

**IAU DIVISION H**  
**THE INTERSTELLAR MEDIUM AND THE LOCAL UNIVERSE**  
**ANNUAL REPORT 2022-2023**

**Mónica Rubio**  
**IAU Division H President**  
**April 2023**

Steering Committee:

Monica Rubio (President)

Claus Leitherer (Vice-President)

Albert Zijlstra (Secretary)

Paola Caselli (Commission H2 President)

Francesca D'Antona (Commission H4 President)

Orsola De Marco (Commission H3 President)

Gražina Tautvaišienė (Commission H1 President)

Leonardo Testi (Advisor - Past President)

Yuri AIKAWA

Pauline Barmby

Edvige Corbelli

Roelof S. de Jong

Laszlo Viktor Toth

The Division has 3067 members and 261 junior members. The main activity during the period 2022 was the organization of the Division Day H during the XXX General Assembly in August n held in Busan, Korea.

The Division H Days took place on the 5<sup>th</sup> and 8<sup>th</sup> of August, 2022. The SC defined the program and structured the two days in different mayor topics. In Aug 5 session, there were 3 invited talks and 12 contributed talks. On August 8 session, there were 2 invited talks and 8 contributed talks. e-poster session was organized and presented by the attendees. On this occasion, the 2018 - 2021 PhD thesis awardees were invited to give a talk in one of the two days. The IAU Thesis Prize Diploma was handed for those attending at Busan. The attendance to the division days was very good.

The other activity of the Division was related to the selection process of the 2022 IAU and FM meetings, for the General Assembly, the 2021 PhD thesis prize and the 2023 IAU Symposiums. In which the SC committee evaluated the proposed meetings and ranked them. The result of this assessment was delivered to the IAU AC for the final decision.

The Division participated as the coordinating Division in the following IAU Symposia and Focus meetings

- IAUS 373 Resolving the Rise and Fall of Star Formation in Galaxies, Busan Korea, Aug 9 -Aug 11, 2022
- IAUS 380 Cosmic Masers: Proper Motion toward the Next-Generation Large Projects Kagoshima, Japan, Mar 24, 2023
- IAUS 379 Dynamical Masses of Local Group Galaxies, Potsdam, Germany, Mar 20 - Mar 24, 2023
- IAUS 377 Early Disk-Galaxy Formation from JWST to the Milky Way, Kuala-Lumpur Malaysia, Feb 6 -Feb 10, 2023

and supported the symposia and meetings held in Busan, Korea

- IAUS 369 The dawn of cosmology & multi-messenger studies with fast radio bursts, Busan, Korea, Aug 2 -Aug 4, 2022
- IAUS 370 Winds of stars and exoplanets, Busan, Korea, Aug 8 -Aug 11, 2022
- FM 4 UV Insights to Massive Stars and Young Stellar Clusters, Busan, Korea Aug 3 - Aug 10, 2022
- FM 7 Astrometry for 21st Century Astronomy, Busan, Korea, Aug 11,2022

Division H has four commission covering specific field, H1: The Local Universe, H2: Astrochemistry, H3: Planetary Nebulae and H4:Stellar Clusters. Included in this Division H Annual Report 2022 are the reports of each of these Commissions.

**COMMISSION H1: THE LOCAL UNIVERSE  
(L'UNIVERS LOCAL)  
ANNUAL REPORT 2022-2023**

President Grazina Tautvaisiene

Vice-president Matthias Steinmetz

Past president Dante Minniti

Secretary Wako Aoki

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

The IAU Commission H1 “The Local Universe” presently unites 349 members, six more than a year ago. Our Commission focuses on studies of the Milky Way and nearby galaxies, where we can resolve galaxies into stars. Extensive observational and theoretical research is going on in order to understand galaxy formation history and evolution.

#### Commission H1 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

### Meetings



This online seminar series is primarily for IAU commission H1 members, but is open to everyone who have interest in the Local Universe.

The Seminar aims to promote exchanging scientific achievements and ideas between scientists with common interests.

Seminars are held via Zoom and YouTube once per month (tentatively) and cover both hot topics and long-term work.

