

COMMISSION H4

STELLAR CLUSTERS THROUGHOUT COSMIC SPACE AND TIME

AMAS STELLAIRES À TRAVERS

L'ESPACE ET LE TEMPS COSMIQUES

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TRIENNIAL REPORT 2015–2018

1. Introduction

Research on star clusters, of any size, at any distance, and of any age, includes the observation and theory of stellar groupings as they form, evolve, and disrupt. It covers many processes, including star formation, stellar feedback, and stellar interactions in various environments. In what follows, we list past, present, and future meetings (<http://www.cadc-ccda.hia-ihh.nrc-cnrc.gc.ca/en/meetings/>), publications statistics, and important surveys, reviews, and databases about clusters.

2. Past meetings (August 2015–January 2018)

- Dwarf Stars and Clusters with K2, January 16–18, 2018; Boston University, Boston, USA
- ($M + 2$)nd Aarseth N -body Meeting, December 12–15, 2017; Charles University, Prague, Czech Republic
- The Initial Mass Function: From Top to Bottom, November 10, 2017; Royal Astronomical Society, London, UK
- 70 years of stellar associations, September 25–27, 2017; Byurakan Observatory, Armenia
- MODEST 17 – Modelling and observing dense stellar systems, September 18–22, 2017; Charles University, Prague, Czech Republic
- Stellar Populations and the Distance Scale, September 11–15, 2017; Kavli Institute for Astronomy and Astrophysics, Beijing, China
- Comparing simulations and observations of the varying scales of star formation, June 26–27, 2017; EWASS 2017 Symposium 3, Prague, Czech Republic
- Star Cluster Formation: Mapping the first few Myr's, June 14–15, 2017; Euroforum Palacio de los Infantes, San Lorenzo de El Escorial, Spain
- Francesco's Legacy: Star Formation in Space and Time, June 5–9, 2017; Istituto degli Innocenti, Firenze, Italy
- Third Winter School of the Valongo Observatory: Astrochemistry of the ISM, Stellar

Populations in Globular Clusters, Evolution of Stellar Populations in Galaxies, Observational Cosmology: Observations Meet Theory, May 22–26, 2017; Valongo Observatory of the Federal University of Rio de Janeiro, Rio de Janeiro, Brazil

- Big Questions in Astrophysics, April 3–5, 2017; Lund Observatory, Lund, Sweden
- Multi-Scale Star Formation, April 2–6, 2017; Instituto de Radioastronomía y Astrofísica UNAM, Morelia, Mexico
- Star Formation from Cores to Clusters, March 6–9, 2017; ESO Santiago, Chile
- Frontiers in Theoretical and Applied Physics, February 22–25, 2017; American University of Sharjah, United Arab Emirates
- 631. WE-Heraeus-Seminar: Stellar aggregates over mass and spatial scales, December 5–9, 2016; Physikzentrum Bad Honnef, Germany
- Star Clusters: from Infancy to Teenagehood, August 8–12, 2016; Max-Planck Haus, Heidelberg, Germany
- Multiple Populations in Stellar Clusters: Where do we stand?, July 25–29, 2016; Sexten Centre for Astrophysics, Sexten (Sesto), Italy
- The role of feedback in the formation and evolution of star clusters, July 18–22, 2016; Sexten Centre for Astrophysics, Sexten (Sesto), Italy
- COSMIC-LAB: Star Clusters as Cosmic Laboratories for Astrophysics, Dynamics and Fundamental Physics (MODEST 16), April 18–22, 2016; University of Bologna, Bologna, Italy
- Globular Clusters and Galaxy Halos, February 22–26, 2016; Lorentz Center, Leiden University, Netherlands
- *Mth Aarseth N-body Meeting*, December 15–18, 2015; Charles University, Prague, Czech Republic
- Stellar clusters: benchmarks for stellar physics and Galactic evolution, October 4–9, 2015; Banyuls, France
- Formation, evolution, and survival of massive star clusters, IAU Symposium 316, August 11–14, 2015; Honolulu, Hawaii, USA

