

Universidad de Guanajuato
Departamento de Astronomía
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The following report covers the Department activities from November 2001 through October 2002.

1. INTRODUCTION

The Department of Astronomy (DA) was founded in late 1994 as part of the Instituto de Física (IFUG, León) of “Universidad de Guanajuato” (UG), the university of Guanajuato state. The DA with a current staff of eight astronomers is located in the city of Guanajuato. Its main goals are teaching, research and outreach to the public. For additional information see the web site at <http://www.astro.ugto.mx>.

2. PERSONNEL

The members of the DA during the period covered were Heinz Andernach, Elias Brinks (on sabbatical at the INAOE since March 2002), Hector Bravo-Alfaro, Patricia Carral (on leave of absence in 2002), Philippe Eenens, Renée Kraan-Korteweg (Head of Dept. since February 2002), and Victor Migenes. Roger Coziol (Montreal, Canada) joined the DA in September 2000 on a visiting professorship (CONACyT) for two years and occupies a temporal position since September 2002.

3. ACADEMIC PROGRAM

3.1 Undergraduate Program

In 1998 the *Licenciatura en Física* (BSc) was formally created at UG and offers essentially a double-major in physics and astrophysics. The program was created to prepare and nurture students interested in astronomy and astrophysics and to better prepare them for graduate programs and research. The BSc is a new program trying to prepare students for the highly technological fields of physics and astronomy, including knowledge in electronics, computation and problem solving techniques required in other fields.

3.2 Postgraduate Programs

The DA currently does not yet offer graduate studies in Astronomy. However, several staff members are co-supervising students for their MSc or PhD theses (see next section), and teach courses in other Mexican astronomy programs.

The DA owns the observatory “La Luz” located about 18 km west from Guanajuato city. It provides a 57-cm Ritchey-Chretien reflector, equipped with a photometer, and a CCD camera with a filter set has been acquired. The telescope will be used as a laboratory for students and for small research projects accessible to this kind of instrument (e.g. monitoring of relatively bright variable stars).

3.3 Theses supervised

E. Brinks is co-supervising the PhD thesis of Luis Ramírez Garduño, a student at INAOE, Tonantzintla,

Mexico. J. Ott at Bonn University, supervised by E. Brinks, successfully defended his thesis in August 2002.

M. Ochoa-Silva has submitted his MSc thesis supervised by R. Kraan-Korteweg and H. Andernach on the existence of a possible obscured galaxy cluster in the Great Attractor region; the defense was approved in Dec. 2002. R. Núñez started her doctoral thesis within the bilateral ECOS-ANUIES project M00-U02 at the IAP in France in September on NIR observations of galaxies hidden in the Zone of Avoidance under the joint supervision of G.A. Mamon (IAP) and R.C. Kraan-Korteweg.

Laura Cruz is working on her MSc thesis on the maser emission in star forming regions, supervised by V. Migenes.

3.4 Outreach

Since its foundation the DA has organized two annual cycles of five talks to the public, every spring and autumn. These tend to be delivered by Mexican astronomers in the center of Guanajuato.

Twice a month during the “dry season” (September through March) we offer guided tours to the public at the observatory “La Luz,” usually attended by 10–25 people. Both the 57-cm telescope and an 8-inch Celestron are used for stargazing. The roof of the central building of UG is equipped with a 20-cm reflector (now under repair) as well as an 8-inch Celestron. The site is supervised by two engineers and open to the public every evening on weekdays. It is planned to host a Science Center devoted to public astronomical observations and presentations.

Since 1998, the DA has regularly offered a 100-h course called “Diplomado de Astronomía.” It is open to the public and designed as an introductory astronomy course requiring little mathematical or physics background, but keeping a structured and systematic way of answering and discussing many of the questions and interests people have. On average it is attended by ~50 people with an increasing fraction of students.

3.5 Organization of Meetings

From March 5–10, 2001, V. Migenes organized the international symposium “Cosmic MASERS: from black holes to protostars,” held in Mangaratiba, Rio de Janeiro, Brazil. Over 100 astronomers from over 20 countries attended. The conference proceedings were edited by V. Migenes and M. Reid (CfA) and will appear in late 2002 as IAU Symposium Volume 206.

P. Eenens is organizing the IAU symposium No. 15 on “Stellar Rotation” to be held in Cancún from November

10–15, 2002. Over 130 astronomers from some 30 countries will attend. The proceedings will be edited by A. Maeder and P. Eenens.

H. Andernach is a member of the organizing committee of the Mexican National Astronomy Meeting which takes place once per year.

