IAU Division G: Annual Report 2021/22

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DP Division President 2021-24
DVP Division Vice-President 2021-24
DS Division Secretary 2021-24
G1-5 Commission President 2021-24
DA Division Advisor 2021-24

This is the first annual report of the Division G Organizing Committee for the 2021-24 triennium. It reports on the time period from Sep 1, 2021 through Aug 31, 2022.

Division officers

In August 2021, new Organizing Committee was elected. Dr. David Soderblom, who served as Division President in the 2018-21 triennium, became Division Advisor; Dr. Andrej Prša, who served as Division Vice-President in the 2018-21 triennium, became Division President. Dr. Merieme Chadid is the newly elected Vice-President. Dr. Chris Sneden is appointed Division Secretary. The Organizing Committee consists of the mentioned officers, 5 Commission Presidents, and 5 at-large elected officers.

Membership

As of August 2022, there are 3841 full and 365 junior members of Division G; 317 members of Commission G1; 233 members of Commission G2; 343 members of Commission G3; 232 members of Commission G4; 264 members of Commission G5.

In addition, there are 4 inter-division commissions: (1) Impact of magnetic activity on solar and stellar environments (122 members); (2) Planetary nebulae (84 members); (3) Stellar clusters throughout cosmic space and time (234 members); and (4) Galaxy spectral energy distributions (227 members).

Finally, there are 3 working groups associated with Division G: (1) Active B stars (110 members); (2) Ap and related stars (73 members); and (3) Red giants and supergiants (17 members).

Division activities

Monthly OC telecons

To facilitate timely organizational discussion, Division G Organizing Committee (OC) decided to meet monthly (except during summer months) on an hour-long zoom telecon. The need for such telecons intensifies in the winter months with many IAU deadlines, most notably the PhD award selection and symposium ranking. Telecons also help develop and foster professional bonds among acting officers. We intend to keep monthly telecons for the remainder of the triennium.

Approval of associate memberships

In the triennium that has just come to an end, the Division G Working Group on Ap and Related Stars included four Associate Members: Klaus Bernhard, Colin Folsom, Stefan Hümmerich, and Vadim Tsymbal. As Associate Members are terminated at the end of each triennium, the OC reviewed and reinstated their associate membership for this coming triennium.

Division G ombud

The IAU embraces equality, diversity and inclusion, and condemns all forms of non-ethical behavior such as bullying, harassment and malpractice. Unfortunately there can be situations when members feel treated unfairly or disrespected, or when they see someone else being treated that way. To provide a secure channel of communication for our members to express these concerns anonymously, be it on behalf of themselves or as an active bystander, we in Division G have set up an on-line comment box:

http://freesuggestionbox.com/pub/qxrqnsf

We will not know who wrote the comment. A very limited number of people within the IAU will have access to the comments. The collected data will be reported in summarized and analyzed form at IAU Executive Committee level, and then be destroyed. It will not be passed on to anyone else. Should the members want us to contact them to further discuss their comments then they will need to leave contact details in the comment.

At this stage we are running this as a pilot, to gauge the range and level of issues, and to assess the viability of turning it into something that can become more responsive. Any follow-up e-mails will be kept strictly confidential, will only be used to inform the report writing, and will then also be destroyed.

Quarterly newsletter and colloquium series

In an effort to reach our membership and to continue with the legacy of the last triennium, the current OC will issue a quarterly newsletter with pertinent events, notices and deadlines. These newsletters will be posted online in pdf form and circulated by email through the regular IAU information channels and posted on the Division G website. The first issue is expected in October 2022.

Starting in Fall 2022, the OC is also planning to kickstart a limited colloquium series that will promote topics that are central to Division G and its Commissions. The goal is to highlight junior research scientists' achievements and to promote their work on public online media.

Division webpage revision

To further ascertain the relevance of the IAU webpages, the OC proposed to add the so-called "slider" functionality to the Division G webpage. The sliders are scrolling captioned images that highlight the latest research results that are of immediate interest to Division members. New sliders would be added on a monthly basis. Commissions are tasked to query their membership for source material and to deliver that material to webpage maintainers. We have been communicating with the maintainers about getting this functionality supported and deployed.

PhD Awards

The IAU PhD Prize recognizes outstanding scientific achievement in astrophysics around the world. The Division G has the opportunity to award a stellar physics candidate who has carried out the most great work and has defended his/her PhD between the 16 December 2020, and 15 December 2021. This year the OC received 23 proposals; after careful review, the PhD award was conferred to Kareem El-Badry from the United States, on his thesis titled "Binary Stars Across the Milky Way: Probes of Star Formation and Evolution."

