A Planetary Companion to the Binary Star γ Cephei

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Gamma Cephei is a sub-giant in a long-period (P> 40 yrs) binary system. Walker et al. (1992) reported short-term periodic radial velocity (RV) variations in the residuals after subtracting the velocity contribution due to the stellar companion. These residual variations had a period of 2.52 yr period and were consistent with a Jupiter-mass companion in orbit at approximately 2 AU from the primary. Walker et al. dismissed this hypothesis because they detected weak variations in the Ca II 8662 A emission line index with the same period as "planet". We present precise stellar radial velocity variations for γ Cep taken at McDonald Observatory that extend the time base of observations to more than 20 years. The combined dataset shows that the planet period has been present and coherent over the past 20 years. The long lived nature of the residual RV variations make it unlikely that they are due to stellar rotation. We also present Ca II S-index measurements that show no periodic variations with the 2.5 yr period. Furthermore, no appropriate period is found in (contemporaneous) Hipparcos photometry. We conclude that a planet with a projected mass of 1.25 $M_{Jupiter}$ in orbit 1.8 AU from the primary star is the most likely explanation for the residual RV variations in γ Cep. This planet is in a binary star system with the shortest binary period found so far and should provide an interesting case study for understanding how binary stars influence the planet formation process.