NEWS AND VIEWS

First Observations from Copernicus

THE first observations from the orbiting astronomical observatory Copernicus were reported in *Nature Physical Science* last week (**239**, 135; 1972). The X-ray star Cygnus X-3 was observed on September 7, 19 and 29 by the instrument provided by the Mullard Space Science Laboratory (MSSL). Unlike the radio observations the X-ray data do not indicate any great enhancement in the flux but do show clear evidence of periodic variability on the time scale of a few hours. There is already speculation that the radio emission may not come from the X-ray object.

The X-ray telescopes on Copernicus, proposed by Professor Robert Boyd in 1963, represent the first use of focusing X-ray optics in an orbiting observatory for non-solar X-ray astronomy. Earlier X-ray instruments on satellites have been of the survey type in which detectors of large area, with mechanical collimators, scan as the satellite rotates. NASA's Uhuru satellite has catalogued some 130 X-ray objects in this way.

Copernicus has arrived at a timely moment in the development of X-ray astronomy, for more detailed studies of the sources listed in the Uhuru catalogue are now needed. The position and mapping of many of the sources require considerable improvement, and spectra need to be measured over a wide range. And, of course, long and short term measurements of variability can give an insight into the type of X-ray source. The instrument aboard Copernicus, with its small acceptance angle, wide wavelength range and ability to point for extended periods, can tackle all these problems.

The X-ray instrument has prime viewing time one day in every ten. Princeton University's ultraviolet telescope occupies 90 per cent of the time with an extensive programme of high resolution spectroscopy of bright ultraviolet stars and interstellar matter. Both X-ray and ultraviolet instruments view in the same direction, and simultaneous operation has proved feasible and easy to plan. If there are X-ray emissions from the Princeton ultraviolet targets, they can be detected to limits lower than those set by previous measurements. The desirability of observing the X-ray isotropic background and its fluctuations provides an additional stimulus for joint operation of the instruments.

The limited prime observing time for known X-ray targets will allow study of thirty or so sources a year and viewing priorities must be established. A panel, chaired by an MSSL project scientist, is to assess proposed observations; it includes representatives of the optical, infrared and radio astronomy communities in Britain. Observations have been proposed by astronomers from MSSL, the University of Leicester, the University of Birmingham, the University of Cambridge, the Royal Greenwich Observatory, the University of Sussex and Jodrell Bank, and the wide participation in the observing programme should benefit collaboration in British astronomy.

The faultless performance of the systems aboard the Copernicus spacecraft and the extent by which they exceed specification is quite remarkable. For example, the pointing jitter of 0.03 arc s, when viewing bright ultraviolet stars, is three times lower than specified and it will inevitably improve the quality of the photometry. Hardly any X-ray targets have bright optical counterparts so that in this case pointing has to be under the control of an inertial reference unit. The drift of this unit is 2 arc s an hour, which enables lengthy observations or scans of an object to be made before time has to be spent updating the reference unit with an observation of a bright star. The indications are that X-ray objects can be positioned to 20 arc s when the pointing of the instrument is fully calibrated.

Copernicus is demonstrating that a large space observatory with excellent pointing capability is now technically possible. Unfortunately it will be the next decade, perhaps, before a large observatory devoted to X-ray astronomy is in orbit. In the meantime there are plans for more sensitive survey missions in several national programmes, so that by the advent of the large observatory the number of X-ray sources may well exceed 1,000. Most of these additional sources will be extragalactic. There is a clear need for additional X-ray missions, before the large observatory is launched, with telescopes at least ten times larger than those on Copernicus. It is encouraging that the ESRO project of a highly eccentric lunar occultation observatory received wide support at a recent colloquium, for it is the kind of mission ideally suited to more detailed studies on faint X-ray sources.—From a Correspondent.

Proteins and Fused Cells

FOR many years biochemists have wrestled with the problem of identifying proteins within single cells. Anyone reared on the standard histological procedures soon realized how inadequate and unspecific most of the staining methods were. Moreover the urge to identify the individual protein types within a cell has intensified under the pressure of theories about gene expression, differentiation and clonal selection.

Because most cells possess many thousands of protein types at any one time, attempts to study the protein contents of single cells have concentrated on the red blood cell, possessing as it does few other proteins besides haemoglobin, which is often present in more than one form. So biochemists and cytologists have addressed themselves to the task of identifying the particular haemoglobin species within individual red blood cells. To date four methods have been tried. First, blood cells have been challenged with fluorescently tagged antibody raised against the haemoglobin, different colours of label being tagged to the antibody against the differing haemoglobins. Such an approach has been exploited by a number of workers such as Dan and Hagiwara (*Exp. Cell Res.*, **46**, 596; 1967) and Maclean and Jurd (*J. Cell Sci.*, **9**, 509; 1971). A second method has been used by Gitlin *et al.* (*Blood*, **32**, 796; 1968), in which blood cells