During the review, other Divisions elected to name Honorable Mentions. After discussing this option at length, Division G OC did not find it appropriate to confer honorable mentions; instead, the OC decided to retain the custom of conferring an award to a single awardee.

Symposium selection

For the 2023 non-GA symposia, we received 16 proposals in total, 5 of which list Division G as supporting Division, and 1 proposal lists Division G as coordinating Division. The OC ranked all proposals and was largely unanimous in their decision to support the proposals by Orsola De Marco, "Planetary Nebulae: a Universal Toolbox in the Era of Precision Astrophysics," and by Andrea Miglio, "Linking near- and far-field galaxy formation with precise ages of stars and stellar populations." The remaining proposals garnered support but the OC identified areas of improvement that were communicated to the proposers. The IAU Executive Committee selected the symposium on planetary nebulae and designated it as IAUS 384, to be held in 2023.

IAU General Assembly in Busan

Division G fosters research, sharing expertise, disseminating knowledge and public outreach related to all areas of stellar astrophysics. The topics include stars, their populations and evolution, binary and multiple systems, stellar variability and observables across the entire light spectrum.

Stellar astrophysics has seen major advancements in the last triennium, mostly thanks to the large surveys that observe large swaths of the sky and deliver aggregate petabytes of data. With the delivery of diverse, high-precision data and advances in data science and computing power, we have been witnessing a substantial increase in model fidelity across stellar astrophysics: from stellar formation and evolution across the H-R diagram, to binary and multiple star physics and asteroseismology, all the way to galactic structure and evolution. Division G days provide us with an opportunity to reflect on what we have learned over the last triennium and ponder on the most pressing current challenges in the field of stellar astrophysics.

Division Days at the General Assembly took place on Friday (Aug 5) and Monday (Aug 8), where we welcomed everyone interested in the latest advancements in stellar astrophysics. We focused specifically on radiative transfer, radioactive decay and magnetic pressure in stellar atmosphere models; the roles of magnetic fields, convection, gravity waves, shear and turbulence in stellar interiors; symbiotic stars, cataclysmic variables and contact binaries; compact objects and tidal disruptions; evolved stars; and the search for transients across the sky. The scientific program comprised 5 invited talks, 16 contributed talks, and 18 e-talks and e-posters. Invited speakers include PhD prize winners Lisa Bugnet, Simon Blouin and Steven Goldman, Division vice-president Merieme Chadid, and the LSST/TVS pulsating stars chair Kelly Hambleton. The program also included a 30-min discourse on Division G's role, scientific and collaborative impact, and worldwide support for stellar astrophysics. The program was varied and well attended. The list of talks is given in Table 1.

In memoriam

We are saddened to report the passing of the number of IAU members affiliated with Division G. Their names and home countries are given in Table 2.

Commission reports

G1: Binary and Multiple Stellar Systems

It was with deep sadness that members recorded the death of Vice President Dimitri Pourbaix in November 2021. Dimitri was instrumental in maintaining and developing the 9th Catalogue of Spectroscopic Binary Orbits since its inception. This catalogue was created by a working group set up by IAU Commission 30 at the 2000 General Assembly in Manchester. The Commission is pleased to announce that Thibault Merle has taken on the task at the Université Libre de Bruxelles and will shortly be releasing the latest revision.

A number of members of the Commission were able to meet in person at the Stars 2020 meeting, to mark the 80th birthday of Peter Eggleton, in Cambridge. Even though this was postponed twice till August 2022 many who would like to have been present in person were unable to travel. A few were able to join remotely. Nevertheless the meeting was vibrant and it was good to see many young PhD students pre-

