

IAU DIVISION H
THE INTERSTELLAR MATTER AND THE LOCAL UNIVERSE
Tri-annual report 2022-2024

Mónica Rubio
IAU Division H President

Steering Committee

President: Monica Rubio (Chile)
VicePresident: Claus Leitherer (USA)
Secretary: Albert Zijlstra (United Kingdom)
Edvige Corbelli (Italy)
Paola Caselli (Germany)
Francesca Dantona (Italy)
Orsola Demarco (Australia)
Grazina Tautvaisiene (Lithuania)
Yuri AIKAWA (Japan)
Pauline Barmby (Canada)
Roelof S. de Jong (Germany)
Viktor Tóth (Hungary)
Past President Leo Testi (Italy)

The Division has 3116 members and 289 junior members. The main activity during the period 2022-2024 was the organization of the Division Day H for the upcoming XXXI General Assembly, August 1-15, 2024, in Cape Town, South Africa, and during the XXX General Assembly in August 1- 12, 2022 held in Busan, Korea and the Division Day

•Members of the Division have steadily risen during the period.

	2024	2023	2022
Active members :	3116	3067	2987
Junior members :	289	261	209

The other activity of the Division was related to the selection process of the 2022-2024 IAU and FM meetings, for the General Assembly, the 2022-2024 PhD thesis prize and the 2023-2025 IAU Symposia, and 2024 IAU GA Focus Meetings, in which the SC committee evaluated the proposed meetings and ranked them. The result of these assessments was delivered to the IAU EC for the final decision.

•IAU PhD Prize

The Steering Committee has the task to evaluate PhD candidates for the IAU PhD Prize that is given every year. The SC proposes a PhD winner and an honorary winner to the EC. The Division also can propose a PhD at large prize winner.

In 2024 there were 8 candidates, in 2023, there were 9 candidates, and in 2022 8 candidates for the PhD Prize. The SC selected one PhD prize winner and one honorary mention for 2022, and 2024.

•Symposiums and meetings

2024: The SC revised the proposals received for the IAU General Assembly 2024. These were 3 symposiums, 6 Focus Meetings and 1 non-GA Symposium for 2024.

The Division organized the Division Day for the IAU GA XXXI in Cape Town. Two invited talk for the PhD winners (2023-2024), 30 oral contributions and about 50 poster presentations in the two days.

The SC revised the proposals for 3 IAU symposium for 2025 in which the scientific field was pertinent.

2023: The SC participated as coordinating Division of 4 IAU symposium and sponsored 1 IAU symposium.

2022: The IAU General Assembly took place in Busan, South Korea. The division organized the GA Division Days on August 5 and 8. The PhD winners (2020, 2021, 2022) were allocated an invited talk. There were 5 invited talks and 20 oral contributions and over 200 poster presentations. About 100 abstracts were submitted. It also supported 2 IAU Symposiums and 2 Focus Meeting.

Division H has four commission covering specific fields,

Commission H1: **The Local Universe**

President: Gražina Tautvaišienė

Commission H2: **Astrochemistry**

President: Paola Caselli

Commission H3: **Planetary Nebulae,**

President: Orsola De Marco

Commission H4: **Stellar Clusters throughout Cosmic Space and Time**

President: Francesca D'antona

At the IAU XXXI General Assembly 2024, the Steering Committee will be modified. Only 3 members of the 9 will continue on the Commission.

Some highlights of the period

COMMISSION H1 :THE LOCAL UNIVERSE

President: Grazina Tautvaisiene

Vicepresident :Mattheus Steinmetz

Past president : Dante Minniti

Secretary : Wako Aoki

Organizing Committee: Andrea Ahumada, Jens Kauffmann, Silvia Pellegrini, Panos Patsis, and Priya Shah

The Commission focuses on studies of the Milky Way and nearby galaxies, where stars can be resolved, to explore how galaxies in different environments and across a wide range of masses formed and evolved.

