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PERIOD INCREASE IN FG Sge

The peculiar variable FG Sge is the central star of a faint planetary nebula ejected about 6000 years ago. Photometrically, the star brightened steadily until the late sixties; in the seventies the continuous reddening of the star could be observed.

Photoelectric observations have shown that a quasi-periodic light variation is superposed to the secular light variation. An increase in the period of the quasi-periodic light variation was reported by Arkhipova et al. (1978).

New photoelectric observations on FG Sge were carried out using the 24 inch reflector of the Konkoly Observatory, an uncooled EMI 9502B photomultiplier and standard B and V filters. Differential BV observations, 18 in number, were made in 1979, with respect to BD +19^o4319. The magnitudes of this comparison star were taken from Arkhipova's (1975) paper:

$$V = 8^m.68 \quad B-V = 1^m.19$$

The observations are listed in Table I and plotted in Fig. 1.

Table I

J.D.	V	B-V	J.D.	V	B-V
2440000+			2440000+		
4049.502	9 ^m .18	1 ^m .63	4140.369	8 ^m .95	1 ^m .59
4054.481	9.15	1.64	4143.390	9.08	1.58
4066.457	9.10	1.65	4157.306	9.15	1.62
4100.504	8.86	1.52	4159.302	9.14	1.60
4101.477	8.80:	1.51:	4166.265	9.16	1.57
4108.388	8.88	1.62	4167.255	9.14	1.62
4111.446	8.91	1.61	4173.251	9.15	1.55
4113.358	8.91	1.58	4203.192	8.82	1.60
4129.366	8.93	1.54	4215.216	8.82	1.57

The magnitudes published here are not corrected for the contributions of the nebula and the faint companion. As can be seen from Fig. 1, the actual value of the period in 1979 was about 108 days.

In order to determine the numerical value of the increase in the period, all the earlier published photoelectric observa-

tions were examined. In Table II, the following data are given:

1. The mean date of the observations made during one observational season
2. The average period in the given year
3. The number of observed cycles during the season (used as a weighting of the accuracy of the period)
4. References detailing where the observational data used have been taken from.

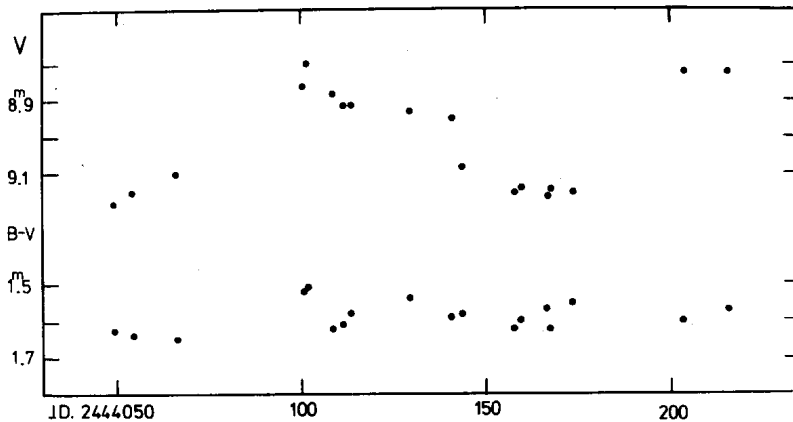


Figure 1. The 1979 light curve of FG Sge

The yearly averaged values of the period vs. the mean date of the observations are plotted in Fig. 2. This figure also shows the straight line approximation to the data points using the weighted least squares technique. The equation of the best fitting line is as follows:

$$P = 4.866 \cdot (Y - 1960.0) + 3.272 \quad ,$$

where Y is given in years and the period P in days. On the basis of this formula the increase in the period of FG Sge is about 4.9 days/year. This value is in agreement with the estimation made by Fernie (1975) who expected an enormous rate of period change in the variability, which period change is caused by the rapid change in the spectral type of FG Sge. In all probability

Table II

Year	P	weight	Reference
1962.6	15 ^d	9	Wenzel and Fürtig (1967)
1963.8	28	2	Wenzel and Fürtig (1967)
1969.7	49	1	Arkhipova (1971)
1970.6	65*	1	Arkhipova (1971), Wenzel and Fürtig (1971)
1971.6	56	2	Arkhipova (1975), Papousek (1972), Wenzel and Fürtig (1972)
1972.6	60	2	Arkhipova (1975)
1973.7	70	2	Arkhipova (1975), Wenzel (1974)
1975.6	80	2	Arkhipova (1975), Arkhipova and Noskova (1976), Stone (1979)
1976.7	82	1	Arkhipova et al. (1977), Whitney (1977)
1977.7	85	1	Arkhipova et al. (1978)
1979.7	108	1	this note

* with fluctuations ($P_{\text{fluct}} = 23^{\text{d}}$)

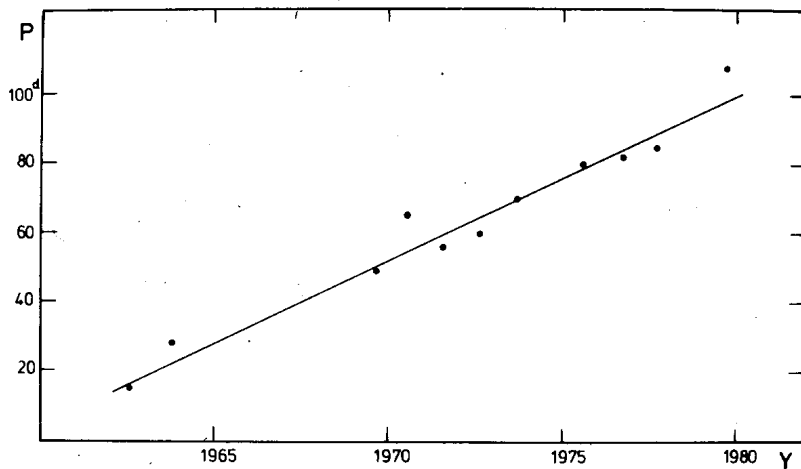


Figure 2. Value of period as a function of time

the expansion of the pulsating envelope (Whitney 1978) is the main factor contributing to the rapid period change. If we assume that FG Sge is crossing the instability strip, the time of

entering the strip was about 1960. It is most unfortunate that photoelectric observations are not available from that time. Even so, when FG Sge leaves the instability strip at the low temperature side in the near future, its observation is not beyond the realms of possibility.

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