Presenter	Title
Soderblom/Prša	Division G status report (along with Commission updates)
Roel Lefever (C)	Towards a more realistic description of Wolf-Rayet atmospheres
Suman Bala (C)	A new Monte-Carlo radiative transfer simulation of cyclotron resonant scattering features
Oleksandr Yushchenko (C)	Radioactive elements with long and short decay times in stellar atmospheres
Innocenza Busa (C)	Magnetic pressure a necessary contribution to pressure in stellar atmosphere modeling
Lisa Bugnet (I)	Characterization of solar-type stars and study of their internal magnetic fields
Allan Sasha Brun (C)	On convection and gravity waves in F stars
Junho Park (C)	Shear instabilities and turbulence in radiation zones of rotating stars
Mateus Ribeiro (C)	Deep inside on the diversity of variability in symbiotic stars
Chris Tout (C)	A double magnetic dynamo in cataclysmic variables
Merieme Chadid (I)	First detection of gravity modes in RR Lyr stars
Vardan Elbakyan (C)	Accretion bursts in high-mass protostars
Einaz Bakhshi (C)	The first photometric study of AH Mic contact binary system
Div G Panel	What can Div G do for you?
Simon Blouin (I)	Decoding the white dwarf fossil record
Natalia Lewandowska (C)	Disentangling the mysteries of single pulses from the Crab pulsar
Taeho Ryu (C)	Fully relativistic global simulation of a tidal disruption event
Bonnie Zaire (C)	What does control the large-scale magnetic field configuration of cool stars?
Zeynep Bozkurt (C)	Detailed synthetic abundance analysis of secondary red clump stars
Steven Goldman (I)	A census of thermally pulsing AGB stars in the Andromeda galaxy
Jielai Zhang (C)	Kilonova and fast transients - an untriggered search
Melike Afsar (C)	Unveiling effective temperatures using line depth ratios in the infrared H and K bands
Kelly Hambleton (I)	The Transients and Variable Star science collaboration roadmap explained

Table 1. Division G Days program at the IAU General Assembly 2022 in Busan. Designations (I) and (C) stand for invited and contributed talks, respectively.

senting their their work in person to an international audience. In fact the reduced numbers led to vibrant discussions in which all were able to participate. Naturally, given Peter's interests, many of the presentations focused on binary and multiple systems. Differential rotation and the processes that affect it, tides, mixing, magnetic fields and mass transfer and loss all featured often. The importance of asteroseismology as a key observing tool became very apparent.

Elsewhere we eagerly await new stimulating observations from the latest telescopes, space missions and surveys. The James Webb Space Telescope exquisitely imaged dust expelled from the colliding wind Wolf–Rayet binary WR140. Gaia continues to add to the wealth of data on resolved and closer binary orbits.

G3: Stellar Evolution

With a refreshed committee following the 2021 elections, we have met on-line twice and discussed via e-mail, and identified three priority areas we want to develop.

Improved communication and collaboration across disciplines

Besides our participation in the ranking and feedback of proposals for IAU Symposia, we are keen to seek opportunities to develop cross-disciplinary links as stellar evolution is important for so many different fields in astronomy – from high-redshift galaxies hosting the first stars to the nearby hosts of planetary systems. Likewise, our knowledge of stellar evo-

Deceased member	Home country
Dr. Edwin van Dessel	Belgium
Dr. Ivan Robert King	United States
Dr. Vasily Gvaramadze	Russia
Dr. Victor G. Kornilov	Russia
Dr. Dieter Reimers	Germany
Dr. Dimitri Pourbaix	Belgium
Dr. Zdravka Kraicheva	Bulgaria
Dr. Arved Sapar	Estonia
Dr. Wilhelm Kley	Germany
Dr. Hwankyung Sung	Republic of Korea
Dr. Alejandro Feinstein	Argentina
Dr. Arlo U. Landolt	United States
Dr. Claude van't Veer-Menneret	France
Dr. Rodolfo H. Barba	Chile
Dr. Alexander V. Loktin	Russia
Dr. Erwin Sedlmayr	Germany
Dr. James W. Truran	United States
Dr. Arcadio Poveda	Mexico
Dr. Szabolcs Barcza	Hungary
Dr. Kazimeras Zdanavičius	Lithuania
Dr. Françis Spite	France
Dr. Guy Pooley	United Kingdom
Dr. Carlos Alberto Torres	Brazil
Dr. Gavril Grueff	Italy
Dr. David F. Grey	Canada
Dr. Ernst Dorfi	Austria
Dr. Robert J. Rutten	Netherlands

Table 2. Deceased Division G-affiliated IAU members.

lution benefits from the studies of stars and stellar populations in different contexts. To this aim we have approached various other IAU bodies (Commissions and Working Groups) to establish contact points. We hope this will encourage collaboration where appropriate.

Providing a service to our community

We want to help ensure the transfer of in-depth knowledge of stellar structure and evolution and of the tools that are used to calculate, model or simulate these. This is of critical importance for effective progress in our field as well as in a variety of fields that rely on our understanding of stellar evolution. But there is a danger that some of that knowledge is lost if it is not passed on to others working in the field; it is also important that users of tools understand their physical ingredients, numerical implementation and the assumptions, approximations and limitations.

