



IAU Catalyst | March 2022

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1

Executive Committee

1.1

Welcome from the IAU
President at the
XXXIst Virtual General
Assembly Business
Meeting in August 2021

Debra Elmegreen
IAU President

I feel enormously honoured and grateful for the confidence placed in me as IAU President. We have been through an unprecedented two years, with global suffering and losses from the pandemic, social and racial injustices, and climate devastation. As we begin to emerge, we recognize that the world is changing, and we have also begun to learn to adapt. We have new opportunities to strengthen the IAU and its international efforts. I want to reflect for a moment on the accomplishments of the last triennium and then look to future aspirations.

First, I thank the outgoing officers for their tireless efforts. Ewine van Dishoeck demonstrated everything it means to be IAU President, executing her office with compassionate and inspired leadership: she led the global IAU100 efforts; she initiated the prizes for outreach, development, and education; she made hundreds of speeches across the globe, in person when possible and virtually when not, to provide a compelling vision for the IAU. We are fortunate now to have her as an advisor.

Teresa Lago in her role as General Secretary ensured that the IAU maintained a strong financial footing. She was the driver in establishing the new Office of Astronomy for Education and served on the steering committees for the four Offices. She initiated the Catalyst newsletter and the IAU Code of Conduct. She has given generously of her time in service and travel, and we have benefitted from her outstanding leadership. We are grateful she too will be an advisor.

I thank our outstanding outgoing Vice Presidents: John Hearnshaw, Ajit Khembavi, and Boris Shustov. Among their many efforts, John helped write the Code of Conduct and initiated the new Working Group on Professional-Amateur Relations. Ajit served as an advisor for the Office of Astronomy for Development, and Boris oversaw IAU representation on several dozen external international organisations. Additionally, both Boris and Ajit served on my Gruber Fellowship Prize Committee for the past 3 years.

Finally, I thank our outstanding advisors, Past President Silvia Torres-Peimbert and Past General Secretary Piero Benvenuti, for their wise counsel and continued outstanding service on many issues. I will miss them all. Thanks, too, to all the outgoing Division Presidents and Commission and Working Group officers for their leadership and service.

As we enter the next triennium, I am guided by the Strategic Plan for 2020-2030 that Ewine and I developed with the help of the Executive Committee and Offices. One of the IAU areas of interest is education. The Office for Astronomy Education and its National Astronomy Education Coordinators focus on schoolchildren using astronomy as the gateway to STEM. Through an agreement signed this past May with the International Association of Physics Students, we now have a link with undergraduates. The Office for Young Astronomers and its international schools (ISYA) support graduate students. The Executive Committee Working Group on Junior Members engages postdocs in mentoring and career advancement. The new I-HOW (hands-on workshops) that Ewine initiated will address specialised training for early-career astronomers, particularly in developing countries. I am very excited by all of these endeavours and look forward to their ongoing success.

We are fortunate to have dedicated leaders in each of the IAU Offices. The Office of Astronomy for Development has just celebrated its 10th anniversary. Its remarkable success follows the vision laid out in the previous IAU Strategic Plan. It has engaged hundreds of thousands of people globally and regionally, applying technologies, techniques and the excitement of astronomy to key programs. Its efforts this past year targeting proposals for pandemic-related activities have been especially positive. Similarly, the Office for Astronomy Outreach has expanded its global reach through concerted efforts by its National Outreach Coordinators on several key projects in over 100 countries.

The IAU fosters an inclusive and welcoming atmosphere at IAU events through its Code of Conduct, Springboard to Action, and Executive Committee Working Groups on Junior

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Executive Committee

Members, Women in Astronomy, and Diversity and Inclusion. A new Executive Committee Working Group on Professional-Amateur relations will develop ties with national organisations of amateurs doing science research.

It is a remarkable time to do astronomy, with numerous current and upcoming international observatories on the ground and in space. There is a great need to use our collective expertise in science and technology to understand the massive volumes of data they will generate. The best science will be achieved when we have a diverse and inclusive community working together. The Working Group on Global Coordination of Ground and Space Astrophysics is focused on this need. Just as it had international meetings on large space telescopes and on multiwavelength and transient science in past years between General Assemblies, so too will it plan another timely Kavli-IAU Symposium in 2023.

