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Study of white dwarfs, neutron stars and black holes through astrometric microlensing

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Astrometric microlensing provides a powerful tool to study white dwarfs, neutron stars and black holes, particularly the isolated ones. We have two such projects to study stellar remnants through astrometric microlensing, the details of which will be discussed: (i) In a reprise of the famous 1919 solar eclipse experiment that confirmed Einstein's general theory of relativity, the nearby white dwarf Stein 2051B passed very close to a background star in March 2014. As Stein 2051 B passed by, the background star's position was deflected. Measurement of this deflection with HST - the first such measurement of deflection by a star outside the solar system - allowed us to determine the mass of Stein 2051 B as 0.675 ± 0.051 solar mass. (ii) All stars with initial masses of larger than 20 solar mass are expected to end their lives as black holes (BHs). Theoretical studies suggest that there should be about 100 million stellar-mass BHs in the Galaxy, and a large fraction of these BHs are expected to be single. Yet, no isolated BH has ever been unambiguously found within our Galaxy. The only technique available to detect such isolated BHs is astrometric microlensing. Initial results from our HST programs specifically aimed at the first detection of solitary BHs through astrometric microlensing will be presented.

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