

SUPERMASSIVE BLACK HOLES AND THE PROBLEM OF GALAXY FORMATION

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Refreshments at 3:30 P.M. in 202 NSH

One of the most remarkable discoveries of the past decade revealed that black holes weighing tens of millions to more than a billion times the mass of the Sun reside in the centers of nearly all large galaxies. Many galaxies and all clusters of galaxies are surrounded by hot, gaseous atmospheres that serve as repositories for the energy released as supermassive black holes in the nuclei of galaxies are formed. The atmospheres also harbor vast reservoirs of gas that is expected to cool to low temperatures and to fuel star formation in galaxies continuously over the age of the Universe. Yet most giant elliptical galaxies show few signs of star formation but are instead “red and dead.” Observations made by Earth-orbiting X-ray telescopes have shown that cooling is suppressed by powerful outbursts of energy released by accreting supermassive black holes. This process, which has been dubbed “feedback”, may solve several outstanding problems in cosmology including the dearth of luminous, blue galaxies and an apparent excess of hot baryons in the Universe. The most energetic outbursts may be powered by rapidly spinning black holes.