

The growth of supermassive black holes via secular processes

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Abstract: Over the last few years, models for galaxy formation and evolution have improved significantly, driven by the constraints imposed by deeper and more comprehensive observations of the high-redshift Universe. The current Lambda Cold Dark Matter structure formation (hierarchical) models, with prescriptions for feedback from Starformation and AGN processes, have been successful in explaining much of the observations, leading to an image of galaxy growth mostly by merging and interaction between galaxies. However, one element still remains absent from the entire picture - pure disk or bulgeless galaxies. These galaxies are simply too difficult to produce in a merger dominated Universe, and would be quickly destroyed by interactions with even low-mass halos. Furthermore, they should not be able to host supermassive black holes, something which has been contradicted by the discovery of handful of bulgeless galaxies with AGN in the local Universe.

In the last few years, the group has assembled a sample of thousands of bulgeless galaxies at intermediate to high redshifts ($z \sim 0.4-1.0$) and, using the deepest X-ray observations available, has identified about 30 bulgeless galaxies with AGN. While the phenomena is obviously rare in the Universe, it is likely a key ingredient to the understanding of galaxy formation and evolution throughout the whole Universe History.

In this thesis, the student will analyse the characteristics of the sample of bulgeless AGN, and compare those to the examples found in the local Universe. Using some of the deepest astronomical observations ever made, in fields that include COSMOS and Chandra Deep Field South, he will try to understand how these supermassive black holes can grow in bulgeless galaxies, which have presumably avoided mergers with neighbouring galaxies (growth by secular processes), and use this knowledge to constrain the current galaxy formation and evolution models.