The Protection of Dark and Quiet Skies has a prominent role in the IAU through the tireless efforts of Past General Secretary Piero Benvenuti, Connie Walker, and dozens of others, bringing the impact of satellite constellations to the attention of the industry as well as the UN through COPUOS. Piero's vision of a new IAU Centre for the Protection of the Dark and Quiet Sky from Satellite Constellation Interference will get underway soon to ensure that countries work together to help mitigate this existential threat to ground-based astronomical observations and our enjoyment of the night sky.

The recently released IAU statement on Climate Change and the call for a Kavli-IAU interdisciplinary symposium provide an opportunity for us to consider climate and climate change on planets, and to act on sustainability issues where possible through science, education, outreach efforts, and societal activities.

Of course, the core of the IAU is our scientific meetings, where we share our discoveries and ideas about the Universe. As we approach a post-pandemic world, when we have all become

accustomed to online meetings, we have the opportunity to consider the structure of future IAU meetings. We will always highly value face-to-face interactions, particularly at the General Assemblies where in-person connections are essential. But we also recognize that the opportunity for hybrid meetings will help those unable to travel for health, family, or financial reasons. Hybrid and virtual meetings will also lessen our carbon footprint. There are many details that we need to consider moving forward. Underlying all our efforts is our desire to have an inclusive, welcoming astronomical community that unites us.

I look forward to helping lead the IAU in these and other new efforts in the coming years along with the new Executive Committee, the Secretariat, and Division Presidents. I welcome your input and help and urge your continued engagement through our Divisions, Commissions, and Working Groups. I hope to see many of you in Busan in August 2022, at least virtually, at the XXXIst General Assembly!

2

IAU Divisions, Commissions & Working Groups

2.1

IAU Executive Committee Working Group of Women in Astronomy is Revived

Mamta Pommier
Chair of the EC WG

Priya Hasan
Co-Chair of the EC WG

Established at the XXV IAU General Assembly in Sydney, Australia in 2003, the Women in Astronomy (WiA) Working Group (WG) was recently revived with new organizing committee members in September 2021. It will pursue and reinforce the earlier mandate to collect information, propose measures, and initiate actions in support of and to advance the equality of opportunity for achievement between women and men in astronomy in the IAU, and the world at large. The IAU WiA WG currently has 198 members from each continent and we look forward to welcoming many more members. The new WiA WG, in the next 3 years, will focus on the difficulties (e.g., gender bias, reduced career prospects, leaky pipeline, lacking role models, childcare issues, harassment, discrimination, and unfair working conditions) faced by women in astronomy. It will help bridge the gender gap in astronomy and other STEM fields and facilitate the careers of women researchers and young women PhD students worldwide. To achieve these objectives, a four-point action plan has been put forward, focusing on (i) awareness & sustainability; (ii) training and skill-building; (iii) fundraising; and (iv) dissemination of results via conferences and newsletters.

Since its commencement, the WiA WG has initiated many activities for women astronomers all over the world to build an active and supportive community. These activities include:

- Building a new WiA WG website to disseminate information regarding all activities, resources, and announcements.
- Starting a new WiA WG monthly Newsletter summarizing all the activities, feedback, participation of global members, and announcements.
- Setting up open communication channels on Slack, Twitter, Facebook, and Youtube to disseminate information about the global WiA WG activities.
- Creating a new IAU WiA WG logo to represent the WG. This will be used for a variety of WG activities, appearing next to the official IAU logo.

Initiating the WiA WG Bi-Monthly Seminar Series, the Women in Astronomy Working Conditions Survey, and a training program for skill-building in research. To develop a better sense of unity as well as encourage active participation amongst the WG members, a regular call for participation is announced in the monthly WG Newsletters. We have also launched the quarterly IAU WiA WG magazine, "ENSEMBLE," in December 2021, to showcase the scientific and outreach activities, achievements, and problems faced by women researchers in the work environment. This magazine will serve as a voice for women in astronomy all over the world to assure they are well represented in the international astronomical community.

At the first meeting of the WiA WG Seminar in September 2021, expert speakers discussed the career challenges faced by women in astronomy and STEM, the history of women in astronomy issues in the United States, ongoing global women in astronomy issues today, awareness of gender equality in research, and male involvement in women in astronomy issues. The first training program in November 2021 helped to develop the Python skills of young and early career women astronomers. These events were streamed via Zoom and YouTube and attracted on average 100–200 participants per live event. The recordings of these public events are available on our WiA WG YouTube channel. These virtual series have received a lot of appreciation from the audience and we will continue to develop such activities and training programs until August 2024, to help the careers and strengthen the community of women researchers worldwide.