Conferences and other meetings

The Commission Web Page was updated by a list of selected conferences, workshops, summer schools, and other meetings related to the thematic of Commission H1. Due to the Covid-19 pandemic the number of face-to-face meetings was smaller, some were organized virtually or in a hybrid format

Members of the H1 SC served in the SOC for

a) the IAU Symposium 377 on “Early Disk Galaxy Formation: From JWST to the Milky Way”, that was held in Kuala Lumpur, Malaysia, from 6 to 10 of February, 2023. member Dante Miniti This meeting was very successful, where some of the first scientific JWST results were presented and future developments were discussed.

b) “Galactic bars: driving and decoding galaxy evolution”, held in Granada, Spain from 3-7 July 2023 (<http://www.galacticbars2023.com/>). Panos Patsis

c) IAU Symposium 395

“Stellar populations in the Milky Way and beyond” to be held in Paraty, Brasil, from 17 to 22 November, 2024. Grazina Tautvaišienė

Workshop “Spirals and Bars in galaxies”, which was held at the Academy

of Athens on October 14th 2022 (<http://astro.academyofathens.gr/events.html>), organized by Panos Patsis

6th Middle-East and Africa Regional IAU Meeting (MEARIM VI), Cairo, Egypt on February 13-16, 2023. Priya Shah was a keynote speaker

Organization of the IAU Division H Days during the IAU XXXI General Assembly in Busan (South Korea) and during the IAU XXXII General Assembly in Cape Town (South Africa). Grazina Tautvaisiene

Organization of Seminar Series : The Local Universe Seminars

The seminar series that were launched in December, 2021, were held via Zoom approximately once per month and covered both hot topics and long-term work.

Commission H1 “The Local Universe” Seminars YouTube

Channel <https://www.youtube.com/channel/UCyH2KzKFVPmABOIJfgBtJ5g>

IAU highlights these seminars at:

<https://www.youtube.com/channel/UCc3I9q-N0NA05vIYeNMmtTw>

The seminars are recorded and listed for asynchronous viewing on the dedicated IAU Commission H1 “The Local Universe” Seminars YouTube Channel:

<https://www.youtube.com/channel/UCyH2KzKFVPmABOIJfgBtJ5g>

The channel has 131 subscribers. By March 31, 2024, 19 seminar presentations have been posted and viewed 2220 times.

COMMISSION H2: ASTROCHEMISTRY

President: Paola Caselli

Vice-President: Jes K. Jørgensen

Advisor (Past President): Edwin A. Bergin

Organizing Committee: Helen J. Fraser, Wolf D. Geppert, Dariusz C. Lis, Karin I. Öberg, Dmitry A. Semenov

The great sensitivity, high angular resolution, and frequency coverage of telescopes such as ALMA have allowed unprecedented views of stellar and planet nurseries. JWST with its sensitive near- to mid-infrared spectrometers has opened a new sensitive and sharp observing window into major molecular ingredients such as water, carbon dioxide as well as other key organic species. JWST has started to probe the composition of ices on interstellar and planet-forming scales, enabling studies of the linked chemistry of exoplanetary atmospheres and protoplanetary disks.

Conferences and other meetings

- a) Kavli-IAU Symposium: Astrochemistry VIII – From the First Galaxies to the Formation of Habitable Worlds. Jul 10 – 14, 2023, Park Place Hotel, Traverse City, MI, USA
- b) From Clouds to Planets II – The Astrochemical Link, Oct 3 – 7, 2022 Harnack Haus, Berlin, Conference that brought together different communities and discuss astrochemistry finally face-to-face, after the long COVID-19 pandemic:
- c) Astrochemical Frontiers 2021, Quarantice Edition 2”
(<https://sites.google.com/view/astrochemical-frontiers-2021>).

COMMISSION H3: PLANETARY NEBULAE

President :Orsola De Marco

Vice President: Magda Arnaboldi

Past President),Albert Zijlstra

Organizing Committee: David Jones, Isabel Aleman, Bruce Balick, Toshiya Ueta.

H3 is an inter-division commission (H and G).

Meetings and conferences

- a) The organization of the IAU Symposium 384: [IAU Symposium 384: Planetary Nebulae: a Universal Toolbox in the Era of Precision Astrophysics](#) , 4 to 8 September 2023, Krakow, Poland
- b) The production of a community paper on the first JWST results that was published in Nature Astronomy accrued 69 astronomers
JWST puts a shine on the Southern Ring: JWST Early Release Observations with the NIRCам and MIRI instruments reveal that the Southern Ring Nebula is not just the product of a binary star system, as previously thought, but likely a creation that involved a quadruple (if not larger) star system. Also, evident, in crisp detail, is a flocculent ring and extended halo composed of molecular hydrogen.



