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Gravitational Self-Torque and Spin Precession in Compact Binaries ALEXANDRE LE TIEC, Observatory of Paris, SAM DOLAN, University of Sheffield, NIELS WARBURTON, University College Dublin, ABRAHAM HARTE, Albert Einstein Institute, BARRY WARDELL, Cornell University, LEOR BARACK, University of Southampton — We calculate the effect of self-interaction on the "geodetic" spin precession of a compact body in a strong-field orbit around a black hole. Specifically, we consider the spin precession angle ψ per radian of orbital revolution for a particle carrying mass μ and spin $s \ll (G/c)\,\mu^2$ in a circular orbit around a Schwarzschild black hole of mass $M \gg \mu$. We compute ψ through $\mathcal{O}(\mu/\mathcal{M})$ in perturbation theory, i.e, including the correction $\delta\psi$ (obtained numerically) due to the torque exerted by the conservative piece of the gravitational self-field. Comparison with a post-Newtonian (PN) expression for $\delta\psi$, derived here through 3PN order, shows good agreement but also reveals strong-field features which are not captured by the latter approximation. Our results can inform semi-analytical models of the strong-field dynamics in astrophysical binaries, important for ongoing and future gravitational-wave searches.

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