Finally, we are very thankful to the IAU Executive Committee, all the IAU Offices, Working Group of Junior Members and the more than 500 researchers (of all genders) from all over the world who have participated in our surveys and provided their important opinions to unitedly improve the working conditions of women in astronomy. We are looking forward to working closely with the global WG members, the IAU Offices, and countries worldwide to promote and safeguard women's careers in astronomy.

Organizing Committee Members

Alshaimaa Saad (Egypt), Arianna Piccialli (Belgium), Aya Bamba (Japan), Belinda Wilkes (USA), Claudia Lagos Urbina (Australia), David Valls-Gabaud (France), John Leibacher (USA), Jolanta Nastula (Poland), Josefa Masegosa Gallego (Pepa) (Spain), Lili Yang (China), Santiago Vargas Domínguez (Colombia)



Figure 2.1: IAU Women in Astronomy Working Group Logo

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IAU Divisions, Commissions & Working Groups

Women in Astronomy Working Group
BIMONTHLY VIRTUAL SEMINAR SERIES - 1
October 12, 2021 | Eastern Daylight Time (UTC - 4:00 hours)

Registration is open for all the International astronomy community (female and male) members and students.
Register @ https://docs.google.com/forms/d/e/1FAIpQLSd1ZosbHALwZd1WU7G5L1T2asPn6QZa8NSwvictR6QADh5CA/viewform?usp=sf_link

7h30-8h00 EDT - Career challenges faced by Women in Astronomy and STEM.
Mamta Pommier (IAU-WIA Chair, France)

8h00-9h00 EDT - History of WIA issues in the United States, and ongoing global WIA issues today.
Debra Elmgreen (IAU President, USA)

9h00-9h30 EDT - Awareness on Gender Equality in Research: Why men should care?
Santiago Vargas Dominguez (IAU WIA Organizing committee member, Colombia)

Women in Astronomy Working Group
BIMONTHLY VIRTUAL TRAINING PROGRAM SERIES - 1
November 8-12, 2021 | 18h-20h Indian Standard Time (UTC - 5:30 hours)

Registration is open for all the International astronomy community female members and students.
Register @ https://docs.google.com/forms/d/e/1FAIpQLSPVMYC3GJh3EIKUbQeU4q2RYWSpJc91TV3QQAWhBRJpA/viewform?usp=sf_link

TP1-Essential Skills for Astronomy Research

Coordinator: Priya Hasah (Co-Chair, IAU WIA)

Theme: The aim of this Training program is skill-building and development of women's careers in Astronomy. The 'Essential Skills for Astronomy Research' is a 5-days virtual Workshop with 2 hours/day which will cover topics like Python, Matplotlib, Astropy, and Overleaf that are useful in Astronomy research activities. Tutorials/assignments will be given to the participants for practice sessions. Certificates will be given for participation and/or completion of assignments

Contact email: iauwia2124@gmail.com
IAU Women in Astronomy Working Group

Figure 2.2: IAU Women in Astronomy Working Group seminar series-1 and training program-1

3.1

The IAU Centre for the Protection of Dark and Quiet Sky from Satellite Constellations Interference

Piero Benvenuti
Director

In the past years, the main source of interference on astronomical observations, as well on the visibility of a starry sky, was the light pollution produced by urban illumination, the so-called ALAN (Artificial Light At Night). More recently, the impact of the large constellations of communication satellites has become a more serious concern due to their ubiquitous invasiveness. The aim of these constellations is to provide a network accessible from anywhere in the world, including oceans and deserts. To achieve this goal, a single constellation is formed by a very large number of satellites – up to tenths of thousands – all orbiting in Low Earth Orbits (LEO) at altitudes ranging from 350 to 1200 Km. Depending on the season and on the location of the observer, many of these satellites will be illuminated by the Sun for a good part of the night. Thus, their luminous trails will not only interfere with astronomical observations but will also significantly alter the appearance of the night sky. Radio observations will also be affected because the density of emitters in the sky will create a microwave background that will interfere with the faint cosmic signals.

