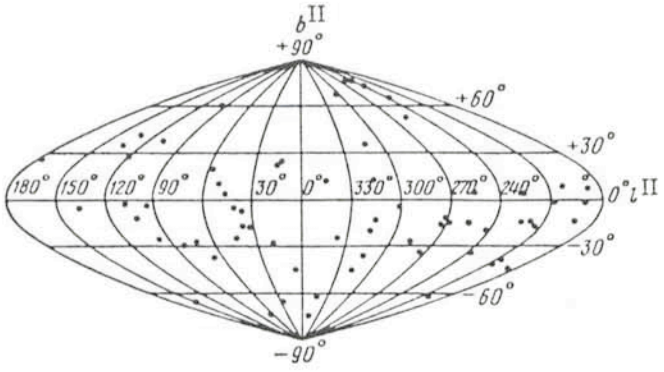

Fig. 3: *The positions of the 69 γ-ray burst sources now roughly localized, shown in galactic coordinates (from Mazets et. al. 1980).*

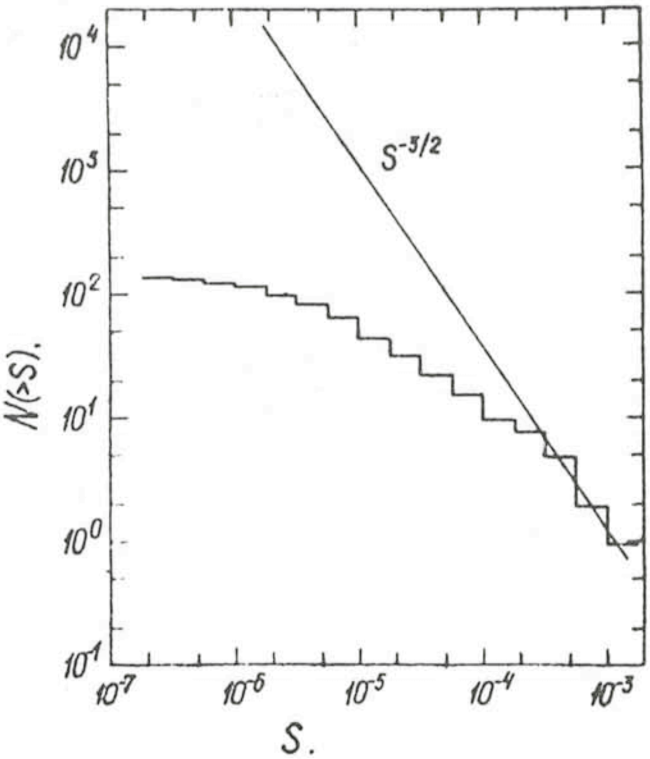

Fig. 4: *The log N-log S distribution for the 43 γ-ray bursts recorded from September 1978 to February 1980 by the Russian Konus experiment on the Venera 11 and 12 spacecraft (from Mazets et. al. 1980).*

If we take into account the known surface densities of faint stars and galaxies at different magnitudes near the galactic pole reported, among others, by Tyson and Jarvis (1979) we find that there should be about 37,800 objects per square degree with magnitudes between 22 and 24. Therefore we would expect between 1 and 3 such objects (Poisson statistics!) in the 800 $arcsec^2$ box which would not appear in the Schmidt plates. Moreover, most of the faintest should be galaxies.

In an attempt to find if any of these faint objects are galactic stars, we plan, during the coming months, to obtain magnitudes, colours and image profiles by continuing photography at the 3.6 m prime focus and also by making electronographic (McMullan camera) and electronic (CCD camera) observations.

The Nature of the Bursts

The spatial distribution of the now about 70 roughly localized bursts is more or less isotropic (see Figure 3). This could indicate either a very local origin (nearby low-luminositiy optical objects) or an extragalactic origin (associated with faraway galaxies). The intensity-vs-number (so-called logN-logS) distribution (see Figure 4) may give some indication in favour of a local origin since, after following a $S^{-1.5}$ power law, it flattens out at low intensities much more than would be expected from instrumental selection effects alone.