4. RESEARCH

4.1 Stars and Star Formation

P. Eenens studies the physical characteristics, chemical composition and structure of winds of massive stars, as well as the parameters of variable stars and interactions between components of binary stars. The aim is to improve our knowledge of the fundamental parameters of massive stars and to understand the process of their evolution based on observable phenomena. He uses stellar spectroscopy to determine distances and abundances of some OB stars in clusters. He also chairs the IAU Working Group on Hot Massive Stars and edits the *Hot Star Newsletter* (see <http://www.astro.ugto.mx/~eenens/hot>).

P. Carral investigates the formation of massive stars through interferometric observations of radio continuum and molecular line emission. She studies molecular cores in order to identify their heating source and to understand their evolutionary state and their relation with ultracompact H II regions.

V. Migenes uses radio-interferometric techniques to observe the spectral and continuum emission from star formation regions, late-type stars and AGNs. He studies the physical and kinematical conditions in these regions. In particular he uses the various maser lines of OH, H₂O and SiO and their properties to probe the sources' most active regions with sub-arcsecond resolution in order to better understand the processes involved in star formation, the chemical composition and structure of the winds and mass loss processes in late-type stars, and finally the existence of black holes in the nuclei of galaxies. He also applies radio-interferometric techniques to study the origin and nature of the non-thermal emission from radio stars.

4.2 Formation and Evolution of Galaxies

The research by E. Brinks focusses on nearby galaxies. He collaborates in a multi-wavelength study of the interstellar medium in nearby dwarf irregular galaxies with the aim to understand the interaction between sites of massive star formation and the ISM. Although an avid H I fan, part of his activities are extending into the X-ray regime, using the *Chandra* and *XMM-Newton* observatories. He is also actively participating in studies of tidally induced dwarf galaxies and in searches for H I counterparts to damped Ly α systems.

He is editor of Newsletter on dwarf galaxy research called *Dwarf Tails* (<http://www.inaoep.mx/~dwarfs>).

H. Bravo-Alfaro uses multi-wavelength observations of spiral galaxies in clusters, e.g. 21-cm and radio continuum, optical photometry and spectroscopy to study environmental effects between galaxies and the intracluster medium, observational features of starburst and post-starburst galaxies, and

dynamical stages of galaxy clusters. He participates in a team observing nearby ($0 < z \leq 0.2$) clusters of galaxies in H I, which has been allocated more than 500 hours of VLA time for the period 2000–2002. He is also actively collaborating with E. Brinks, A. Baker (Max-Planck-Institut für extraterrestrische Physik) and F. Walter (AOC-NRAO, Socorro) in the study of star forming dwarf galaxies from H I (VLA) and CO (OVRO) data. H. Bravo-Alfaro is also collaborating with R. Coziol in a multifrequency study of groups of galaxies, including deep NIR photometry and optical spectroscopy, as well as VLA-H I data coming from the VLA archives.

R. Coziol studies the effect of environment on galaxy evolution in compact groups of galaxies and in the field, searching for an evolutionary relation between the H II galaxies and the more massive starburst nucleus galaxies, based on radio data as well as optical and near-infrared spectroscopy and imaging. He collaborates with Migenes on the search for new extragalactic H₂O masers.

4.3 Observational Cosmology

R.C. Kraan-Korteweg, in a number of international collaborations, works on the uncovering of the partially to fully obscured galaxy distribution behind the Milky Way through various systematic observational multi-wavelength approaches (optical, near infrared, and blind H I surveys) to obtain a better understanding of the peculiar velocity of the Local Group (to be compared to the dipole anisotropy in the CMB radiation), other streaming motions (such as in the Great Attractor region), and the possible continuation (or existence) of superclusters across or behind the Milky Way. Particular emphasis is given to the clustering in the Great Attractor region.

H. Andernach is involved in a collaboration on a radio-X-ray study of relic radio sources in clusters of galaxies to determine their morphology and radio spectral shapes, as well as their cosmic ray content via the inverse-Compton effect. He has also performed (with others) a deep radio search for gravitational arcs in several southern Abell clusters which are prominent in X-rays. He maintains a compilation of published redshifts of Abell clusters of galaxies and, with colleagues at Tartu Observatory, exploits it for the determination of the distribution of superclusters in the nearby Universe. Together with collaborators at SAO (Russia), he is looking for radio and optical counterparts to radio sources found at decametric frequencies, with the help of the largest radio source database (CATS, <http://cats.sao.ru>). The latter is maintained by a group at SAO (Russia) in collaboration with H. Andernach who has collected electronic tables during the last 10 years from over 1400 published articles of which only a third is available through the astronomical data centers.

PUBLICATIONS

Refereed papers by department members (published and accepted), and edited books from Nov. 2001–Oct. 2002, are included.

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