The IAU has immediately reacted to the new situation and decided to proceed along two lines of action:

- 1 Address the issue at the level of the UN Committee for the Peaceful Use of Outer Space (COPUOS), seeking International consensus on mitigating guidelines
- 2 Engage and coordinate the astronomical community and all stakeholders in the development and implementation of mitigating measures

The IAU is a permanent observer in the COPUOS, and at the February 2022 meeting of its Scientific and Technical Subcommittee, presented a working paper in collaboration with the delegations of Austria, Chile, Dominican Republic, Slovakia, Spain and the observers ESO and SKAO. The paper contains recommendations aimed at mitigating the impact of the constellations and obtained the positive support of 25 delegations: a quarter of the entire forum.

In addition to this top-level action, last year, the IAU launched an international call to establish an IAU Centre for the Protection of the Dark and Quiet Sky from Satellite Constellations. The proposal jointly submitted by the NOIRLab and SKAO was evaluated positively and accepted by the IAU and the relevant memorandum of understanding has just been signed.

The definition of the mission of the Centre¹ stems from about two years of very positive experience with a large number of colleagues and industrial partners who contributed to the organisation of workshops and two conferences on “Dark and Quiet Skies for Science and Society,” (the reports for which are available in Links 2 and 3).

The Centre will therefore continue and consolidate this positive collaboration. In particular:

- The Centre will coordinate efforts & unify voices of the global astronomical community, both optical and radio
- The Centre will bring together astronomers, industry members, policy experts and the wider community to act as a bridge between all stakeholders
- The Centre will produce and disseminate information and resources
- The Centre will continue research on satellite constellation issues to arrive at feasible and implementable solutions in the following four areas:
 - 0.1** SatHub: a repository of observational data, and a portal for orbital solutions, software tools, tutorials and documentation
 - 0.2** Industry and technology: a nexus for interactions with space industries and constellation companies, in addition to the continued study, development, and testing of technological mitigating solutions
 - 0.3** Policy: a collection of studies of national and international policy



Figure 3.1: The IAU Centre for the Protection of Dark and Quiet Sky from Satellite Constellations Interference logo. Credit: IAU

3 News

0.4 Community engagement: a focal point for outreach, and organising seminars and workshops

The Centre relies upon the collaboration of the astronomical community, and of the interested stakeholders who can participate in the activities of the Centre as either Contributing Members – those who can commit specific resources – or as Affiliated Members – those who can sustain the Centre in a broader sense. The Centre will officially start its activity on April 1st, 2022 and will soon open a dedicated website and social media channels.

Links

1 <https://www.iau.org/news/pressreleases/detail/iau2201/>

2 <https://noirlab.edu/public/products/techdocs/techdoc021/>

3 <https://noirlab.edu/public/products/techdocs/techdoc051/?nocache=true>

Figure 3.2: Starlink Satellites pass overhead near Carson National Forest, New Mexico, photographed soon after launch. Credit: M. Lewinsky/ Creative Commons Attribution 2.0



4 Scientific Meetings

4.1

The 31st General Assembly in Busan

Hyesung Kang
Chair of the
IAUGA2022 LOC

For the first time in IAU history, the XXXIst General Assembly (GA2022) will be held in a hybrid format in Busan, South Korea: in addition to the traditional in-person conference, IAU members are welcome to participate in the GA2022 virtual conference at a discounted rate. Virtual registrants can attend all sessions remotely, including the plenary talks, live-streaming oral sessions, and web-based galleries of e-talks and e-posters through the meeting platform. Please refer to the GA website for further details: <http://www.iauga2022.org/>

Due to the delays in scheduling the meeting, and our choice of a hybrid format, costs have been increased. For that reason, speakers who wish to give talks at live-streaming oral sessions are asked to register for in-person registration, rather than virtual registration. Virtual registrants can only submit abstracts to e-talk/e-poster galleries, where pre-recorded talk videos and e-posters will be displayed during the GA2022.

Registration and Abstract Submission

Registration	Abstract Submission	Presentation Mode
in-person	max 2 abstracts to live oral sessions	in-room or remote talks
	max 2 abstracts to e-talk/e-poster sessions	web-based galleries
virtual	max 2 abstracts to e-talk sessions	web-based galleries
	max 2 abstracts to e-poster sessions	

Table 4.1: Registration and Abstract Submission.

The first two weeks of August comprise the busiest holiday season in Korea. Hence, in-person attendees are advised to reserve their accommodations well in advance.

Timeline for GA2022

Important dates are summarized in Table 4.2 below.

