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## Black holes give as well as take

26 March 2003

**Black holes are well known for their ability to swallow matter, but now a group of astronomers in the US has found evidence that they might emit substantial amounts of matter as well. George Chartas of Penn State University and colleagues have discovered that quasars - star-like objects that are thought to be fuelled by supermassive black holes - eject significant quantities of gas into space, including elements such as carbon, oxygen and iron.**

Theorists have predicted that light emitted by quasars should act as a kind of wind, blowing gas from the accretion disc that surrounds a quasar's black hole into intergalactic space. This occurs because ions in the gas absorb photons and acquire their momentum.

Chartas and colleagues observed this phenomenon by studying the absorption of X-rays from two quasars known as APM 08279+5255 and PG1115+080, using the "gravitational lensing" of intervening galaxies to magnify the unabsorbed radiation. Astronomers have previously found evidence for this effect in the ultraviolet region of the spectrum, but the new data suggest that X-rays could eject material into space at about ten times the rate of radiation at longer wavelengths.

"The winds we measured imply that as much as a billion suns' worth of material is blown away over the course of a quasar's lifetime," said Chartas.

By measuring the relativistic Doppler shift of the absorption lines, the researchers calculated that the ejected gas was travelling at 40% of the speed of light, considerably faster than predicted. They also found that the quasar winds might regulate the growth of black holes and stimulate star formation.

The results, which were presented yesterday at a meeting of the American Astronomical Society in Quebec, come from data obtained by NASA's Chandra X-ray Observatory and the European Space Agency's XMM-Newton satellite. XMM-Newton and Chandra, the third of NASA's "great observatories" after the Hubble and Compton satellites, were both launched in 1999.

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