PHYSICS AND ASTRONOMY
COLLOQUIUM

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"Coevolution (Or Not) of Supermassive Black Holes and Host Galaxies"

Abstract

I review the observed demographics and inferred evolution of supermassive black holes (BHs) found by dynamical modeling of spatially resolved kinematics. Tight correlations between BH mass and the mass and velocity dispersion of the host-galaxy bulge have led to the belief that BHs and bulges coevolve by regulating each other's growth. New results replace this simple story with a richer and more plausible picture in which BHs correlate differently with different galaxy components. BHs are found in pure-disk galaxies, so classical (elliptical-galaxy-like) bulges are not necessary to grow BHs. But BHs do not correlate with galaxy disks or with disk-grown pseudobulges or with halo dark matter halos (beyond the known correlation with bulges). I suggest that there are four regimes of BH feedback:
1- Local, stochastic feeding of small BHs in mainly bulgeless galaxies involves too little energy to result in coevolution.
2- Global feeding in major, wet galaxy mergers grows giant BHs in short, quasar-like AGN events whose feedback does affect galaxies. This makes classical bulges and coreless-rotating ellipticals
3- At the highest BH masses, maintenance-mode feedback into X-ray gas has the negative effect of helping to keep baryons locked up in hot gas. This happens in giant, core-nonrotating ellipticals. They inherit coevolution magic from smaller progenitors.
4- Independent of any feedback physics, averaging during successive mergers helps to engineer tight BH-host correlations.
Many lines of research converge on a unified picture of the quenching of star formation in galaxies with redshifts $z <\sim 1$. The main quenching agents are bulge formation starbursts and AGNs in wet mergers (mode 2 above) and hot, X-ray gas in high-mass galaxies and clusters of galaxies (mode 3 above).

Wednesday, November 4, 2015
3:00 p.m.
Elliott Building
Room 167