Early Bird Registration	Jan. 1, - Mar. 28, 2022
KAS Grant Application	Jan. 1, - Mar. 28, 2022
Regular Abstract Submission	Jan. 1, - Mar. 31, 2022
IAU Grant Application	Jan. 1, - Mar. 31, 2022
Regular Registration	Apr. 1 – May 31, 2022
Abstract Submission for e-talks/e-posters	Apr. 1 – May 31, 2022
GA2022 in Busan, South Korea	Aug. 2-11, 2022

Table 4.2: Timeline for the GA2022.

IAU and KAS Grants for GA2022

In addition to the IAU travel grant, the Korean Astronomical Society (KAS) will assist young students, early-career astronomers, and retired IAU members from economically less privileged countries by awarding registration fee waivers.

The GA2022 is jointly hosted by the KAS and the KASI (Korea Astronomy and Space Science Institute), and partially supported by the Ministry of Science and ICT, the Korean Federation of Science and Technology Societies, the city of Busan, the Korea Tourism Organisation, and the Busan Tourism Organisation. The LOC sincerely hopes that the pandemic situation will improve soon and many astronomers from all around the world can come to Busan and join the GA2022 in person.

4 Scientific Meetings

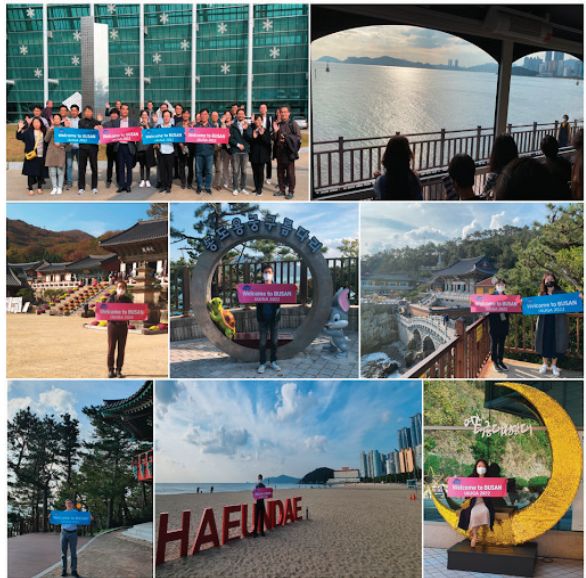


Figure 4.1: The GA2022 LOC members at BEXCO and popular tourist sites in Busan (November, 2021).

5

IAU Offices

5.1

What Everybody Should Know About Astronomy Education: IAU's Office of Astronomy for Education

Markus Pössel
OAE Director

Carolin Liefke
OAE Deputy Director

Leveraging astronomy for education – that is the mission of the Office of Astronomy for Education (OAE), the newest of the four IAU offices, active since the beginning of 2020. To this end, the OAE has been creating infrastructure for publishing and for finding educational resources and supporting the professionalisation of both astronomy educators and astronomers in the areas of teaching and learning.

Where professionalisation is concerned, our major recent effort was the 3rd Shaw-IAU Workshop on Astronomy for Education, held as an online event from October 12 to October 15, 2021. The workshop is part of a collaboration between the Shaw Prize Foundation and the IAU. This year's edition was titled "What everybody should know about astronomy education" – "everybody" referring to anyone who is, or is interested in being, active in the field of astronomy education. In effect, this made the workshop a fairly comprehensive "astronomy education 101."

Taken together, the workshop's 18 sessions covered a wide range of topics with useful knowledge for astronomy education practitioners. Talks and discussions presented basic knowledge on daytime observations, low-tech astronomy education, remote observing, citizen science, and teaching about indigenous astronomy, but also on how to make astronomy education equitable and inclusive, how to evaluate educational activities, and how to participate in a review process. One session presented the basics of astronomy education research.

In order to make the workshop accessible, each session was held twice, in markedly different time zones, and for both the (pre-recorded) talks and for the discussions, English subtitles were available. Feedback from the workshop's 583 participants (from 90 countries) was overwhelmingly positive, although we did take note of a number of recommendations to include talk contributions in languages other than English (with English subtitles) in future events, for greater inclusivity.

The results of the OAE astrophotography competition were announced in August 2021: the competition was meant to fill specific gaps when it comes to astronomical images available for education (and outreach) under free licences, notably in areas not covered by professional observatories. Feel free to head over to [<https://www.iau.org/news/announcements/detail/ann21047/>] and use the impressive winning images in your own teaching!

