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Media Inquiries: Kristin Elise Phillips, Department of Communications July 2010
212-496-3419; kphillips@amnh.org
www.amnh.org

RAIN OF GIANT GAS CLOUDS CREATE ACTIVE GALACTIC NUCLEI

NEW RESEARCH EXPLAINS HOW GALAXY CENTERS LIGHT UP

Galaxies like our own were built billions of years ago from a deluge of giant clouds of gas, some of which continue to rain down. Now new calculations tie the rain of giant clouds of gas to active galactic nuclei (AGN), the extremely bright centers of some galaxies. If a gas cloud with millions of times more mass than our Sun wanders too close to the center of a galaxy, it can either be consumed by the supermassive black hole that lurks there or, through shocks and collapse, give birth to new stars.

"For a while, people have known that gas clouds are falling onto galaxies, and they've also known that active galactic nuclei are powered by gas falling onto supermassive black holes," says Barry McKernan, a research associate in the Department of Astrophysics at the American Museum of Natural History and an assistant professor at the Borough of Manhattan Community College (BMCC), City University of New York. "But no one put the two ideas together until now and said, 'Hey, maybe one is causing the other!'"

All galaxies are believed to host a supermassive black hole at their center, yet only a fraction of galactic centers show signs of brighter activity due to black hole feeding. The new research provides an explanation for the apparent conundrum: galactic centers which have sustained recent cloud impacts have enough fuel to light up by giving birth to hundreds of stars and feeding the central black hole. Galactic centers that have not been hit for a while (in cosmic terms, for more than about 10 million years) will be relatively inactive and their cores will appear normal.

"It's interesting that only some galaxies are active, even though we think every galaxy contains a supermassive black hole," says K. E. Saavik Ford, a research associate

at the Museum and an assistant professor at BMCC. “The cloud bombardment idea provides an explanation: it’s just random luck.”

The research paper, currently online, will be published in the *Astrophysical Journal Letters*. In addition to McKernan and Ford, the paper is authored by Ari Maller, assistant professor at New York City College of Technology, City University of New York. The research was supported in part by the American Museum of Natural History, grants from the City University of New York, and an ROA supplement to a National Science Foundation grant.

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