logistic issues.

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FIRST LIGHT ON THE GTC 10.4 M TELESCOPE

J. M. Rodríguez Espinosa[1]

The Gran Telescopio Canarias (GTC) is a collaborative project with participation from Spain, Mexico and the University of Florida, Gainesville. The GTC is an advanced technology 10.4 m segmented primary telescope currently under commissioning. By the time of the conference we should have pointed to the sky. In the talk I will give a brief overview of the GTC, and present the latest results from the commissioning tests. I will also give an account of the scientific instruments that will be initially available for the community, as well as the current plans for future instruments.

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TOPIC 7: OUTREACH

SAN MARCOS ASTRONOMICAL PROJECT AND DOCTORAL PROSPECTUS

M. L. Aguilar[1]

The Universidad Nacional Mayor de San Marcos, UNMSM, in Lima, Perú, is the only Peruvian institution working for the peruvian astronomical development as a career since 1970. We are conforming a network with international friend astronomers to invite them as Visiting Lectures to assure the academic level for the future doctoral studies in the UNMSM. The Chancellor of UNMSM has decided that the Astronomical Project is a UNMSM Project, to encourage and advance in this scientific and strategical area, to impulse the modernity of Peru, the major effort will be the building of the San Marcos Astronomical Observatory, with a telescope of 1 meter aperture.

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AN OUTLOOK ON THE SCENES OF PARADIGMATIC CHANGES IN ASTRONOMY

R. Girola[1]

In this introduction I will put forward solutions which have been given to resolve the disagreements about the different models in the history of Astronomy from a didactic point of view. It is also about having a critical and prudent look concerning the risk of combining theories which may turn out apparently valid as it is in the case of the Tycho Brahe historical model. I will particularly focus on four models from a historical and epistemological perspective with the purpose of showing how the conflictive scene moved on to an efficient way out of the problem. To do so I will describe the variables in age, time and space(cognitive space and time of Astronomy) by confronting historical models with contemporary ones about the dispute concerning the Universe dynamic description. The Mond theory explains the difficulties in the interpretation of the rotation of the spiral galaxies claiming that Newton laws are not accurate in great scale, thus denying the solution of the missing matter. At the same time the rival theory refuses the solution given by its opponent Mond theory, through observations of galactic clusters in interaction, stating the existence of Dark Matter. The chosen historical confrontations are the following: (a) Heliocentric and Geocentric Model, (b) The origin of the 1920 debate: Curtis and Shapley, (c) The Red Shift of the Galaxies and the Unchanging Cosmology, and (d) Dark Matter and Newton's Laws as viewed from Mond Theory, which is about the present disagreement. The target focuses on showing the building up of both theories and the risk of combining them as well.

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ASTRONOMICAL AND RELATED KNOWLEDGE OF VENEZUELAN INDIGENEOUS GROUPS

D. Sánchez[1]

This work comprises the research (1990–2005) by the author in relation with the astronomical knowledge of the aboriginal ethnic groups living in Venezuela. Essentially it is a resume of the three books by the author titled *Astronomy of the Arawaks from Venezuela, Astronomy of the Caribs from Venezuela*, and *Astronomy of the Bari (Chibchan) and Isolated ethnic groups from Venezuela*. The research has been guided mainly by the cosmogonic and cosmological concepts of each one of the more than twenty ethnic groups living in Venezuela, included in the above mentioned books, and also with the relations they have between the cosmos and climate, habitat conditions, mythology and their daily work, their life and culture. Due to the fact that this research covers very different human groups, obviously, we will find several ways in the description of origins and organization of the cosmos.

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EXPERIMENTAL EDUCATION OF ASTRONOMY ACROSS THE SEEDBEDS OF INVESTIGATION IN SCIENCES

E. Taborda[1]

In Colombia, the geographic situation help us in the moment of make academic work of astronomic observation, due to the opportunity of look almost the totality of the nocturnal sky in the hemispheres north and south in on night generating the possibility of make easy our labor as educators and to the astronomy and the related science with the students learn and the socialize in fundamental areas as mathematics, physic, chemistry, biology, art, technology, geography and history between others fundamental areas. In our presentation will be show the results of 3 years of in which we the students of primary and high school studies as a descriptive study of these research. we need economic help for the aid to this event.

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LIST OF ABSTRACTS