The seminars are recorded and listed on YouTube for asynchronous viewing: [IAU commission H1 "The Local Universe" seminars](#)

The online application form: <https://bit.ly/3AtmGP3>

or send via email to Wako Aoki (Commission H1 secretary) [aoki.wako@nao.ac.jp](mailto:aoki.wako@nao.ac.jp) the following information:

Name and Surname, Affiliation, E-mail, Preferred duration of the talk (Keynote (25 min + 15 min) or Highlights (12 min + 8 min)), Title of presentation, Abstract (<100 word), Preferable approximate dates (months) of presentation, Preferred time of presentation (17:00 UTC, 09:00 UTC, or 01:00 UTC), Personal web-page link or a self-presentation up to 300 words.

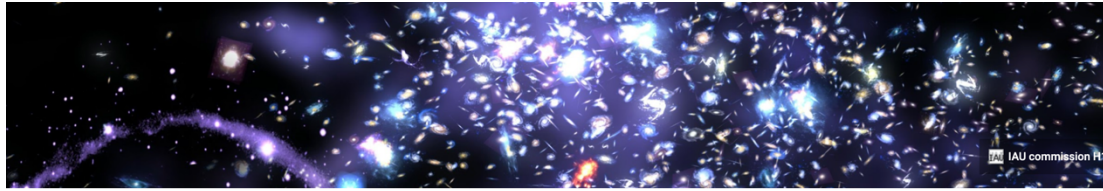
Seminar talks during the reporting period:


- 1) April 6, 2022, Keynote talk by Lorenzo Spina (INAF- Astronomical Observatory of Padua, Italy), “Strong chemical tagging: possibility or mirage?”.
- 2) May 24, 2022, Keynote talk by Q. Daniel Wang (University of Massachusetts, USA), “X-ray galactic ecosystem of nearby galaxies”.
- 3) June 6, 2022, Keynote talk by Priya Shah (Maulana Azad National Urdu University, India) “Machine learning for membership determination in open clusters”.
- 4) September 15, Keynote talk by Lorenzo Spina (INAF- Astronomical Observatory of Padua, Italy), “Planet engulfment events in Sun-like stars”.
- 5) October 19, 2022, Keynote talk by Thavisha Dharmawardena (Max Planck Institute for Astronomy, Germany), “The 3D structure of Star Formation Regions in the era of Gaia DR3”.
- 6) November 24, 2022, Keynote talk by Angela Bragaglia (INAF-OAS Bologna), “NGC 6388: combining high-resolution spectroscopy and Gaia”.
- 7) December 14, 2022, Keynote talk by Donatella Romano (INAF- Istituto Nazionale di Astrofisica), “The evolution of CNO elements in galaxies”.
- 8) February 15, 2023, Keynote talk by Saroon Sasi (University of Andres Bello, Chile), “Shape of the Outer Stellar Warp of the Large Magellanic Cloud Disk”.
- 9) March 22, 2023, Keynote talk by Elisa Rita Garro (University of Andres Bello, Chile), “Gaia-IGRINS synergy: Orbits of newly identified Milky Way star clusters”.

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 89 subscribers. By March 27, 2023, 13 seminar presentations have been posted and viewed 1363 times.







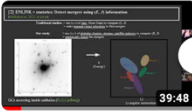
 IAU commission H1 "The Local Universe" seminars  
@iaucormissionh1thelocaluni309 89 prenumeratoriai 12 vaizdo įrašų

Užprenumeruota

This online seminar series is primarily for IAU commission H1 members, b... >

PAGRINDINIS VAIZDO ĮRAŠAI GROJARAŠČIAI BENDRUOMENĖ KANALAI APIE >

Vaizdo įrašai ▶ Leisti viską

 <p>H1 007 Machine learning for membership determination in open clusters 40 peržiūrų · prieš 8 mėnesius</p>	 <p>H1 006 Strong chemical tagging: possibility or... 28 views · prieš 11 mėnesių</p>	 <p>H1 005 The inner halo of the Milky Way 71 peržiūra · prieš 1 metus</p>	 <p>H1 004 Gaia-ESO Survey: Detailed elemental abundances in red giants of the peculiar globular cluster NGC 3651 121 peržiūra · prieš 1 metus</p>	 <p>H1 003 The Global Dynamical Atlas of Milky Way mergers... 760 peržiūrų · prieš 1 metus</p>
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Potential speakers of the seminars can fill the online application form: <https://bit.ly/3AtmGP3> or send their proposals to the Commission H1 Secretary via email.

