

IAU Commission C.X1 (parent divisions D & J)

Supermassive Black Holes, Feedback, and Galaxy Evolution

Rationale: The physical processes that couple the growth of supermassive black holes (SMBH) to their host galaxies -- the so-called feedback processes, are now necessary ingredients in galaxy evolution models, not only regulating the growth of the galaxies but also influencing their environment. Radio jets extending to hundreds of thousands of kpc, their interaction with ambient gas producing X-ray, optical and infrared emission, relic X-ray cavities observed in galaxy clusters, outflows observed in neutral, ionized and molecular gas, are all observed manifestations of these feedback phenomena. Instruments including Gamma-ray and X-ray satellites, the Hubble Space Telescope, integral field spectrographs on 8-10m class telescopes and radio observations, including the Atacama Large Millimeter Array, have been dedicating increasing fractions of their time to observe and characterize these phenomena and constrain the relevant physical mechanisms. A coordinated multi-wavelength observational and combined theoretical effort is key to advancement in this field. We thus plan to bring together observers from across the electromagnetic spectrum with theorists to understand the interplay between the growth of supermassive black holes and galaxy evolution, from the earliest epochs to the present day Universe. The commission would both continue the progress made to the present day and extend the discussion to directly address AGN and galaxy interactions at high redshifts. Detailed studies at high redshift will be possible with future, more powerful observatories, both on the ground (notably LSST, E-ELT, GMT, and TMT in the optical and infrared and JVLA, SKA, GMRT, LOFAR in the radio) as well as space missions (e.g., James Webb, Euclid, WFIRST, ATHENA, ATLAST, X-ray Surveyor).

Goals and planned activities for the next six years: The goals of IAU Commission C.X1 would be to promote the development of the field and foster interaction between observational and theoretical astronomers working on all covered topics, providing a well-defined forum for discussion and dissemination of results. To achieve this goal, we propose the development and support of the following activities, most of which would begin in the first year of the commission and continue through its duration:

- Provide a forum for discussions about the best observational campaigns;
- Enable a forum for discussion of particular objects or classes of objects to be observed along with needed multi-wavelength surveys;
- Support, propose, and organize meetings, especially IAU Symposia;
- Encourage discussion of theory and simulations, supporting the dissemination of computing codes. We intend that our organizing committee include theorists who are expert in simulations. In addition to a forum for discussion, in the first year of the commission, we will form a small subcommittee to support the dissemination of available computing codes;
- Plan and coordinate sessions at IAU General Assemblies;
- Prepare a quarterly newsletter to announce meeting deadlines, key science advances, opportunities for collaboration, observing proposal deadlines.