

## Astrophysics &gt; Cosmology and Extragalactic Astrophysics

# Galaxy Formation Spanning Cosmic History

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Over the past several decades, galaxy formation theory has met with significant successes. In order to test current theories thoroughly we require predictions for as yet unprobed regimes. To this end, we describe a new implementation of the Galform semi-analytic model of galaxy formation. Our motivation is the success of the model described by Bower et al. in explaining many aspects of galaxy formation. Despite this success, the Bower et al. model fails to match some observational constraints and certain aspects of its physical implementation are not as realistic as we would like. The model described in this work includes substantially updated physics, taking into account developments in our understanding over the past decade, and removes certain limiting assumptions made by this (and most other) semi-analytic models. This allows it to be exploited reliably in high-redshift and low mass regimes. Furthermore, we have performed an exhaustive search of model parameter space to find a particular set of model parameters which produce results in good agreement with a wide range of observational data (luminosity functions, galaxy sizes and dynamics, clustering, colours, metal content) over a wide range of redshifts. This model represents a solid basis on which to perform calculations of galaxy formation in as yet unprobed regimes.

Comments: MNRAS accepted. Extended version (with additional figures and details of implementation) is available at [this http URL](#)

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