

**FG SGE: AMATEUR CHALLENGE, PROFESSIONAL ENIGMA**

**Ronald E. Royer**  
3519 St. Pancratius Place  
Lakewood, CA 90712

*Presented at the 87th Annual Meeting of the AAVSO, October 31, 1998*

**Abstract**

The history of FG Sagittae is briefly summarized, and a visual light curve by the AAVSO for the interval 1992–1998 is presented.

**1. Early history**

In the last 100 years, the unique star FG Sagittae has brightened from photographic magnitude 13.7 to 9.1. Its temperature has been cooling off, at a rate of 340K/year between 1955 and 1965, and 250K/year between 1969 and 1974. Concurrently, its spectral type has changed, from Be (peculiar) in 1955 to its present K2Ib; it resembles a supergiant with some anomalies. The star is surrounded by a circular emission nebula, but is not typical of the central stars of planetary nebulae. Summaries of the early history of this star's unusual behavior can be found in Burnham (1977) and Kraft (1974).

**2. Recent behavior**

In August 1992, FG Sge began a rapid decline in brightness to about 16th magnitude, from which it has not fully recovered, although in late 1997 it brightened to magnitude 9.4. In October 1998, it was observed at about 15th magnitude, making it a challenge for the visual observer, who may confuse FG Sge with its slightly variable 12.5 magnitude companion about 10 arcseconds farther east (see Figure 1).

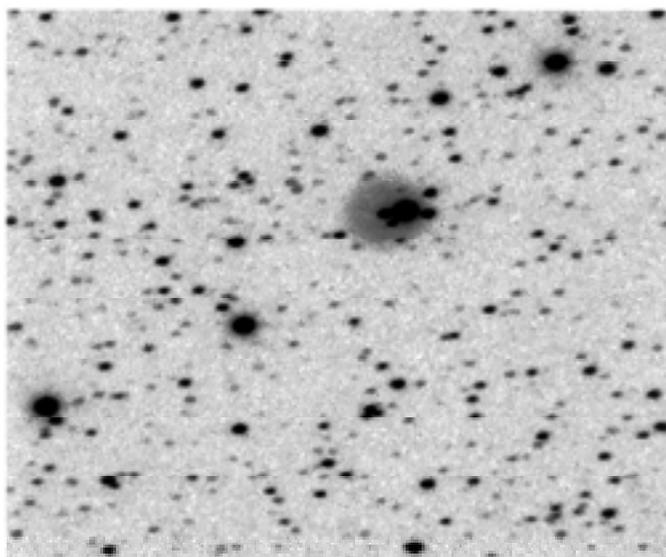


Figure 1. CCD image taken by the author on 1 July 1998 of FG Sge at 15th magnitude, centered in its nebula. A brighter companion at magnitude 12.4 is about 10 arcseconds to the east. East is right, south is up; image is approximately 6 x 6 arcminutes.

FG Sge has an estimated mass of  $0.61_{\odot}$  (Bloeker and Schoenberner 1997). The spectrum has been monitored since before the star's 1992 fading (Gonzalez *et al.* 1998), and its behavior is similar to that of an R Coronae Borealis star. Figure 2 shows the AAVSO visual light curve for FG Sge from late 1992 to 1999 (Mattei 1998).

Tatarnikov *et al.* (1998) have observed this star in many wavelengths and have discovered a complex, active dust envelope. They propose that a new dust envelope emerges at each deep minimum of light. The dust envelope contains graphite particles of various sizes. (Similar dust envelope formation is proposed by these authors for V4334 Sagittarii, another AAVSO program star which should be monitored carefully.)

We can hope for some high-resolution photographs of the nebula from the Hubble Space Telescope while FG Sge is faint.

### 3. Conclusion

The close proximity of a bright variable companion and the embedding nebulosity provide the challenge to the visual observer. The continuing enigma of the nature of FG Sge will provide research opportunities for astronomers for years to come.

### 4. Acknowledgements

I wish to thank Janet Mattei, Elizabeth Waagen, and Rebecca Pellock for their prompt and thorough help on this paper; my thanks also to all observers.

### References

- Bloeker, T., and Schoenberner, D. 1997, *Astron. Astrophys.*, **324**, 991.  
 Burnham, R., Jr. 1977, *Celestial Handbook*, **3**, 1541, Dover, New York.  
 Gonzalez, G., Lambert, D. L., Wallerstein, G. Rao, N. K., Smith, V. V., and McCarthy, J. K. 1998, *Astrophys. J. Suppl.*, **114**, 133.  
 Kraft, R. P. 1974, *Sky & Telescope*, **48**, 18.  
 Mattei, J. A. 1998, Observations from AAVSO International Database, private comm.  
 Tartarnikov, A. M., Shenavrin, V. I., and Yudin, B. F. 1998, *IAU Rep. Astron.*, **42**, 377.

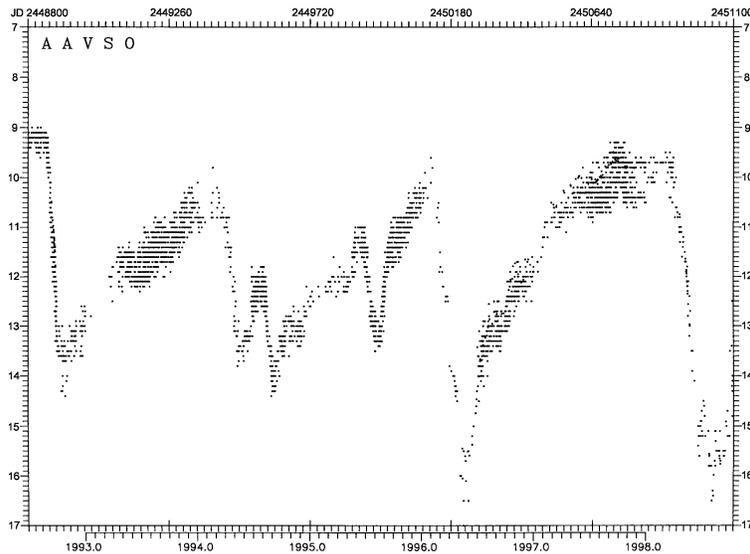


Figure 2. AAVSO visual light curve of FG Sge from late 1992 to late 1998. Each dot represents one observation.