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Timothy Weinzirl

# Probing Galaxy Evolution by Unveiling the Structure of Massive Galaxies Across Cosmic Time and in Diverse Environments

Doctoral Thesis accepted by the University  
of Texas at Austin, USA



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*In memory of Grandpa & Grandma*



# Foreword

This excellent thesis, by Dr. Timothy Weinzirl, uses the novel approach of structural archaeology to unveil the assembly history of galaxies across diverse environments and over a wide range of cosmic epochs covering over two-thirds of the age of the Universe. Structural archaeology involves using the mass budget between two fundamental structural components of galaxies—dynamically cold, flat, disk-dominated components versus dynamically hot classical bulges—to characterize the relative importance of different assembly modes, including galaxy major mergers, minor mergers, gas accretion, and secular evolution, in building up galaxies over cosmic time.

This thesis uses cutting-edge datasets, including some of the largest and deepest galaxy surveys conducted with the Hubble Space Telescope, as well as insightful comparisons with contemporary hierarchical models of galaxy evolution. Students and researchers working on galaxy evolution will benefit from the detailed pedagogical descriptions of the methodology and tailored techniques addressing systematic effects. A major finding of this work is that disk structures are far more prevalent in massive galaxies over a wide range across different epochs than previously appreciated. This raises important challenges for current models of galaxy evolution.

This thesis paves the way for the future explorations of galaxies at earlier cosmic times, which will only be possible with next generation facilities, such as the James Webb Space Telescope and the ground-based Giant Magellan Telescope.

Austin, TX, USA  
May 2014

Shardha Jogee





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