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Spacetime Physics of Force-free Magnetospheres

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The spectacular displays of pulsars and quasars are likely energized by rotating compact objects (neutron stars and black holes, respectively) through their plasma magnetospheres. When the magnetic field energy dominates that of the plasma, the system can be described by force-free electrodynamics (FFE), a non-linear, autonomous set of equations for the electromagnetic field on the compact object spacetime. Despite its simple covariant formulation, FFE has primarily been studied in 3+1 frameworks, where spacetime is split into space and time. I will describe new results, techniques and insights from an emerging research program taking a spacetime-geometrical approach to the physics of force-free magnetospheres.