Ancient era of fast growth in supermassive black holes studied

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(PhysOrg.com) -- In collaboration with an international team of astronomers, an assistant professor of physics at the University of North Texas has identified the earliest known epoch of fast growth of the supermassive black holes in outer space, coming a step closer to understanding the mysteries of the universe. UNT professor Dr. Ohad Shemmer said this discovery is a “missing link” between black holes observed in galaxies today and the first black holes formed due to the explosion of the first stars.

The study is the culmination of a seven-year project - led by Benny Trakhtenbrot and Hagai Hetzer from Tel Aviv University in Israel and included Shemmer and Paulina Lira from the University of Chile. The study was designed to trace the evolution of the most massive known black holes and compare it with supermassive black holes observed in galaxies today. The results of the study were reported in a recently published issue of *The Astrophysical Journal.*

The researchers observed 40 active galaxies and compared their properties with those of about 50 other active galaxies to find how the black holes were actively growing, or increasing in size by accreting matter from their host galaxies. The team has reported that the era of fast growth occurred when the universe was about 1.2 billion years old and that the subsequent growth period lasted 100-200 million years.

The discovery is comparable to finding that a 30-year-old human must have been much younger when its first growth spurt took place. Previous

reports in 2004 and 2007 by the same group of astronomers found that the era of fast growth must have occurred when the universe was younger than at least 2-4 billion years old.

“We are not seeing the first supermassive black holes, but we are seeing the final stage of their adolescence,” said Shemmer. “This research helps us to determine what the ‘meal schedule’ is for supermassive black holes.” The “meal schedule” is a timetable in which the black holes grow in size by accreting matter from their host galaxies.

The research is based on observations taken from the Gemini North Observatory in Hawaii and the Very Large Telescope Observatory in Chile, which are among the largest ground-based telescopes in the world. The telescopes used infrared spectrographs to determine the masses and the mass accretion rates of the black holes. The team analyzed the data using a method Shemmer first developed while earning his doctoral degree at Tel Aviv University in Israel.

A black hole is an extremely dense, massive object which can form in the aftermath of the explosion of a massive star, or a supernova. Its gravitational field is so intense that no matter or electromagnetic radiation can escape. Most galaxies in the universe, including the Milky Way, harbor supermassive black holes in their centers that vary in mass from about one million to about 10 billion times the mass of the sun.

More information: The article in *The Astrophysical Journal* can be found online at iopscience.iop.org/0004-637X/730/1/7

Provided by University of North Texas

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