## 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. The H1 OC member Dante Miniti served in the SOC for 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. This meeting was very successful, where some of the first scientific JWST results were presented and future developments were discussed.

## Appeal to the scientific community

The astronomical community is deeply upset for the continuing totally unacceptable and unjustified military invasion to Ukraine by the Russian Federation, in complete disregard for internationally recognized borders, in flagrant violation of international law, and in damaging scientific work and collaboration. We urge all scientists, including those in the Russian Federation, to do their best in stopping the war and call everyone to help our colleagues who suffer from the consequences of the military actions.

## COMMISSION H2: ASTROCHEMISTRY ANNUAL REPORT 2022-2023

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

In May 2022, the President of the H2 Commission received the letter of acceptance of the proposed Kavli-IAU Symposium: Astrochemistry VIII – From the First Galaxies to the Formation of Habitable Worlds. We then started the preparation for the Symposium, inviting speakers and opening to the community for registration. The registration was recently closed. Abstracts for contributed talks have then been selected and now the program can be found on the Symposium website: <https://events.mpe.mpg.de/event/14/>

Besides the IAU and Kavli funds, the H2 Commission also asked for further financial support from NRAO, which has sponsored the ALMA and JWST synergy training course, scheduled on the last day of the Symposium. A lot of activity has been dedicated to distributing available IAU funds to help Ph.D. students, young researchers, and people from Institutes with a lack of funding to participate in the Symposium and present their work. The Kavli funds have been used to attract renowned scientists from fields outside of Astrophysics and who will contribute to the interdisciplinarity of the Symposium. The proposal for the distribution of Kavli-IAU funds has been recently submitted and we hope that it will be approved soon.

In October 2022, the H2 Commission President, together with one of the H2 Commission OC, and in consultation with the other members of the OC, organized a conference in Berlin to bring together different communities and discuss astrochemistry finally face-to-face, after the long COVID-19 pandemic: From Clouds to Planets II – The Astrochemical Link (<https://events.mpe.mpg.de/event/12/>). This was a success, with lots of positive comments from the young participants. Particularly important were the (about one hour) long talks in each session, which were dedicated to the introduction of the specific topic, allowing everybody (even non-experts) to understand the following (more specialists) talks and the open questions. Discussion sessions were very much appreciated, with a lot of interventions from students and young postdocs.

## COMMISSION H3: PLANETARY NEBULAE ANNUAL REPORT 2022-2023

Organizing Committee

Orsola De Marco (President).

Magda Arnaboldi (Vice President),

Organizing Committee: David Jones, Isabel Aleman, Bruce Balick, Albert Zijlstra (immediate past President), Toshiya Ueta.

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

The two main activities of the committee in 2022 are the organisation of the IAU Symposium 384 and the production of a community paper on the first JWST results that was published in Nature Astronomy.

IAUS 384: Planetary Nebulae: a Universal Toolbox in the Era of Precision Astrophysics

The symposium was approved in May 2022 and will take place in Krakow, Poland in September 2023 (<https://iaus384-pne.ncac.torun.pl/>). Most of the activities associated with the organisation have taken place in late 2022 and early 2023. Starting with the definition of the scientific programme, we then proceeded to advertise the symposium by producing a first announcement via email as well as on sites such as the AGB and AstroPAH newsletters, and the Facebook PN group. Almost all invited speakers have now confirmed (we have reached good gender balance and geographic distribution) and we are about to issue the second announcement. Pre-registration is open: <https://iaus384-pne.ncac.torun.pl/registration/>.

