

Preface: Special Session SpS3 Galaxy Evolution through Secular Processes

The meeting “Galaxy Evolution through Secular Processes,” hosted as Special Session 3 at the XVIIIth General Assembly of the IAU in Beijing, brought together a broad community of astronomers actively working on topics related to the evolution of galaxies. This evolution is currently thought to have two phases: (1) a formative chaotic phase, where baryonic matter collected into dark halo “seeds” with the occurrence of frequent mergers; and (2) a slower secular evolutionary phase where internal perturbations such as bars and spirals interacted (and likely still interact) with a galaxy’s stars and gas clouds to redistribute material and slowly change the morphology, such as growing bulges or pseudobulges from disk material.

At the present epoch, secular evolution is thought to be the dominant process that changes galaxies. Major mergers since $z=1$ are far less important than they were in the past, and minor mergers can explain mainly some peculiar morphologies. For the majority of normal galaxies, secular evolution is likely to be mostly an internal process of change, although the meeting also brought attention to environmental secular evolution and the role it plays in changing magellanic spirals and irregulars into what John Kormendy calls “spheroidal galaxies.” This and studies of the rotation of early-type galaxies and the structural components of S0 galaxies has led to a serious modification of the old Hubble “tuning fork” of galaxy morphologies. The goal of the meeting was to examine these issues and others from a wide variety of viewpoints, to better establish the role secular processes have played on galaxy evolution.

The program of the meeting included 20 invited reviews and 43 contributed talks presented in 12 sessions over a five day period, plus a few dozen related posters. The meeting covered dynamical mechanisms of secular evolution, including radial migration, external gas accretion, and the roles of collective effects and resonances; the origins and lifetimes of internal perturbations that drive secular evolution and the features they may generate, such as rings, lenses, and secondary bars; characteristics of classical bulges versus pseudobulges; the rise of parallel-sequencing as an alternative view of galaxy morphology; the role secular evolution plays on stellar populations, chemical abundances, and star formation; how secular evolution affects vertical disk structure; secular processes in the Milky Way, including new models of the Galactic bar; the structure of isolated galaxies whose properties may be driven only by secular evolution; and finally, secular evolution in a cosmological context.

We are grateful to the SOC of IAU SpS3 and to the speakers and poster presenters for making this meeting a great success. We are also grateful to the LOC for the smooth operation of the meeting venue.

Ronald J. Buta and Daniel Pfenniger, co-chairs SOC,
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