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1 Weatherall, D. J., and Clegg, J. B., *The Thalassaemia Syndromes*, second ed. (Blackwell, Oxford, 1972).
2 Ottolenghi, S., *et al.*, *Nature*, **251**, 389–392 (1974).
3 Taylor, J. M., *et al.*, *Nature*, **251**, 392–393 (1974).
4 Kan, Y. W., *et al.*, *Nature*, **255**, 255–256 (1975).
5 Weatherall, D. J., and Clegg, J. B., *Phil. Trans. R. Soc.*, **B271**, 411–455 (1975).
6 Forget, B. G., Benz, E. J., Jr, Skoultchi, A., Baglioni, C., and Houseman, D. *Nature*, **247**, 379–381 (1974).
7 Benz, E. J., Jr, Swerdlow, P. S., and Forget, B. C., *Blood*, **45**, 1–10 (1975).
8 Conconi, F., Rowley, P. T., Del Senno, L., Pontremoli, S., and Volpato, S., *Nature new Biol.*, **238**, 83–87 (1972).
9 Ottolenghi, S., *et al.*, *Proc. natn. Acad. Sci. U.S.A.*, **72**, 2294–2299 (1975).
10 Clegg, J. B., Naughton, M. A., and Weatherall, D. J., *J. molec. Biol.*, **19**, 91–108 (1966).
11 Hell, A., Birnie, G. D., Slimming, T. K., and Paul, J., *Analyt. Biochem.*, **48**, 369–377 (1972).
12 Tibbets, C., Johansson, K., and Philipson, L., *J. Virol.*, **12**, 218–225 (1973).
13 Lanyon, W. G., Ottolenghi, S., and Williamson, R., *Proc. natn. Acad. Sci. U.S.A.*, **72**, 258–262 (1975).
14 Harrison, P. R., *et al.*, *J. Molec. Biol.*, **84**, 539–554 (1974).
15 Weatherall, D. J., Clegg, J. B., Na-Nakorn, S., and Wasi, P., *Br. J. Haemat.*, **16**, 251–267 (1969).
16 Kan, Y. W., Holland, J. P., Dozy, A. M., and Varmur, H. E., *Proc. natn. Acad. Sci. U.S.A.* (in the press).

letters to nature

Transient X-ray source A1118—61

THE transient X-ray source Ariel 1118—61 was discovered late in 1974 (refs 1, 2). It has been suggested[3] that this source may be associated with the long period Mira-type variable RS Cen, which is located within the error box for the X-ray source. The proposed mechanism of X-ray generation was accretion on to a compact object in orbit around the variable star. The periodic variation in the radius of the star would lead to a variable accretion rate at the orbit of the compact object, and give rise to a variable X-ray flux. This suggestion has two important consequences. First, it raises the possibility that some, at least, of the apparently transient X-ray sources can be explained by similar phenomena. For instance, Barnden and Francey[4] and Shukla and Wilson[5] reported the presence of two presumably 'transient' X-ray sources in the constellation Cetus. The error box for each source (Cetus X-1 (ref. 4) and Cetus X-2 (ref. 5)) was large, ~ 10–15° diameter, but they did just overlap. Of significance here is the fact that the overlap area is centred on O Ceti (Mira), the type star of this class of variables. The two observations were at similar phases (0.12 and 0.22) of the variable, but separated in time by ~1 cycle. The difference in phase of the Centaurus and Cetus transients is easily explained by differences in orbit size and expansion velocity.

The second consequence of Fabian *et al.*'s proposed identification is a clear, experimentally testable prediction, that the X-ray source should be observable at intervals of ~164.5 d after the outburst observed by Ariel V.

We have used the collimated proportional counter on board Copernicus to test this prediction. The detector was pointed at A1118—61 on June 8, 1975 between 17 h 9 min and 22 h 15 min, a time corresponding to an eclipse of the nearby binary X-ray source Cen X-3. No signal was detected above background during the whole of the observing session. Our 90% confidence upper limit to the source strength in the energy band 2.5–7.5 keV is 3×10^{-11} erg cm^{-2} s^{-1}; this is 1.7% of the peak flux reported by Ariel V in the same energy band. Thus it is likely that the X-ray source A1118—61 is not connected with RS Cen, unless for some reason the X-ray generation was turned off during the time when Copernicus was observing the source.

Copernicus observed Cen X-3 on January 30, 1974 precisely 2 periods of RS Cen before the peak of the outburst reported by Ariel V. A1118—61 was well within the field of view of the detector, so we have been able to search for a signal from it during the binary down state of Cen X-3. Again, no signal was detected above an upper limit of 2×10^{-10} erg cm^{-2} s^{-1} (~10% of peak Ariel V flux) in the energy band 2.5–7.5 keV. Thus there is no strong case for an association of A1118—61 with RS Cen, based on the mechanism suggested by Fabian *et al.*[3].

We have also searched for X rays from A1118—61, using Copernicus, at a time well removed from the hypothesised critical phase. The observations were made between April 1975 6 d 23 h 31 min and 7 d 3h 33 min, again during a binary down state of Cen X-3. On this occasion, too, we were unable to detect the source. Our 90% confidence upper limit on this occasion of $\sim9\times10^{-11}$ erg cm^{-2} s^{-1} in the energy band 2.5–7.5 keV is again substantially below the peak Ariel V flux of 1.8×10^{-9} erg cm^{-2} s^{-1}.

Our upper limits should clearly be borne in mind in any attempts to explain this source. In particular, Pacini and Shapiro[6] have suggested that it is the motion of the compact object in an eccentric orbit which periodically brings the compact object close enough to the primary for accretion rates to become appreciable (this scheme has also been suggested by Clark *et al.*[7] and Davison and Tuohy[8] to explain the long term behaviour of Cir X-1). Our upper limits modify some of the constraint equations developed by Pacini and Shapiro for the parameters of the proposed binary system. The June 8 upper limit of 1.7% of the peak flux leads immediately to a lower limit of ~0.8 for the orbital eccentricity, as compared with the value of 0.4 derived by Pacini and Shapiro. This higher value of eccentricity also does not seem to be excluded by the theory developed by Wheeler *et al.*[9], though we note that practically any value for the final eccentricity may be predicted, given a suitable (and not impossible) choice of initial conditions.

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1 Ives, J. C., Sanford, P. W., and Bell Burnell, S. J., *Nature*, **254**, 580 (1975).
2 Eyles, C. J., Skinner, G. K., Willmore, A. P., and Rosenberg, F. D., *Nature*, **254**, 577 (1975).
3 Fabian, A. C., Pringle, J., and Rees, M., *Nature*, **255**, 618 (1975).
4 Barnden, L. R., and Francey, R. J., *Proc. astr. Soc. Australia*, **1**, 236 (1969).
5 Shukla, P. G., and Wilson, B. G., *Astrophys. J.*, **164**, 265 (1971).
6 Pacini, F., and Shapiro, S. L., *Nature*, **255**, 618 (1975).
7 Clark, D. H., Parkinson, J. H., and Caswell, J. L., *Nature*, **254**, 674 (1975).
8 Davison, P. J. N., and Tuohy, I. R., *Mon. Not. R. astr. Soc.*, **173**, 33 (1975).
9 Wheeler, J. C., McKee, C. F., and Lecar, M., *Astrophys. J. Lett.*, **192**, L71 (1974).