The very short time scales sometimes exhibited by gamma-ray bursts (see Fig. 1) imply very compact sources like neutron stars (the rise time of the 1979 March 5 event was less than 200 microseconds, suggesting a source size of less than 60 km!). These arguments have recently been used by some authors (R. Sunyaev, S. Bonazzola) to propose for gamma-ray bursters a model somewhat similar to that currently accepted for the recurrent X-ray bursters (see THE MESSENGER No. 23) which differ from gamma-ray bursters in intensity, spectrum and recurrence but have time scales analogous to some gamma-ray bursts. The gamma-ray bursts would be due to thermonuclear flashes ($3\ He^4 \rightarrow C^{12} + \gamma$) occurring in the surface layers of neutron stars which undergo a very slow but steady accretion of matter, presumably in binary systems.

Although nearby galactic neutron stars seem the most plausible candidates for gamma-ray burst sources, the alternative suggestion of an extragalactic (albeit neutron-star-based) origin for the 1979 March 5 event has not yet been completely abandoned by some theorists in spite of the rather incredible values of burst luminosities that it would imply ($3\ 10^{44}$ ergs/sec if at the distance of the LMC). Therefore, optical identification of these sources is still a crucial task. And it requires a detailed, time-consuming study of all the faint optical objects in the small error boxes derived for some of the best-studied gamma-ray bursts.

References

Chambon, G. et al. 1980, in *Non solar gamma-rays,* R. Cowsik and R. D. Wills, eds. Pergamon Press, p. 141.
Cline, T. L. et al. 1980, *Astrophysical Journal,* Letters, **237,** L1.
Evans, W. D. et al. 1980, *Astrophysical Journal,* Letters, **237,** L7.
Hurley, K. 1980, in *Non solar gamma-rays,* R. Cowsik and R. D. Wills, eds. Pergamon Press.
Laros, J. G. et al. 1981, *Astrophysical Journal,* Letters (in press).
Mazets, E. P. et al. 1980, *Soviet Astronomy,* Letters, **5,** 318.
Tyson, J. A., Jarvis, I. F. 1979, *Astrophysical Journal,* Letters, **230,** L 153.

ESO Conference on the "Scientific Importance of High Angular Resolution at Infrared and Optical Wavelengths"

The conference on the "Scientific Importance of High Angular Resolution at Infrared and Optical Wavelengths", announced in the last issue of the MESSENGER, took place in the ESO headquarters at Garching on 24–27 March 1981. It was attended by 91 participants from 13 countries.

The aim of this conference was to help deciding if the large telescope of the future should be made of a single 16 m mirror or of several smaller aperture telescopes forming an interferometer. Accordingly, present achievements of both speckle interferometry and interferometry with multiple systems were extensively discussed together with the theoretical limitations of these techniques. Then the needs for high angular resolutions in all fields of astronomy from the solar system to the galaxies have been presented.

Good arguments have been given for both solutions, single and multiple apertures. Some lively discussions on this subject have shown that any decision would be premature.

The workshop proceedings will be published by ESO in a few weeks. *P. V.*

PERSONNEL MOVEMENTS

STAFF

Arrivals

Europe

FLEBUS, Carlo, I, Laboratory Technician, 1.5.1981
MÜLLER, Karel, DK, Administrative Assistant (Accounting), 1.5.1981
TANNE, Jean-François, F, Project Engineer in Astronomical Instrumentation, 1.7.1981
HUSTER, Gotthard, D, Designer-Draughtsman, 1.7.1981
MEYER, Manfred, D, Electronics Engineer, 1.10.1981
KRAUS, Hans-Jürgen, D, Driver/General Clerk, 1.7.1981
MALASSAGNE, Serge, F, Designer-Draughtsman, 1.8.1981
PONZ, José, E, Science Applications Programmer, 1.10.1981

Departures

Europe

SCHULTZ, Raimund, D, Driver/General Clerk, 15.5.1981
SCHABEL, Peter, A, Senior Electr. Engineer, 31.8.1981

ASSOCIATES

Departures

Europe

LINDBLAD, Per Olof, S, 31.8.1981

FELLOWS

Arrivals

Europe

BJÖRNSSON, Claes-Ingvar, S, 1.10.1981
GILLET, Denis, F, 1.10.1981
WOUTERLOOT, Jan, NL, 1.10.1981

