

When the black hole was born: Astronomers identify the epoch of the first fast growth of black holes

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Most galaxies in the universe, including our own Milky Way, harbor super-massive black holes varying in mass from about one million to about 10 billion times the mass of our sun. To find them, astronomers look for the enormous amount of radiation emitted by gas which falls into such objects during the times that the black holes are "active," i.e., accreting matter. This gas "infall" into massive black holes is believed to be the means by which black holes grow.

Now a team of astronomers from Tel Aviv University, including Prof.

Hagai Hetzer and his research student Benny Trakhtenbrot, have determined that the era of first fast growth of the most massive [black holes](#) occurred when the [universe](#) was only about 1.2 billion years old — not two to four billion years old, as was previously believed — and they're growing at a very fast rate.

The results will be reported in a new paper soon to appear in *Astrophysical Journal*.

The oldest are growing the fastest

The new research is based on observations with some of the largest ground-based telescopes in the world: "Gemini North" on top of Mauna Kea in Hawaii, and the "Very Large Telescope Array" on Cerro Paranal in Chile. The data obtained with the advanced instrumentation on these telescopes show that the black holes that were active when the universe was 1.2 billion years old are about ten times smaller than the most massive black holes that are seen at later times. However, they are growing much faster. The measured rate of growth allowed the researchers to estimate what happened to these objects at much earlier as well as much later times.

The team found that the very first black holes, those that started the entire growth process when the universe was only several hundred million years old, had masses of only 100-1000 times the mass of the [sun](#). Such black holes may be related to the very first stars in the universe. They also found that the subsequent growth period of the observed sources, after the first 1.2 billion years, lasted only 100-200 million years.

The new study is the culmination of a seven year-long project at Tel Aviv University designed to follow the evolution of the most massive black holes and compare them with the evolution of the [galaxies](#) in

which such objects reside.

Provided by Tel Aviv University

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