Scientific Goals for a Collaboration Between Amateur and Professional Astronomers in the

Study of Variable Stars

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Variable stars are a field where the contribution of amateur astronomers is of great importance. This contribution can be separated in to complementary parts:
1) collaboration with professional institutes that well-equipped amateurs can easily undertake in the field of photoelectric observation;
2) visual observation of variable stars, which in many cases can be a preliminary approach to photoelectric photometry.

Amateurs using their own photoelectric equipment can, of course, plan their work independently of astronomical institutions, but I think that their collaboration could produce interesting results. Here I would like to point to the advantages that a network of photoelectric observers can secure. I have appreciated these advantages when analysing photoelectric measurements carried out by both amateur and professional astronomers on 39 = AY Cet, the RS CVn star with largest known difference between orbital and rotational periods. With a period of 77 d, only the contribution of many well-equipped observers could secure the required light-curve coverage. Compare the wealth of information contained in our work (Poretti *et al.*, 1986) with the fragmentary light-curve of Fig. 1, where all the available measurements on V509 Cas are plotted together with those carried out at Merate Observatory in 1985 and 1986. The behaviour of this long-period massive supergiant is far from being understood and many questions remain unanswered. I would also like to draw attention

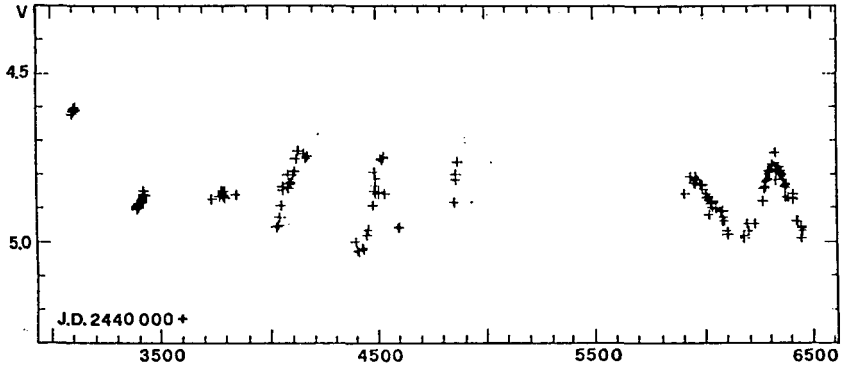

Fig. 1. Photoelectric light curve of V509 Cas from 1977 to 1986

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to yet another possibility offered to a group of observers with a spread in longitude: the continuous monitoring of a short-period variable star. The advantages are essentially two: 1) the reduction of aliases in frequency analysis; 2) the opportunity of analysing cycle-to-cycle variations. Multi-site observations allowed us to solve the complex light-curve of the δ Sct variable ϑ^2 Tau (ΔV = 0.04 mag; Breger *et al.*, 1987). A data analysis does not show any discernable alias structure, thus allowing an easy period identification: this is not the rule for δ-Sct-star frequency analysis. The double-mode pulsator V1719 Cyg is another example: in this case it has been sufficient to link two sets of observations made in Italy and in the U.S.A. to obtain a clear indication of the second period (Antonello *et al.*, 1987). Extensive photometry of BW Vul (Sterken *et al.*, 1987) proved that the standstill on the ascending branch of the β Cep variable is stable, thus sweeping away conjectures on its variability (in phase and length) based on insufficient data.

It is the general opinion that visual investigation of faint E/RR variables can yield satisfactory preliminary elements for a more accurate study: in a way this can be seen as a preparatory approach to photoelectric photometry. Indeed, the AAVSO is known and acknowledged all over the world for its survey of long-period and cataclysmic variables. However, it is of importance to note that many associations now use automated routines to acquire and process data. For this reason, a general improvement in data reduction is required to provide reliable light-curves for red, small-amplitude (< 0.5 mag) variable stars. In fact, I do not think that a photoelectric survey, even if preferable, could be undertaken of all known bright variables. Ralincourt *et al.* (1987) emphasized the existence of effects that may alter visual light-curves and they developed a method that gives more satisfactory results by making an appropriate correction. The analysis of estimates secured by GEOS on five SR variables shows that an average observer can make estimates with a standard deviation of 0.08 mag, but is affected by a systematic error of the same order.

References

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