

Preface

Scope

Almost all stars initially stayed in clustered environment, they formed from following the turbulent structure. These structures will quickly collapse into bound clusters within very short period. Current consensus of formations of star clusters suggests that their star-forming processes should behave as a star burst mode: the initially segregated protostars and the secondary protostars will lead the central region of a cluster to be shielded from further gas accretion, they will quickly dominate the cluster region and expel their surrounding gas through strong stellar feedback, stopping the subsequent star formation. This is the simple stellar population scenario, which means in a star cluster, all of its member stars should form in the same era (therefore have the same age) and share similar helium abundance and metallicity. However, the discoveries of stellar age spreads and chemical anomalies of stellar populations in lots of massive clusters have made the notion of star clusters as true samples of simple stellar populations had to face a serious challenge. This book aims to introduce the stellar population properties of star clusters with various ages. The history and progress of researches in this field as well as most recent improvements, including observational results and related scenarios that were proposed to explain the observations, are also present.

Content

This book consists of three parts: Part I contains the background knowledges of star formation and evolution, as well as an introduction of current consensus of stellar populations in star clusters. Part II covers the latest researches related to this topic, including the observational results of young massive star clusters, 1–2 Gyr intermediate-age star clusters as well as old globular clusters. The relevant scenarios that proposed to explain the observations are also present. Part III gives a

comprehensive discussion based on all the observations and explanations: Where do we stand in this field? How can we shed light on the stellar population problems in the future? What is the impact on other astrophysical aspects once we improved our understanding on this topic?

This book is mainly based on my Ph.D. thesis that was submitted to Peking University of China in 2015, it also includes some of our subsequent researches and reviews, as this active field really changes rapidly. Because of this, we cannot guarantee that all the conclusions appearing in this book are exactly correct, we suggest that readers inherit the knowledges of this book in a critical way.

Audience

This book is designed for junior researchers who are interested in stellar populations in star clusters. For those who are senior experts in this field, we hope this book can serve as a reference for scientific discussions and debates. For readers who want to get a quick start on this field, we encourage them to focus on Part I, Part III and the main conclusions in Part II. The Chaps. 1 and 2 in Part I mainly focus on the basic knowledges of star formation and evolution, readers who already have this base level foundation can skip this part and directly enter the Part II, which introduces our latest research results related to this field. Any comment about our works in this book is welcome.

Acknowledgements

I want to thank Dr. Mark Gieles at the University of Cambridge, UK, Dr. Simon F. Portegies Zwart at the Leiden Observatory, the Netherlands and Dr. Wuming Yang at the Beijing Normal University, China, for sharing their data with us. I also want to express my gratitude to Dr. Wong Mek, who was my psychiatrist when I was a Ph.D. student in Peking University, she supported in any aspect during that period.

Macquarie University, Sydney

Chengyuan Li

Not-So-Simple Stellar Populations in Star Clusters

Li, C.

2017, XV, 132 p. 56 illus., 44 illus. in color., Hardcover

ISBN: 978-981-10-5680-2