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## Black Holes begin to 'reveal' their Secrets

*Pakistan Times Monitoring Desk*

SAN DIEGO (California, US): Black holes, the invisible celestial bodies whose enormous gravitational pull sucks in everything around them, are beginning to share some of their secrets.

Using the newest generation of satellite-mounted x-ray telescopes, astrophysicists are starting to divine the shape and size of these mysterious objects, whose gravitational pull appears to be the fundamental source of energy at the heart of galaxies.

At the same time, their discoveries are producing new evidence for the 89-year-old theory of relativity of legendary physicist Albert Einstein.

Black holes are created by an immense gravitational contraction of matter after the universe's largest stars burn up their nuclear cores and explode as supernovas.

As the star burns out, it forms a dark concentration of matter with a diameter of maybe just 24 kilometers (14.5 miles) but a mass four times greater than our own sun.

The gravitational pull siphons up everything that passes nearby. Black holes are so dense that even light cannot escape, rendering them invisible and

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only detectable by their effect on their environment.

As Einstein proposed in his 1916 theory of relativity, scientists can detect black holes' attributes by the way their pull deforms the continuum of space-time around them.

This pull is equally powerful on astronomers and astro-physicists, who are reporting numerous potentially important discoveries about black holes at the winter convention of the American Astronomical Society, taking place this week in San Diego, California.

Harvard University astrophysicist Jon Miller and his colleagues report that they have detected particles of gas literally "surfing on a wave of space-time" around the black hole known as GRS 1915+105, situated 40,000 light-years from Earth in the constellation Aquila.

Their observations, made with the US space agency NASA's Rossi X-Ray Timing Explorer, a satellite-based x-ray telescope, shows how the gravitational force of black holes can "warp and drag the fabric of space-time" as Einstein theorized, Miller said.

Another team of scientists led by the University of Maryland's Jane Turner observed three clumps of super-heated gas particles orbiting a black hole at 32,000 kilometers (19,000 miles) a second, about one-tenth the speed of light.

Using the European Space Agency's XMM-Newton x-ray satellite, Turner's team followed these bits of matter as

they made a complete revolution around the black hole. "Knowing that, scientists can measure black hole mass and other characteristics that have long eluded them," explained Turner.

Steinn Sigurdsson, Professor of Astronomy at Pennsylvania State University, was to show the convention on Wednesday how giant black holes, like those at the center of our own Milky Way, swallow up smaller black holes and extremely dense neutron stars to become even more massive.

Using ultra-sophisticated computer modeling, Sigurdsson and his colleagues estimated that they should be able to observe such events several times a year. They hope to do so via the joint NASA-European Space Agency LISA project, involving three satellites to be launched in 2012.

Equipped with laser antennae, the satellites will detect waves of gravitational radiation unleashed when a small black hole or neutron star falls into a giant black hole, Sigurdsson explained in a paper at the conference.

Predicted by Einstein and moving at the speed of light, these ripples of time-space have never been detected directly. The LISA project represents the best chance of studying black hole absorption, Sigurdsson said.●

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