Last but not least, the OAE has grown: since Summer 2021, we have welcomed the OAE Centre Cyprus (hosted by the Cyprus Space Exploration Organisation), the OAE Node Nepal (Nepal Astronomical Society), the OAE Center China–Nanjing (Beijing Planetarium), the OAE Center India (Inter-University Centre for Astronomy and Astrophysics), the OAE Center Egypt (National Research Institute of Astronomy and Geophysics) and the OAE Node Republic of Korea (Korean Astronomical Society) to our network.

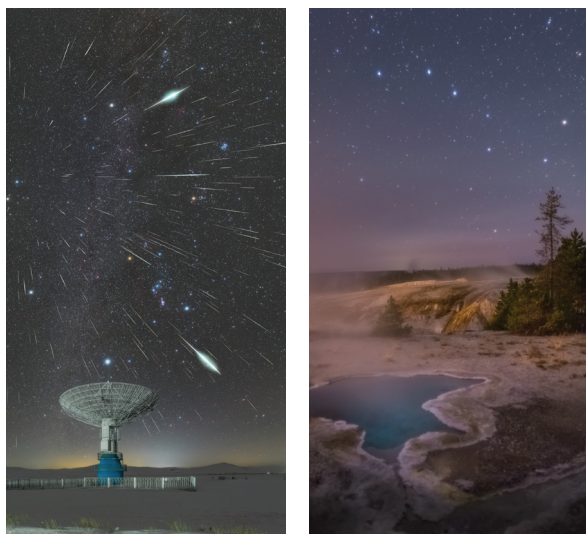


Figure 5.1: a) The Big Dipper over Yellowstone National Park. Credit: Alex Conu/IAU OAE under license CC BY 4.0. b) The Gemini meteor shower as seen from China. Credit: Hao Yin/IAU OAE under license CC BY 4.0

6.1

Resolutions Adopted in the
IAU XXXI General Assembly
Business Sessions
Proposed by Commission
A2 on Rotation of the Earth

A. Escapa,
R. Heinkelmann,
J. M. Ferrándiz,
F. Seitz,
R. Gross

Observing and studying the Earth's rotation is fundamental to the International Astronomical Union (IAU). Along with the IAU, 32 Standing Committees were also created on July 28, 1919. One of them was Standing Committee 19 on Latitude Variations, later transformed into Commission 19 on Variation of Latitude in 1922, and then into Commission 19 on Rotation of the Earth in 1964. Since 2015 it has been designated as Commission A2 on Rotation of the Earth¹ (CA2) and belongs to IAU Division A Fundamental Astronomy.

The Earth's rotation connects the Earth-fixed (terrestrial) and space-fixed (celestial) reference systems that provide the fundamental framework for referencing astronomical and space-geodetic observations, and for navigating objects in space and on Earth. The associated Earth Orientation Parameters (EOP) are a key set of parameters for the realisation of those coordinate systems: that is, for the determination of the Terrestrial Reference Frame (ITRF) and the Celestial Reference Frame (ICRF). Such a set is composed of three kinds of parameters: two related to precession and nutation, one to length of day, and two to polar motion. The EOP have been observed since the 19th century, initially by astrometric optical measurements. Later, the advent of precise space-geodetic techniques paved the way for reaching near millimetre-accuracy. Corresponding EOP series are disseminated by the International Earth Rotation and Reference Systems Service (IERS).

The knowledge of the Earth's rotation is also indispensable for the realisation of time systems and precious for studying the Earth's internal structure and geophysical phenomena. A particular focus of CA2's scientific work is the theory of Earth rotation. Along with technological advancement and increased accuracy requirements, CA2 encourages the improvement of the Earth rotation theory regarding its accuracy, consistency, and ability to model and predict the essential EOP. The IAU theories of nutation and precession currently in force are IAU2000 and IAU2006, adopted in 2000 and 2006, respectively.

During the IAU XXXI General Assembly Business Meetings, two resolutions related to such topics were proposed by CA2 and then adopted, after receiving support from the IAU members through online voting. In particular, these were *Resolution B1, which supports the protection of geodetic radio astronomy against radio frequency interference*², and was proposed in coordination with IAU Commission A1 Astrometry, and *Resolution B2, on the improvement of the Earth's rotation theories and models*³. They are a paradigmatic example of the need to combine both the observational and theoretical aspects of a discipline to get a further advance in its understanding.

