

## CARA - THE CENTER FOR ASTROPHYSICAL RESEARCH IN ANTARCTICA

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The Center for Astrophysical Research in Antarctica is a new National Science Foundation Science and Technology Center formed to explore and exploit the unique advantages of the Antarctic Plateau for astrophysical observations.

Member institutions currently include the University of Chicago, Princeton University, Boston University, the University of Illinois, Haverford College, George Williams College, AT&T Bell Laboratories, Rockwell International Corporation, and Adler Planetarium. Administrative offices of the Center are located at the University of Chicago's Yerkes Observatory in Williams Bay, Wisconsin.

Currently planned research includes the following projects:

- AST/RO (Antarctic Submillimetre Telescope and Remote Observatory) will use a 1.7 m diameter submillimetre telescope to survey the Galactic plane, the Galactic Center, and the Magellanic Clouds in the emission from the fine-structure line from CI at 609  $\mu\text{m}$  and the J=4 P3 line of CO at 650  $\mu\text{m}$ .
- The COBRA (Cosmic Background Radiation Anisotropy) experiment will search for and map anisotropies in the cosmic background radiation on angular scales ranging from 15 arcmin to 20° at sufficient sensitivity to place stringent constraints on current theories of the origin of the universe.
- SPIREX (South Pole Infrared Explorer) will use a near-infrared telescope and infrared array detectors to explore the potential of the Antarctic Plateau as an infrared site and to make deep 2.4  $\mu\text{m}$  continuum surveys for faint sources including primeval galaxies, brown dwarf stars and dust-obscured objects in regions of star formation.

Center researchers and a broadly-based group of astronomers from the United States and other countries will conduct experiments to measure environmental parameters including sky brightness, atmospheric transmission, and seeing. They will also discuss and develop plans for more powerful telescopes which could be built in the future at the South Pole or other Antarctic sites.

## FRENCH PLANS FOR ASTRONOMY IN ANTARCTICA

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French astronomers have been involved in research programs in Antarctica since 1979 when a successful campaign on helioseismology was done by a collaboration between the Nice University and the Bartol foundation. Several campaigns followed on this subject. In 1984 sub-mm observations of the diffuse galactic emission were done by a collaboration between the LPSP (Verrières le Buisson) and the Bartol foundation. These showed the high quality of the site for such observations not only because of the low water vapour content, which gives good transparency, but also because of the very low sky noise.

Future plans for Antarctic research by French astronomers are not well defined yet but strong interest exists in three fields:

- helio and stellar seismology
- mm observations of the Sunyaev-Zeldovich effect, complementing balloon-borne sub-mm observations
- site testing for image quality in the visible.

Such plans would preferably be carried out in an international base such as the one proposed by CARA at Dome A. The French plans for Antarctic infrastructure call for a base at Dome C, mostly optimized for geophysical observations.

## ITALIAN PLANS FOR ASTROPHYSICAL OBSERVATIONS FROM ANTARCTICA

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The characteristics which make Antarctica interesting for astrophysical research are: i) atmospheric transparency, ii) remoteness iii) geographical and geomagnetic position. Because of previous experience of observation from arctic sites in northern Europe and from isolated mountain sites, groups of Italian astrophysicists were immediately ready to go to Antarctica and bring their equipment to places not easily accessible, in a difficult environment when, about ten years, ago, the antarctic regions became more accessible.

With the support of the Italian Antarctic Program, two astrophysical projects are at present under way. 1) A permanent facility OASI (= Infrared and Submillimetric Antarctic Observatory) is in operation at Terra Nova Bay, the Italian base. Details about OASI were presented in a separate paper at this same conference (G Dall'Oglio 1991). 2) Observations of the Cosmic Background Radiation from the Amundsen Scott Base at South Pole are made by the University of Milano in collaboration with the Lawrence Berkeley Laboratory - University of California/Berkeley. Both programs are expected to continue in 1991 and in the following years. In particular there are plans for regular observations at OASI and for an extension of the study of the Cosmic Background Radiation by adding to our radiometers, used to measure the CBR temperature, a polarimeter which will measure the degree of polarization (expected to be extremely small or null) of the CBR at 33 GHz.

Stimulated by the positive results so far obtained and by the expected improvements of the facilities available at Terra Nova Bay, in particular the transformation of the Base from only summer to a permanent station, new projects are now under consideration, namely: i) observations at mm, sub-mm and in the infrared wavelength region (superheterodyne spectrometer for observation of molecular lines; source variability in the IR). ii) observations of the celestial background radiation at different wavelengths iii) studies of solar phenomena, in particular solar oscillations; in winter, monitoring of optical sources. iv) studies of the Cosmic Rays from ground level and at balloon altitudes (Cerenkov radiation in the earth's atmosphere and in the ice; opportunities offered by the reduced geomagnetic cut-off; search for rare components; long duration balloon flights around the polar cap). v) observations at the border between astrophysics, space physics and atmospheric physics, planned by collaborations between researchers of the three fields.

Amongst Italian astrophysicists who have been involved in observations in polar regions there is strong interest in projects for international facilities, completely dedicated to astronomy and astrophysics, supported and run by an International Institute.