Departures

Europe

PAKULL, Manfred, 31.5.1981

Photometric, Spectroscopic and IUE Observations of X-ray Binaries

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Introduction

X-ray binaries offer the unique opportunity to study the properties of neutron stars in some detail. In a recent article E. J. Zuiderwijk (THE MESSENGER No. 19, p. 18, 1970) discussed the "Standard Model" of X-ray binaries with massive components, demonstrating the difficulties in lightcurve analysis and mass determination. The model is relatively simple: a normal primary star, which can be observed in visual light, and a neutron star form a binary system. The most important constraint is given by the "Limiting Roche Lobe", a critical surface, which is confining the maximum possible radius of the primary star. The size of this lobe, in units of the separation of the two stars, is dependent only on their mass ratio. Thus the radius of the primary star gives a limiting value for the mass ratio.

It is assumed that the optical star is in bound rotation, which means that the rotational period of the star is identical with the orbital period of the binary system. Thus, the orientation of the star relatively to the axis connecting both components is constant, an assumption which seems quite plausible due to the strong tidal deformation in very close binary systems. If, however, the primary star shows unbound rotation, then the size of the limiting lobe is different from the normal case of bound rotation and as a consequence, a different value for the mass of the neutron star is possible.

Another problem is the mass transfer, which is necessary to make the binary star an X-ray binary. The kinetic energy of the gas falling onto the neutron star is converted into heat, at the surface of the neutron star a temperature of about 10^7K is reached, giving rise to strong X-ray emission. There are two possible mechanisms for the mass transfer: Either the primary star, due to its evolution, has expanded up to its limiting Roche lobe and the matter overflowing this lobe is falling on the neutron star, or the primary star loses mass due to a strong

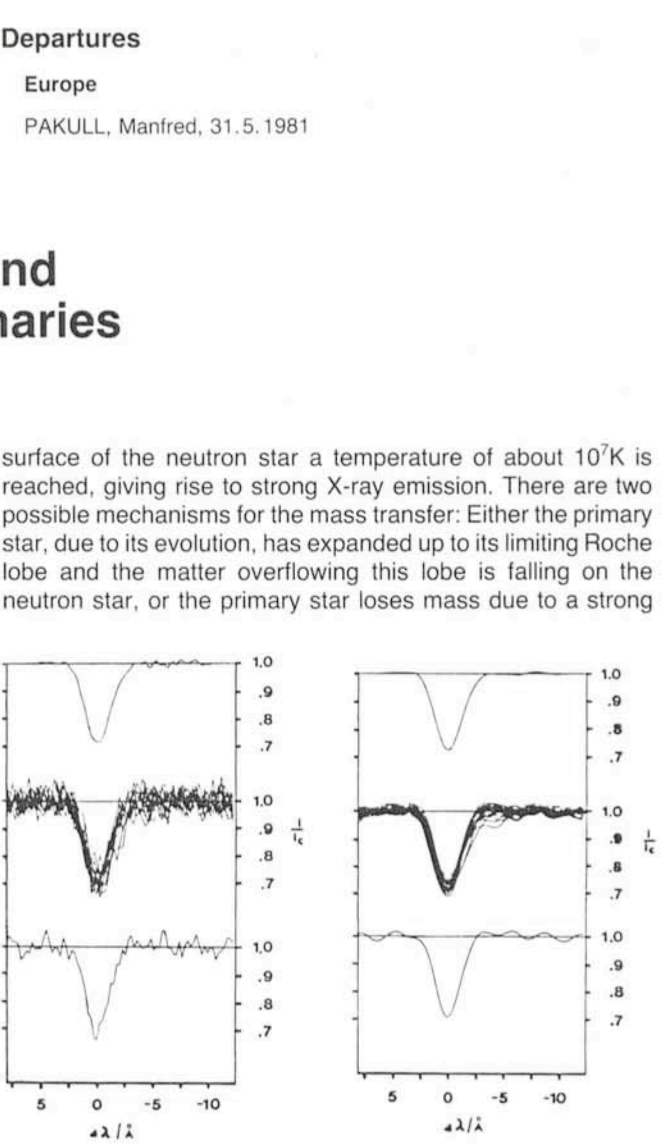

Fig. 1: *The He I 4026 Å line of Vela X-1. Left part: uncorrected line profile. Right part: Corrected for high frequency noise. Bottom: profile of a single line. Middle: profiles of all the 14 spectra used. Top: mean profile.*