Resolution B1 is of relevance for Very Long Baseline Interferometry (VLBI), which is the only operational technique for the determination of the five EOP. The International VLBI Service for Geodesy and Astrometry (IVS) organises permanent observing programs that provide the EOP several times a week.

The VLBI ground network is currently undergoing a technical upgrade. The next generation of antennas, called VGOS (VLBI Global Observing System), will observe with broader bandwidth and at slightly different frequencies (2 – 14 GHz) in order to increase the precision of the target parameters. The increase of precision is indicated for the provision of accurate reference frames that allow for the monitoring of environmental signals, such as the sea-level change, at the required level (0.1 mm y⁻¹). The high level of precision is not only mandatory for the science but also directly addresses the United Nations (UN) societal goals on sustainable development, such as its resolution: “A global geodetic reference frame for sustainable development”⁴.

With **Resolution B1**, the IAU recognizes the importance of the EOP dataset and its application in fulfilment of the UN societal goals on sustainable development. As a Sector Member of the International Telecommunication Union (ITU-

R), the IAU recommends the exploration of new observation bands for geodetic radio astronomy in the frequency range of 2 – 14 GHz, which need to be registered and protected by ITU against radio frequency interference. The IAU furthermore resolves that the most effective protection of geodetic radio astronomy sites would be through radio-quiet or coordination zones.

However, despite the impressive advancement of observing techniques, the accuracy of EOP determination and prediction has not improved for many years. That is the origin of **Resolution B2**. The activity of two successive working groups of CA2, joint with the International Association of Geodesy (IAG), showed the need of improving the underlying theories.

The three kinds of EOP are affected by Earth rotation theories to different extents. The two precession and nutation EOP are the ones with higher variations, exceeding 9 arc seconds (as), but their excitation is mainly astronomic and their unmodeled changes deviate from the IAU2000 and IAU2006 theories by about 0.2 milli as. That level of accuracy was satisfactory in past decades, but currently, the goal is to achieve a level of accuracy of 33 micro as, equivalent to 1 mm on the Earth's surface and imposed not only for the development of astrometry at the micro as level but also by the aforementioned effective monitoring of global change previously remarked. It was found, too, that a part of their unexplained variance is susceptible to removal because the said theories have small inaccuracies and inconsistencies that can be fixed in the short to medium term.

Another part poses different problems since it is due to geophysical excitations at least to a large extent, as happens to the so-called free core nutation, a wobble corresponding to one of the free frequencies of the Earth, associated with the existence of the fluid core. Geophysical excitations also appear to dominate the evolution of the remaining three EOPs. On the other hand, the whole set of EOP is affected

by inconsistencies and inaccuracies in the definition or realisation of the two involved reference systems and frames to which they are referred and they link, namely the celestial and terrestrial ones. Systematics errors are ever a barrier that prevents improving accuracy, and they must be corrected to the maximum extent we could do it.

Resolution B2 describes these problems and urges the astronomical community to work in their solution with intensity, and in cooperation with other concerned organisations, such as the IAG and UN. Finally, it is important to note that improving the theories goes further than solving a scientific problem. It should be useful to accelerate the convergence and decrease the numerical errors of the programs of EOP determination, and especially to improve the features of the prediction methods. A lot of work and operations are done or planned based on predictions (e.g., observations, space navigation, etc.), and the better the models fit the actual evolution of a given EOP, the more accurate and long-time lasting the predictions are.

The adoption of any IAU resolution is the result of collective and long efforts of many researchers around the world. We want to recognize and thank the work of the members of Commissions A2 and A1, its Organising Committees, and other colleagues that contributed to the resolutions; and also, of the IAU Resolutions Committee and IAU members of the IAU XXXI General Assembly Business Sessions whose careful analysis and support led to the final form of the adopted resolutions.

