

Introduction

This report contains a summary of the wide variety of research activities that were carried out in our Physics Department and TANDAR Laboratory during the year 2001. Significant production has been achieved in the main fields and projects that concentrate the interest of our staff: nuclear physics, condensed matter, astrophysics, solar energy, applications of nuclear-physics techniques, and interdisciplinary research using the heavy-ion accelerator TANDAR. Related areas that have shown an increasing level of activity include research on chaos and complex systems, intermediate energies, amorphous-carbon films and micro-electromechanical systems. Technical support and maintenance of infrastructure and experimental facilities has been provided via a number of auxiliary laboratories and dedicated groups that cover most of the requirements in the fields of electronics, high-vacuum, target and thin-foil production, mechanical workshop, computers and networks, and operation and maintenance of the heavy-ion accelerator.

The strong involvement of the research staff in teaching activities has continued both at local universities and within the framework of our postgraduate program. Twenty two graduate students have worked on their PhD thesis work under the supervision of researchers in connection with the different ongoing projects. Five of these students have obtained their degrees during this year. In addition to the postgraduate program, six scholarships (postdoctoral and technical) have been associated to the Physics Department. Technical training of high-school students in work related to the heavy-ion accelerator has taken place in the framework of agreements with technical high schools. Finally, the Department has continued its usual strong involvement in the *Laboratorio Cero* program, an outreach activity aimed at senior high-school students.

Some of the most relevant results and facts associated with the different projects and research lines are the following:

Condensed Matter:

- Design and construction of a small carbon 60 accelerator for the production of very hard amorphous-carbon coatings
- Systematic study of hematite nanoparticles using Mossbauer spectroscopy
- Theoretical studies and simulations in nanoscopic systems of technological interest

TANDAR accelerator and applications:

- First irradiations using the microbeam facility that has been recently installed in one of the experimental lines. Multielementary maps with micrometric spatial resolution have been obtained for several samples using the microPIXE technique.
- Studies of the astrophysical interest of the Mg-Al cycle in connection with the production of the stellar production of the radioisotope ^{26}Al using Accelerator Mass Spectrometry (AMS)
- The accelerator itself has benefited from the partial upgrading of the control system

Solar Energy

Most of the activity of the Solar Energy group was aimed to the design of solar cells and panels in connection with the argentine space program. In this respect:

- Beginning of the Solar Panels Project for the provision of the solar panels required by the satellite mission SAOCOM, in the framework of an agreement between our home institution (CNEA) and the national space agency (CONAE). The R&D activities include, among others, the design and building of an integration facility, development of bonding procedures and device characterization techniques, design and test of interconnectors, development of c-Si devices and radiation damage test facilities
- Provision of low-cost solarimeters for the National Weather Service (Servicio Meteorológico Nacional) which will be installed in portable weather stations located in remote areas of the country, and a module built with c-Si solar cells fabricated in CNEA, to power a tracking system of a solar kitchen developed at University of Salta.

Astrophysics

The Physics Department has continued its strong involvement in the Pierre Auger Project, an international effort to make a detailed study of cosmic rays at the highest energies. Some of its staff members have played leading roles in the construction of the southern-hemisphere observatory located at Pampa Amarilla in the province of Mendoza, which has proceeded according to schedule. In addition to this effort, related R&D activities had taken place locally, mostly associated with the detection prototype TANGO.

The activities of the Physics Department have been supported mainly by CNEA, although we must also acknowledge important contributions from other agencies such as the National Research Council (CONICET), the National Agency for Science and Technology (ANPCyT), and Fundación Antorchas.

I would like to express my deep gratitude and appreciation to all members of the Physics Department who, in spite of a variety of negative circumstances that still affect the practice of scientific research, have devoted their effort towards the achievements of the year 2001.

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