Theoretical and Observational Tests for the Mass Transfer Scenario of Ba II stars*

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* Based on observations carried out at the Observatoire de Haute-Provence (France)

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Ba II stars are red giants showing an enhancement of carbon and s-process elements. The elucidation of their nature seems to require a mass transfer, either by wind or Roche lobe overflow, during their past evolution. Were it really the case, all Ba II stars would be binaries with a white dwarf as companion. To better understand the exact role of their binarity, more orbits are definitely needed. They can be obtained by monitoring the radial velocity variations of those stars. However, a quicker way to find new Ba II stars with orbital elements would be to search for their existence among known spectroscopic binaries. This would also crucially test whether mass transfer is a necessary and sufficient condition to explain Ba II stars. If it is indeed the case, then all spectroscopic binaries, made of a giant and a white dwarf, in a reasonable range of periods, would exhibit the Ba II pecularity. However, the discovery of a peculiar giant+main sequence binary system would imply a revision of our ideas about Ba II stars. To this end have we begun a systematic spectral survey of spectroscopic binaries with orbital periods in the range characteristic of known Ba II stars and containing a red giant. The realization that some stars of the catalogue we compiled were already identified as semibariium stars encourages us to pursue our investigation. Coude spectra were taken with the 152 cm telescope, at a dispersion of 12 Å mm^{-1}. Until now, 2 stars out of a sample of 31 present a slight enhancement of s-process elements (their anomaly being in the range Ba 0.3 to 0.5), and 2 more appear to be good candidates. The study of a larger sample is currently in progress. A discussion of the nature of the companion to the 2 newly discovered semibarium stars is presented on grounds of their mass function and photometric indices.

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