We are therefore exploring the idea of a series of advanced workshops, preferably hands-on but recorded and disseminated if it is meaningful to do so. Accessibility will be at the forefront of our minds. This idea has been endorsed by the IAU President Professor Debra Elmegreen.

Mobilizing our community

It would be both undesirable and impossible for a small committee to take the lead in organising major incentives such as the aforementioned workshops. We are therefore inviting expressions of interest from the community in first instance, before approaching potential collaborators on this project more directly. After a first communication to our membership at large shortly after we took office, we expect to do this on a regular basis but not too frequently – three times per year sounds about right.

We are also keen to increase the opportunities and support for members of our community who come from an under-privileged or under-represented background, to engage in IAU activities and assume leadership roles within our field.

Initiated during the previous triennium following a pilot, we will relaunch the Ombud as it needs to move to a new platform following the commercialisation of the previous service.

It needs no explanation that the last couple of years have been particularly demanding, and we are acutely aware that many people continue to face challenges as they try to recover.

G4: Pulsating Stars

The Commission has 230 members out of which 16 are junior members, which signals a renewed interest in this classical topic. Indeed, with the advent

of large sky surveys and ultra-precise space-based photometric datasets the study and application of pulsating stars entered a 'renaissance' period, while a relatively new branch of astrophysics, namely asteroseismology has been flourishing. It is worth mentioning that the in 2022, the Kavli Prize was given to Jørgen Christensen-Dalsgaard, Conny Aerts (G4 Comm members) and Roger Ulrich (Div G member) "for their pioneering work and leadership in the development of helioseismology and asteroseismology. Their research has laid the foundations of solar and stellar structure theory, and revolutionized our understanding of the interiors of stars," according to the laudation.

In the reporting period our community enjoyed the post-covid "freedom" of travelling and in-person conference opportunities. The annual meeting of the TESS and Kepler Asteroseismic Science Consortia in Leuven in July 2022 titled Asteroseismology in the Era of Survey from Space and the Ground: Stars, Planets, and the Milky Way was very well attended, with around 200 participants. The last such meeting was held in Boston in 2019. In September 2022, the fourth edition of the RR Lyrae and Cepheid conference in La Palma Large-scale surveys as bridges between spectroscopy and photometry gathered 100 participants. That number hit a hard upper limit imposed by covid restrictions, still it was a fruitful and vivid conference despite the disruptive tropical storm Hermine that battered the Canary Islands. Because of the storm many flights of participants were diverted and cancelled, and the program started one day later. At that conference the community discussed reviving the Los Alamos Conference Series on pulsating stars, the last edition of which was held in 2016 in Chile, at San Pedro de Atacama.

G5: Stellar and Planetary Atmospheres

The scope of the work of the Commission includes theory and modeling of stellar and planetary atmospheres, as well as observational spectroscopic studies of these objects. The Commission tries to meld the work of theorists, modelers, and observers, particularly spectroscopists. A main objective is to address the issues of how to make theory more useful for observers, and how to make observations more powerful by judiciously using state-of-the art theoretical descriptions.

Activities in 2020-21 have been constricted by the Covid-19 pandemic, with few in-person meeting opportunities. In their place, the commission has hosted online seminars approximately once every two months. These seminars are recorded and kept available online to enhance their impact. The work of deciding seminar topics and engaging speakers has been led by Katia Cunha, Daniela Korcakova, and Carlos Allende Prieto. Here is a list of these talks in 2021-22:

1. 1st IAU-G5 seminar: The revolution of task-based computing, applied to stellar and planetary atmospheres, by Prof. ke Nordlund, May 18, 2021
2. G5T: ExoMolHD: Precision spectroscopic data for studies of exoplanets and other hot atmospheres, by Dr. Sergey Yurchenko, July 20, 2021
3. G5T: Exoplanetary Atmospheres, by Dr. Nikku Madhusudhan, September 21, 2021
4. IAU G5: Extreme Precision Stellar Spectroscopy, by Dr. Dainis Dravins, November 23, 2021
5. IAU G5 - The GALAH survey: science goals and highlights to date, by Dr. Sarah Martell, January 25, 2022
6. IAU G5 talk: Inelastic hydrogen collisions in stellar atmospheres Dr. Paul S. Barklem, March 22, 2022