NGC3132

Interconnections between the different topics (Associations and Young clusters; Old Clusters and Globular Clusters; Dynamics) continues to be dominant in the study of this field.

Several astrometric and spectroscopic surveys like Gaia, GALAH, APOGEE, and Gaia ESO (which published its final catalog in May 2022) are being exploited for cluster stars.

The first data from JWST represents major steps towards our understanding of the formation of globular clusters.

Science Results

Ring Nebulae Rule! Or should I say: two rings, NGC 6720 (the Ring) and NGC 3132 (the Southern Ring), now seem to rule the (PN) world, thanks in large part to dramatic new JWST infrared imaging of both nebulae (De Marco et al. 2022). Despite (or perhaps because of) the fresh JWST-enabled insight into the morphologies and compositions of these two nebulae, the 3D structures of both PNe were the subject of much discussion and debate at the meeting (Monteiro, Wesson).

Molecular line observations of PNe, especially by ALMA, are highly revealing. ALMA mm-wave molecular line and dust emission mapping is completely transforming the study of protoplanetary nebulae,

More atomic and molecular species continue to be found in PN
New elements are being detected and used to constrain the s-process in AGB stars
continue to reveal no closer binaries. Searches for binaries in the middle of PPNe
MUSE observations to constrain the PN luminosity function

COMMISSION H4: STELLAR CLUSTERS

President: Francesca D'Antona

Vice-President: Florent Renaud

Past President :Amanda Karakas

Organizing Committee: Randa S. Asa'd Angela Bragaglia Andrea K. Dupree, Ignacio Negueruela, Eric W. Peng, Andres E. Piatti

The community continues the joint exploitation of Gaia data together with spectroscopic surveys (APOGEE, GALAH, Gaia-ESO), while we prepare for the next generations with 4MOST, WEAVE, MOONS etc. Asteroseismology is being exploited also for cluster stars, with Kepler-K2 and TESS, in combination with spectroscopic information.

Social newsletter: "The Stellar Clusters Young and Old Newsletter" (SCYON), edited by M. Netopil, E. Paunzen, and A. Adamo

Conference and Meetings

- a) Cambridge Workshop on Cool Stars, Stellar Systems, and the Sun (Cool Stars 20.5),(virtual meeting, March 2-4 2021)
- b) EAS 2021, virtual meeting, June 28- July 2, 2021,
Star Clusters: the Gaia revolution, Barcelona 5-7 October 2021, on line,
- c) Aspen Winter Conference "Illuminating Galaxy Formation with Ancient Globular Star Clusters and their Progenitors", March 13- 18, 2022

IAU GA Division Day Division H – Interstellar Matter and Local Universe August 9 and August 12, 2024

SOC: Division SC and the presidents of Commissions

Edvige Corbelli (Italy)
Claus Leitherer (USA)
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Francesca Dantona (Italy)
Orsola Demarco (Australia)
Grazina Tautvaisiene (Lithuania)
Yuri AIKAWA (Japan)
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Roelof S. de Jong(Germany)
Viktor Tóth (Hungary)
Albert Zijlstra (United Kingdom)
Leonardo Testi (Italy)
Monica Rubio (Chile)

Scientific rationale:

The purpose of this meeting is to provide a summary of the most recent and relevant results for a broad range of topics of our Division. Researchers can present their new findings through this two-day workshop in the form of an oral or poster presentation. Presenters should register and submit their oral and poster abstracts selecting “Division H: Interstellar Matter and Local Universe”.

Topics for Day 1:

From simple molecules to the most complex compounds of the ISM

The earliest phases of star formation

Linking the smallest to the large scale: star formation in the MW and nearby galaxies

Dust in the ISM and its role in the formation of planetary systems

Dynamics of galaxies and their satellites in the Local Group

Feedback, streams and the circumgalactic medium of local galaxies

Topics for Day 2:

The latest view of our Milky Way and its center

Multiple stellar population and their dynamics in Open and Globular Clusters

Stellar fossils in the Milky Way and in nearby dwarfs

Imprints of evolved stars in the ISM: PNe and AGBs

Latest results from space missions

The MeerKat contribution to understanding the ISM in and around galaxies

The future impact of new instrumentation

Oral presentations are included as invited talks by PhD Prize winners awarded in 2023 and 2024.