

Preface

The outskirts of galaxies are mostly unexplored territory. Great advances have been made in particular in studying the star formation (through UV imaging) and gas (HI radio emission), but exploration of the stellar component, observed through optical and infrared imaging, can be considered to be still in its infancy. Yet the outskirts are key to understanding how galaxies form and evolve and how they have diversified into a class of objects with the wide range of morphologies of properties that we observe today. Their importance stems from two facts: the timescales in the outer regions are long, and stellar and gas densities are low. Both lead to slower evolution in the outskirts, implying that we are observing conditions at an earlier state there relative to the denser inner regions of galaxies which have been observed traditionally. In addition, accretion of pristine gas happens in the outskirts, stars are thought to migrate outwards and the material in the outer regions, when seen projected against the emission from background quasars, yields important information about the properties of the interstellar and intergalactic medium.

This volume brings together the views and insights of a number of world-renowned experts in this field, who have written a total of ten chapters summarizing our current knowledge of the outer regions of galaxies, as well as their views on how this field is likely to evolve in the near future. The topics described in detail range from studies of the structure and star formation history of our own Milky Way and the nearest external galaxies on the basis of individual star counts, via the deepest possible imaging of the integrated light of galaxies, to the study of the outskirts of galaxies at cosmological distances through the study of the light of background quasars passing through their outer regions. Other reviews discuss recent observations of molecular and atomic gas in the outskirts of galaxies and what we can learn from those about topics as varied as the current and past star formation and the shape of the dark matter haloes. Observed metallicities and their radial gradients are discussed in the context of chemical composition and star formation in the outskirts, touching on mechanisms such as metal-rich infall and metal mixing in disks. Stellar migration in galaxies is discussed in detail, paying particular attention to how observations and theoretical insights are improving our understanding of galaxy evolution, as is star formation in the outskirts of galaxies, which shines a

new light not just on the properties of the outer regions but also on the process of star formation itself.

Our knowledge of the outer regions of galaxies is rapidly improving because new data are now enabling detailed study at a variety of wavelengths and with a variety of techniques. As the authors of this volume discuss, the next generation of telescopes and instruments will accelerate the exploration of galaxy outskirts, which will without any doubt lead to breakthroughs in our understanding of how galaxies have formed and evolved. We hope that this collection of reviews will provide a resource for a full range of workers in the field—expert investigators in theory and observation, those intrigued by recent discoveries who wish to learn more and students and other researchers who are interested in entering this exciting field.

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