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Star Clusters: From the Milky Way to the Early Universe

Edited by

Angela Bragaglia
Melvyn Davies
Alison Sills
Enrico Vesperini

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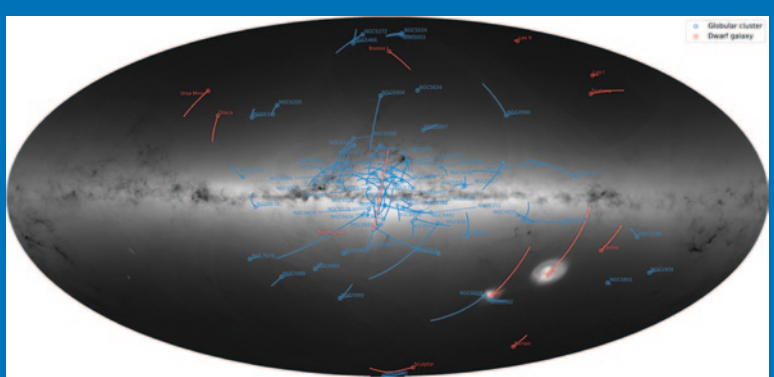

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COVER ILLUSTRATION:

The Milky Way as reconstructed from Gaia DR2 data, highlighting the location of nearly 90 satellites of the Milky Way: globular clusters (in blue) and dwarf galaxies (in red). The arcs show the path these objects will take in the next 10 million years for the globular clusters and in the next 100 million years for the dwarf galaxies. Image created by Maarten Breddels. Credits: ESA/Gaia/DPAC, Amina Helmi, Maarten Breddels and co-authors of the paper "The kinematics of globular clusters and dwarf galaxies around the Milky Way".

Source: Group photo kindly taken by Dr. Anton Seleznev, who also made other pictures available from the Symposium website (http://iausymp351.oas.inaf.it/).

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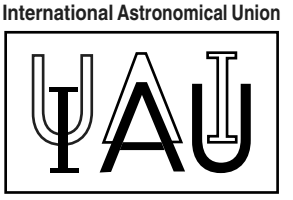

STAR CLUSTERS: FROM THE MILKY WAY TO THE EARLY UNIVERSE

PROCEEDINGS OF THE 351st SYMPOSIUM OF THE INTERNATIONAL ASTRONOMICAL UNION HELD IN BOLOGNA, ITALY 27–31 MAY, 2019

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Preface

IAU Symposium 351 "Star Clusters: from the Milky Way to the early universe" was held at the Consiglio Nazionale delle Ricerche conference centre in Bologna, Italy on May 27–31, 2019. The IAU Symposium 351 was also chosen as MODEST-19 (Modelling and Observing DEnse STellar systems, a meeting series started in 2002). The Symposium was followed on Twitter (#iaus351, #MODEST19) thanks to many participants. It was attended by about 200 participants from 33 countries. We had 73 talks and about 100 posters presented during the meeting. This volume contains 119 contributions which provide an important snapshot of the state of the field. The topics in the volume follow the order in which they were presented during the conference.

- Formation and evolution of clusters at present time and at high redshift
- Globular clusters and satellite systems and extragalactic clusters in general
- Multiple stellar populations in stellar clusters, in the Milky Way and in the local Universe
- Dynamics and evolution of stellar content in clusters
- Black holes and other exotic populations in clusters
- Links between globular, open, young massive, nuclear star clusters
- Dwarf/ultra-compact/ultra-faint galaxies and clusters as building blocks of large galaxies
- The Gaia revolution for star clusters
- Galactic archaeology with present and future large surveys

The Symposium clearly showed the complexity of stellar clusters, either at low redshift (e.g. multiple stellar populations, internal dynamics, binary interactions, etc) or at high redshift (formation and early evolution). The formation mechanisms and sites of stellar clusters of any age and mass were debated, also in the light of multiple populations. The presence of sessions both on the local and the high-z universe was very useful to establish links between the clusters we see today and their progenitors, using properties both well known or still only partly explored. Researchers were then able to get a broader and more informed vision of the important constraints coming from confronting low- and high-z conditions. Star clusters were not only considered as interesting objects per se, but as probes of larger systems such as galaxies and as contributors to the halo/disc populations of the Milky Way. The internal dynamics of stellar clusters and their dynamical evolution were debated, considering particularly the populations of "exotic" objects such as compact binaries, black holes, and millisecond pulsars.

The increasing importance of large scale studies and massive datasets and simulations was discussed. Particular mention should be made of the increasing number of theoretical and observational investigations devoted to the study of the internal kinematics of star clusters. Various contributions based on large radial velocity surveys and proper motion studies based on HST and Gaia data were presented. Gaia data and results were widely exploited.

We were very happy to see many young researchers presenting very interesting, clear and informed talks and posters. This shows that the new generation of scientists promises to bring new highlights in the field of stellar clusters research.

We would like to extend our thanks to everyone who helped to make this symposium a success. First, Maurizio Salaris took on the task of giving an outreach presentation for the general public on the subject of Globular Clusters and the possibility of alien life. We acknowledge the immense amount of work done by the Local Organizing Committee and we thank Emanuele Dalessandro (LOC chair), Caterina Caravita, Cristiano Fanelli,

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Alice Minelli and Antonio Sollima for their dedication; without their help the Symposium 351 would not have been so successful. We also thank the technical assistence of the C.N.R. area. We gratefully acknowledge support from INAF (Istituto Nazionale di Astrofisica) and the INAF-OAS Bologna. Our many thanks go to the Scientific Organizing Committee. They managed the difficult job of selecting the speakers for the scientific program among the many interesting abstracts which were submitted. In addition, many of the SOC members took part in the Symposium and had an active role, chairing sessions and fostering discussion. Finally, we thank the IAU, particularly Division H (Interstellar Matter and Local Universe) and our other supporting divisions and commissions (Divisions G-Stars and Stellar Physics and J-Galaxies and Cosmology; Commissions A1-Astrometry; H1-The Local Universe; H4-Stellar Clusters throughout Cosmic Space and Time) for their support of this symposium.

Angela Bragaglia, Melvyn Davies, Alison Sills, Enrico Vesperini

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