Ramesh Narayan
Harvard University - Department of Astronomy

Energy Extraction from Spinning Black Holes: Relativistic Jets

Authors: R. Narayan

A deep idea in black hole physics is that it is possible to extract energy from a spinning black hole. It has for long been an article of faith among astrophysicists that black hole spin power is somehow responsible, perhaps via magnetic fields, for the relativistic jets seen in accreting black holes. Two recent advances have strengthened the case for this thesis.

First, spin parameters of a number of accreting stellar-mass black holes have been measured. It is found that relativistic jets from more rapidly spinning black holes have substantially larger radio power than those from slowly spinning black holes. This observational evidence strongly suggests a causal relationship between black hole spin and jets.

Second, numerical magnetohydrodynamic simulations of accreting black holes show that relativistic jets appear spontaneously in such systems. For a while it was unclear whether the power source for the jets is the accretion disk or the spin of the black hole. Recent work has produced unambiguous evidence that much of the energy flows out of the black hole and into the jet via magnetic fields.