The Extreme Spin of the Black Hole Cygnus X-1

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Remarkably, an astronomical black hole is completely described by the two numbers that specify its mass and its spin. Knowledge of spin is crucial for understanding how, for example, black holes produce relativistic jets. Recently, it has become possible to measure the spins of black holes by focusing on the very inner region of an accreting disk of hot gas orbiting the black hole. According to General Relativity (GR), this disk is truncated at an inner radius

that depends only on the mass and spin of the black hole. We measure the radius of the inner edge of this disk by fitting its continuum X-ray spectrum to a fully relativistic model. Using our measurement of this radius, we deduce that the spin of Cygnus X-1 exceeds 97% of the maximum value allowed by GR.