letters to nature

Is Fairall 9 an X-ray Seyfert galaxy?

FAIRALL recently identified a new Seyfert galaxy, designated F-9, from coarse spectra of a galaxy evident on an ESO Fast Blue Survey Plate[1]. Only limited data were presented, however, for example, a redshift was not given, nor was the galaxy spectroscopically classified (Seyfert type 1 or 2)[2]. In a search at MIT for possible catalogued optical counterparts to X-ray sources, I noticed that F-9 lies within the common intersection of both a 2A and 4U X-ray error box[3, 4]. Figure 1 shows the 2A error box and part of the (much larger) 4U error box overlaid on an ESO Fast Blue Survey Plate of the region around F-9. The apparent magnitude of F-9 is given as mag ~ 13 (ref. 1). Because of its fuzzy perimeter, it is the most conspicuous object in the 2A error box.

All known X ray-emitting Seyfert galaxies are of type 1 (refs 5 and 6). A determination of the optical classification (type 1 or 2), as well as a measurement of the redshift of F-9 is desirable. Such information, combined with an improved X-ray error box, is essential to establishing the nature of F-9.

After the submission of this paper, West[7] and Ward *et al.*[8] reported a determination of the spectroscopic class of Fairall-9 (= ESO113–IG45). They find it to be a type 1 Seyfert, with a redshift $z = 0.045$ and magnitude $V = 13.2$. Thus, F-9 seems to be the brightest Seyfert galaxy known in the Southern Hemisphere. If the identification of F-9 with 2AO120–591 (4UO105–59) suggested here is correct, then its X-ray luminosity (2–10 keV) is approximately 3.10^{44} erg s^{-1}, which is comparable to that of the brighter X-ray emitting Seyfert galaxies[5,6]. Detailed studies of this unique object at radio, IR, optical and X-ray wavelengths are obviously needed, particularly with a view to establishing variability.

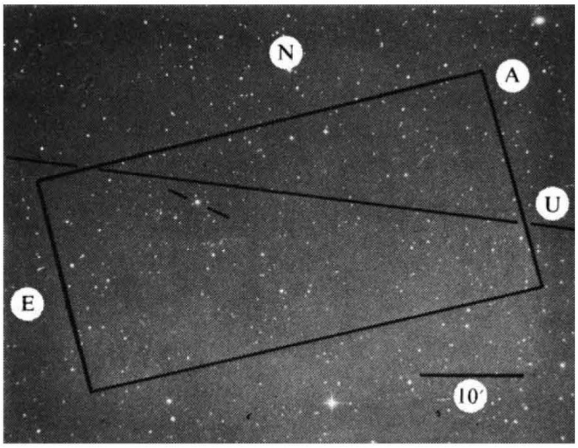

Fig. 1 The X-ray source 2AO120−591 (4UO106−59) and the Seyfert galaxy F-9. 'A' designates the 2A error box[3] and 'U' the northern edge of the 4U error box[4]. The nucleus of F-9 is at α (1950) = 01 h 21.8 min, δ (1950) = −59°04′ (ref. 1). The photograph is reproduced from an ESO Fast Blue Survey Plate.

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Infrared light curves of AM Herculis

AM HER has been identified as the optical counterpart of 3U 1809+50 by its common period of 3.1 h (refs 1, 2). The system shows strong emission lines, the radial velocities of which have been measured by Priedhorsky[3] and Cowley[4]. Tapia[2] has measured strong linear and circular polarisation which indicates that one component of the system is probably a white dwarf emitting strong cyclotron radiation. Photometric light curves have been observed[5,6] which show two minima, unlike the X-ray light curve which has only one; the system also has a red colour index. Models of the system which rely on a white dwarf, accretion disk, hot spot, and a gas stream from a companion star that fills its Roche Lobe have been proposed by Chanmugan[7] and Fabian[8]. In view of the red colour, strong emission lines and cyclotron radiation, we considered that infrared observations of this star would be of interest.

The 2.2 μm light curve was observed on the night of the 9–10 July 1977 and the 1.2 μm curve was observed the following night. The observations were made with the 1.5 m Infrared Flux Collector at the Cabezon Observatory, Tenerife. A standard infrared photometer with an InSb detector operated at 63 K was used. Observations covered one period only on both nights but there is a short break in the 2.2 μm light curve when it was thought the cryostat had run out of liquid nitrogen. Both nights were of excellent photometric quality and α Lyr, used as the standard star, was monitored throughout the night, but only before and after the AM Her observations. This procedure was followed so that the light curves should be as complete as possible. The magnitudes assumed for α Lyr are $J = 0.02$ and $K = 0.02$ (ref. 9). Corrections were made for atmospheric extinction but these were very small. Each observation is the result of a 60-s integration, 30 s in each channel. The errors on each point, estimated from observations of a similarly faint non-variable star, are ±0.05 mag. Thus the spread of the points is thought to be genuine flickering of the star. Such flickering is also seen in the optical light curves[5,6].