



Discovery of a stripped red giant core in a bright eclipsing binary system

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We have identified a star in the WASP archive photometry with an unusual lightcurve due to the total eclipse of a small, hot star by an apparently normal A-type star and with an orbital period of only 0.668d. From an analysis of the WASP lightcurve together with V-band and I_C-band photometry of the eclipse and a spectroscopic orbit for the A-type star we estimate that the companion star has a mass of $(0.23 \pm 0.03)M_{\text{sun}}$ and a radius of $(0.33 \pm 0.01)R_{\text{sun}}$, assuming that the A-type star is a main-sequence star with the metallicity appropriate for a thick-disk star. The effective temperature of the companion is $(13400 \pm 1200)\text{K}$ from which we infer a luminosity of $(3 \pm 1)L_{\text{sun}}$. From a comparison of these parameters to various models we conclude that the companion is most likely to be the remnant of a red giant star that has been very recently stripped of its outer layers by mass transfer onto the A-type star. In this scenario, the companion is currently in a shell hydrogen-burning phase of its evolution, evolving at nearly constant luminosity to hotter effective temperatures prior to ceasing hydrogen burning and fading to become a low-mass white dwarf composed of helium (He-WD). The system will then resemble the pre-He-WD/He-WD companions to A-type and B-type stars recently identified from their Kepler satellite lightcurves (KOI-74, KOI-81 and KIC10657664). This newly discovered binary offers the opportunity to study the evolution of a stripped red giant star through the pre-He-WD stage in great detail.

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