3. Forthcoming meetings (February–August 2018)

- Multiple populations in massive star clusters, a common thread through cosmological ages?, EWASS Special Session 19, April 4, 2018; EWASS 2018, Liverpool, UK
- MODEST-18: Dense Stellar Systems in the Era of GAIA, LIGO & LISA, June 25–29, 2018; Santorini, Greece
- Multiple Populations in Stellar Clusters, July 9–13, 2018; Sexten Centre for Astrophysics, Sexten (Sesto), Italy
- The formation of globular clusters at high and low redshift; tracing star and cluster formation across cosmic times, July 16–20, 2018; Sexten Centre for Astrophysics, Sexten (Sesto), Italy

4. Publications

The topic of star clusters and associations continues to be one of the most widely followed in all of astronomy. It spans the range of interest from stellar properties, to stellar clusters, to star formation and evolution, the stellar initial mass function, etc.

Peer-reviewed publications in the period from August 2015 to January 2018 as follows (from NASA's Astrophysics Data Service):

- Globular clusters: ~ 850 papers;
- Young massive clusters: ~ 50 papers;

- Open clusters: ~ 560 papers;
- Stellar associations: ~ 90 papers.

Some of the issues addressed in these publications include the formation and dynamical evolution of star clusters; stellar evolution and ages; star clusters as tracers of stellar populations; not-so-simple stellar populations in star clusters; studies of specific types of objects within clusters; nuclear clusters; extragalactic cluster systems.

The authors use observations covering an increasing portion of the electromagnetic spectrum, ranging from X-rays to the far-infrared, as well as advanced N -body simulations.

A newsletter with cluster results, SCYON, has been adopted as Commission H4's house publication: <http://www.univie.ac.at/scyon/>. It is edited by Giovanni Carraro, Martin Netopil, and Ernst Paunzen.

Reviews related to star clusters that appeared during the period of record include:

- Forbes D. A., et al., 2018, Proc. Roy. Soc. A, in press (1801.05818): Globular Cluster Formation and Evolution in the Context of Cosmological Galaxy Assembly: Open Questions
- Renaud F., 2018, NewAR, in press (arXiv:1801.04278): Star Clusters in Evolving Galaxies (invited review; ed. C. Clarke)
- Bastian N., Lardo C., 2018, ARA&A, in press (arXiv:1712.01286): Multiple Stellar Populations in Globular Clusters
- de Grijs R., Li C., 2018, Physica Scripta, 93, 024001: Not-so-simple stellar populations in nearby, resolved massive star clusters
- Li C.-Y., de Grijs R., Deng L.-C., 2016, Res. Astron. Astrophys., 16, 179: Stellar populations in star clusters

5. Databases of note

- Data on Open Clusters in the Milky Way and the Magellanic Clouds can be found in the WEBDA site (<http://www.univie.ac.at/webda/>), which was originally developed by Jean-Claude Mermilliod from the Laboratory of Astrophysics of the EPFL (Switzerland) and is now maintained and updated by Ernst Paunzen, Christian Stütz, and Jan Janik from the Department of Theoretical Physics and Astrophysics of the Masaryk University, Brno (Czech Republic).

- Data on Galactic Globular Clusters can be found in the “Catalog of MilkyWay Globular Cluster Parameters” by W. E. Harris (<http://physwww.mcmaster.ca/~harris/Databases.html>), as well as in “The Galactic Globular Clusters Database” at the Astronomical Observatory of Rome INAF-OAR: (<http://gclusters.altervista.org/>).

- A catalog of “Open Clusters and Galactic Structure,” by W. S. Dias, et al. (2002, A&A, 389, 871), which also contains references to other catalogs, is here: <https://wilton.unifei.edu.br/ocdb/>.

- A Catalogue of Variable Stars in Globular Clusters is maintained by Christine Clement at <http://www.astro.utoronto.ca/~cclement/read.html>.

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