

Preface

Understanding the origin of galaxies is one of the major research goals of astrophysicists. Our own Milky Way and its neighbouring galaxies provide the ideal laboratory to facilitate a deeper understanding of how galaxies form. We can look in detail at the different components of our Milky Way and try to reconstruct events in the distant past through present-day clues—in essence we are carrying out archaeology on a galactic scale.

Our Galaxy resides in The Local Group, an overdense region out to about ten megaparsecs from the Milky Way. This region includes Andromeda (M31) a similar galaxy as our own, as well as a few dozen smaller galaxies and satellites. This environment is typical of most galaxies in our Universe. In a few billion years, the Local Group will have evolved into a single large elliptical galaxy as its most massive members merge together.

The origin of the Galaxy and Local Group is placed within the framework of the standard Λ CDM big bang cosmology. The Milky Way and its satellites continue to provide tests and constraints on theories of galaxy formation and on the standard cosmological model—namely a hierarchical universe in which structure formation is driven by an underlying dominant component of cold dark matter.

The following chapters contain a broad and detailed overview of our current understanding of the origin of our Milky Way Galaxy and the Local Group. They represent the current state of the art in the exciting topic of Near Field Cosmology.

These up-to-date reviews are based on lectures given at the inspiring 37th Saas Fee School held in Muerren, Switzerland. Muerren is a car-free mountain village high above the spectacular Lauterbrunnen valley in the Bernese Oberland. The school was entitled “The Origin of the Galaxy and Local Group” and it was attended by over 100 young astronomy students. The School was organised by Prof. Ben Moore (University of Zurich) and Prof. Eva Grebel (University of Heidelberg) and the lectures were given by world experts on these topics: Prof. Joss Bland-Hawthorn (Sydney Institute for Astronomy), Prof. Kenneth Freeman (Mount Stromlo Observatory) and Prof. Francesca Matteucci (Trieste University).

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Ben Moore

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