Nature Astronomy Community Article: The Messy Death of a Multiple Star System and the Resulting Planetary Nebula as Observed by JWST

The second activity was the production of a community paper that was initiated by the commission H3 in a series of emails that aimed to address a peculiarity in the Early Release Observation of JWST-observed nebula NGC3132, namely the presence of a strong IR excess around the central star. These discussions lead to Albert Zijlstra suggesting a short community paper. The paper was coordinated on Slack by De Marco and quickly accrued 69 astronomers from around the world. The Nature Astronomy Editor was consulted and he was enthusiastic about the initiative and the paper. We submitted the paper in October. The paper was published on December 8 (<https://www.nature.com/articles/s41550-022-01845-2>), making the front page of the magazine (<https://www.nature.com/natastron/volumes/6/issues/12>). The interesting story of how the paper came together can be found in this Nature Astronomy Blog: [https://astronomycommunity.nature.com/posts/a-firmament-of-astronomers-crowd-over-the-jwst-image-of-the-southern-ring-nebula?channel\\_id=behind-the-paper](https://astronomycommunity.nature.com/posts/a-firmament-of-astronomers-crowd-over-the-jwst-image-of-the-southern-ring-nebula?channel_id=behind-the-paper)

A number of press releases were issued by several institutions, starting with STScI and echoed by many of the authors institutions with text available in several languages. New images and diagrams were produced by STScI for the press release. Several news outlets picked up the release and several of the authors were interviewed on TV and radio.

Here are some links to published popular articles.

- New Scientist:

<https://protectau.mimecast.com/s/UYQBC6XQ68fYzkD4Cpi2Y6?domain=newscientist.com/>

- Physics Today:

<https://physicstoday.scitation.org/doi/10.1063/PT.6.1.20230112a/full/>

- Astronomy:

<https://astronomy.com/news/2022/12/extreme-stripping-caused-messy-birth-of-the-southern-ring-nebula>

- Phys.org:

<https://phys.org/news/2022-12-messy-death-star-webb.html>



## COMMISSION H4: STELLAR CLUSTERS ANNUAL REPORT 2022-2023

### INTER-DIVISION (G-H-J)

Francesca D'Antona (President)

Florent Renaud (Vice-President)

Amanda Karakas (past President)

Organizing Committee:

Randa S. Asa'd Angela Bragaglia Andrea K. Dupree

Ignacio Negueruela Eric W. Peng Andres E. Piatti

Research of the commission H4 concerns star clusters, of any size, at any distance, and of any age, includes the observation and theory of stellar groupings as they form and evolve, cluster disruption, stellar interactions inside clusters, and star formation in dense environments.

The Commission H4 has a social newsletter: "The Stellar Clusters Young and Old Newsletter" (SCYON), edited by M. Netopil, E. Paunzen, and A. Adamo. The newsletter is a link to the scientific activity in the field.

Research addresses 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; structure of star clusters.

An increasing portion of the electromagnetic spectrum, ranging from X-rays to the far-infrared is used in the analysis. The last year has seen the accelerated emergence of simulation works treating star clusters star-by-star in their galactic and cosmological context. This increase in the scales covered is often at the expenses of precise internal dynamics, which calls for innovations in modelling techniques. 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. This greatly complement previous works based on strong-lensing. This topic connects with new results on the earliest stages of galaxy formation, which preludes to an even deeper inter-connection of these fields.

Meetings on star clusters held in 2022 comprise:

- EAS 2022, Valencia, Spain (<https://eas.unige.ch/EAS2022/>) 27 June-1 July, with two symposia: S14 A stairway to the Universe and SS15 The Renaissance of Open Cluster Science with Gaia
- Cool Stars 21 Cambridge Workshop on Cool Stars, Stellar Systems and the Sun, Toulouse, France, 4-9 July 2022
- Stellar evolution across the HR diagram with Gaia, Naples, Italy, 20-23 September 2022 (<https://indico.ict.inaf.it/event/2023/>)
- Star forming clumps and clustered starbursts across cosmic time, Garching B. Muenchen, Germany, 5-30 October 2022 (<https://www.munich-iapbp.de/star-formation20>)
- The Impact of Binaries on Stellar Evolution, Garching B. Muenchen, Germany, 14-18 November 2022 (<https://indico.ph.tum.de/event/7022/>)