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ON THE MAGNETIC FIELDS OF SYMBIOTIC STARS

L. LUUD. SÜMBIOOTILISTE TÄHTEDE MAGNETVÄLJADEST

Л. ЛУУД. О МАГНИТНЫХ ПОЛЯХ СИМБИОТИЧЕСКИХ ЗВЕЗД

(Presented by J. Einasto)

There were two symbiotic stars EG And and AG Peg with observed highly variable kilogauss fields included among the 89 stars with detected magnetic fields in the pioneering work by H. W. Babcock [1]. This result was contested by M. H. Slovak [2] who could not detect significant fields and concluded that symbiotic stars have no detectable magnetic fields. However, his conclusion was based on the rather scanty observational data.

M. H. Slovak explains this discrepancy as being due to complicated profiles of lines used in H. W. Babcock's measurements. Actually, for EG And it is normal absorption lines that are measured, whereas for AG Peg it is emission lines with a simple structure. H. W. Babcock's measurements were based in the blue spectral region, while those of M. H. Slovak were based on the red region. It is also possible that in composite spectra of symbiotic stars the fields measured by blue and red spectral region lines do not agree. This fact is observed for some white dwarfs [3], but the used method of determination of magnetic field is different.

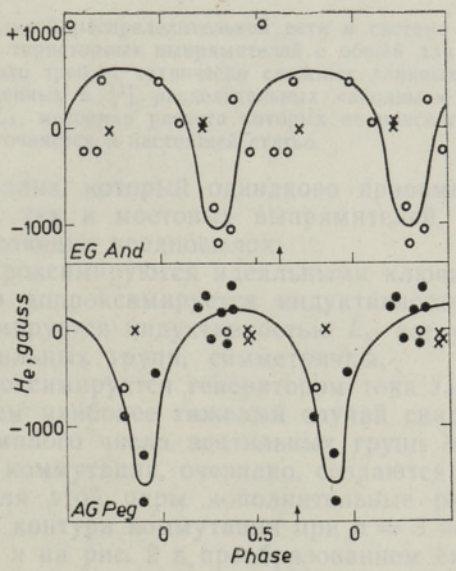
Both stars under consideration are binaries consisting of a red giant and, most probably, of a white dwarf. The white dwarfs have frequently magnetic fields between 3—100 MG. In the cases when the structure of a field is studied, almost all the data are consistent with a centered or slightly decentered dipole model [3]. The magnetic fields may also be generated in a rapidly rotating core during the helium shell flash instability when the giant undergoes the second ascent of the red giant branch [4]. E. M. Drobyshevski and B. I. Reznikov [5] have given evidence that in the binaries with $P \geqslant 100^d$ the effect of magnetic field on system evolution is maximal. Unfortunately it seems to be true only for the pairs with almost equal masses of components. In spite of this, the magnetic field must be strongly suspected as a possible supporter of giant accretion disks in symbiotic stars.

E. M. Drobyshevski and B. I. Reznikov also found that magnetic fields may probably be important during the formation of S-stars. For two S-stars H. W. Babcock also found that variable magnetic field is present. Therefore the situation calls for an additional examination of the existing data.

EG And is an equivalent width, radial velocity and H_α profile variable. The maximum of H_α equivalent width is given by JD 2 443 200+ +470 E [6]. These data strongly suggested that EG And is an eclipsing binary. According to R. E. Stencel et al. [7], the hot source eclipsed in phase 0.6—0.65.

AG Peg is a spectroscopic binary with elements JD 2 440 928+ +820 E [8]. The same authors have demonstrated that the period is not well determined and may be in error of even 30 days. The moment of eclipse (or a nonocculted hot star behind a red giant) occurs near the phase ≈ 0.7.

Using the above-mentioned periods, the magnetic field values determined by H. W. Babcock and M. H. Slovak are plotted against the orbital phase (Figure).



The variations of magnetic fields of EG And and AG Peg in dependence of orbital phases. ○ — H. W. Babcock's measurements by absorption lines, ● — H. W. Babcock's measurements by emission lines, × — M. H. Slovak's measurements by absorption lines. Lines represent handdriven supposed magnetic field curves. Arrows indicate the moments when a hot source is behind the red giant.

The Figure shows that there exist certain phases (before ingress for EG And and after egress for AG Peg) when the nonzero values of a magnetic field are observed, probably not recurring in all cycles. It seems that these symbiotic stars have oriented variable magnetic fields observable as longitudinal fields only in special phases. Therefore what is needed are new long-lasting observations of magnetic fields with well established routine. These observations should cover the whole period during several cycles.

From our brief discussion it can be deduced that probably symbiotic stars have transient kilogauss magnetic fields oriented to be observable only in special conditions near the eclipse of a hot companion.

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