Links

- 1 https://www.iau.org/science/scientific_bodies/commissions/A2/info/
- 2 <https://www.iau.org/static/archives/announcements/pdf/ann21040a.pdf>
- 3 <https://www.iau.org/static/archives/announcements/pdf/ann21040b.pdf>
- 4 <http://ggim.un.org/knowledgebase/Attachment157.aspx?AttachmentType=1>

7 IAU Publications

IAU Offices Publications

The ISYA lecturers 2020

Eds. Itziar Aretxaga
& David Mota
14 Sep 2021

The ISYA family 2020

Eds. Itziar Aretxaga,
Jowita Borowska, Michèle
Geraldi & David Mota
14 Sep 2021

The International School for Young Astronomers 2019

Eds. Itziar Aretxaga
& David Mota
14 Sep 2021

IAU's Interaction with Young Astronomers 2019

Ed. Engvold Oddbjorn
14 Sep 2021

International School
for Young Astronomers
(ISYA) since the
1960s: Participants
and Host Institution
2019

Ed. Michèle Gerbaldi
14 Sep 2021

International Schools
for Young Astronomers
Teaching for Astronomy
Development: two
programmes of...
2011

Eds. Michèle Gerbaldi,
Jean-Pierre DeGreve,
Edward Guinan
14 Sep 2021

Division XII / Commission
46 / Program Group
International Schools for
Young Astronomers

Ed. Karel van der Hucht
Cambridge
University Press
14 Sep 2021

Program Group on
International Schools for
Young Astronomers
Ed. O. Engvold
Cambridge
University Press
14 Sep 2021

International School For
Young Astronomers (ISYA):
Their New Horizon
26th meeting of the
IAU, Special Session 5,
21-22 August, 2006 in
Prague, Czech Republic
14 Sep 2021

A renewal of astronomy
education in Vietnam
Victoria University of
Manchester, Manchester,
UK, 14-16 August 2000
Ed. Alan H. Batten
San Francisco:
Astronomical Society
of the Pacific
14 Sep 2021

International Schools
for Young Astronomers,
Astronomically developing
countries and Lonely...
IAU Colloquium #162
held at University College
London and the Open
University, 8-12 July, 1996
Eds. L. Gouguenheim, D.
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IAU Timeline: Dates and Deadlines

8.1

IAU Dates and Deadlines from January to June 2022

January 1st

Travel Grant Submissions Open for the GA 2022
Early-Bird Registration Opens for the GA 2022
Abstracts and Grant Submission for the GA 2022 Opens

January 31st

Deadline for Proposals to Host I-HOW Workshops in 2022

February 15th

Deadline for the Review of Membership Applications by the Respective NCA, Adhering Organization or Division President

February 28th

Deadline for signature of MoU between the next GA Host and the IAU and the End of Early-Bird Registration for the GA 2022

March 1st

Deadline for Items Submitted to go on the EC Agenda
Regular Registration Opens for the GA 2022

March 31st

Deadline for Applications for the Gruber Foundation Fellowship
Deadline for the Review of Individual & Junior Member Applications by the Membership Committee
Grant and Abstract Submission for the General Assembly Closes

April 1st

Deadline for Submitting to the GS Bid Books Proposing to Host the IAU General Assembly in 2027
Opening of the Call for The Gruber Foundation Fellowship Applicants to Submit their Applications for Next Year

April 15th

Deadline for the Division Days Program to be sent to the IAU Assistant General Secretary

May 1st

Call for Letters of Intent (LOI) for Symposia 2024
Program of Symposia, Focus Meetings and Division Days
Finalized and Announced

May 15th

Grants Communicated to Grantees
Announcement of Recipients of the Gruber Foundation
Cosmology Prize

May 21st

Announcement of the Winners of the Shaw Prize 2022

May 31st

Applicants will be Notified by the IAU General Secretary of
the Outcome of the Selection for the Gruber Fellowship and
Announcement is Posted
Regular Registration for the GA 2022 Closes

May 31st

Deadline for Poster Submission
Communication to the SOC of the Final Selection of Symposia

June 1st

Late / Onsite Registration for GA2022 Opens

June 7th

Accepted Individual and Junior Members Announced

June 15th

PhD Prize Winners Announced

June 30th

Deadline to change Registration for GA2022 from In-Person
to Virtual or Virtual to In-Person

A long-exposure photograph of the night sky filled with numerous parallel light trails from Starlink satellites, appearing as a dense shower of white and blue streaks. The trails are set against a dark blue twilight sky. In the lower-left foreground, a dark, silhouetted mountain range is visible, with a warm orange and red glow from the setting or rising sun on the horizon behind it.

Editor in Chief: José Miguel Espinosa and Debra Elmegreen

Managing Editor: José Miguel Espinosa

Editor(s): Lina Canas and Kelly Blumenthal

Layout: IAU Office for Astronomy Outreach

Production: National Astronomical Observatory of Japan

Cover: Starlink Satellites pass overhead near Carson National Forest, New Mexico, photographed soon after launch.

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