



IAU Catalyst, June 2019



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Editorial

The IAU is commemorating 100 years¹ of its existence, spanning an era of dramatic changes in science and in technology. During this period, especially for astronomy, the impact of the discoveries, the scale of the uncovered observable Universe and the progress in understanding its origin, evolution and detailed structure are truly breathtaking. It is therefore not surprising that the scientific organisation designed to facilitate international cooperation in astronomy has grown in size from the 7 member states at its birth to the present 82, while at the same time opening up to the inclusion of individual members, currently more than 13 500.

In the meantime, the IAU has also changed profoundly in its scope, from a purely scientific organisation to an organisation with a much broader perspective and ambition in terms of how science, especially astronomy, can impact society as a whole and have a recognisable influence in the improvement of humanity. This impact is visible in terms of progress in the scientific knowledge of astronomy, but also through its instrumental role in education (formal and informal) and development and as a source of inspiration for us as human beings questioning our origin and place in the Universe.

These profound changes, especially in the last decade of the IAU's life, necessarily call for a different approach to communication within the organisation.

Here is the justification for the "Catalyst", an information bulletin made by many to be shared among all. A tool for direct communication between the Executive Committee, Divisions, Commissions, Working Groups and the various IAU Offices, individual members and other international scientific organisations and institutions. Communication focused on science, but also on education, shared with a wider audience. Concerned with the impact of science for a better world.

The "Catalyst" will appear twice a year, as a short and invigorating electronic-only bulletin.

Maria Teresa Lago, General Secretary IAU

¹ <https://www.iau-100.org/>

1

Executive Committee

The IAU at 100 years:
outward and forward

Ewine F. van Dishoeck
President IAU

An anniversary is an opportunity for celebrations but also for reflection. Where do we stand as a field and where are we going? What is the role of the IAU in the next century? This reflection is exactly what happened on 11–12 April in Brussels, at the beautiful Palace of the Academies where the IAU was founded back in 1919. The IAU 100 years Flagship event² highlighted what a century of astronomical discoveries has brought, and can bring, to society. The programme consisted of astronomy and its relation to other sciences, technology, culture, development, education, inclusion and diplomacy, with many speakers from outside astronomy, thereby encouraging astronomy to see itself through a different lens. It culminated with a future perspective from Nobel Laureate Brian Schmidt and a panel discussion on the next 100 years. Thus, the IAU looked mostly outward and forward in Brussels, and only briefly backwards and inward.

One message came through loud and clear — astronomy is a uniquely inspirational field among the sciences; it is, in fact, an expression of our humanity. “It excites the young and old by triggering their sense of wonder as no other scientific discipline would” (Khotso Mokhele) and “it empowers, liber-

Figure 1: Cosmic fireworks over Paranal.
Credit: P. Horálek/ESO



ates and inspires" (Anne Glover). The widespread attention given to the first image of a black hole on 10 April is just one of the many testimonies to this worldwide fascination with our Universe. Directly and indirectly, socio-economic benefits follow from our astronomical endeavours, but "impact on society is not possible without professional astronomers in the country" (Maria Teresa Ruiz). The IAU plays a crucial role in the promotion of astronomy worldwide and interacts with society at many levels. I encourage all of you to keep emphasising these inspirational aspects of astronomy to politicians and funding agencies at a time when investments in long-term fundamental science are at risk.

It is a privilege to be an astronomer, but we should never forget the obligations our profession brings to society. Let's use the momentum from the Brussels meeting and the thousands of other IAU100 celebrations³ worldwide to secure the next century of discoveries as part of a better world, Under One Sky.

Notes

² <https://www.iau-100.org/iau100-brussels-event>

³ https://www.iau.org/science/scientific_bodies/divisions/C/



2.1

A challenging triennium

Susana Deustua
President of Division C

In this triennium, 2018–2021, there are many exciting changes coming in Division C. Education, Outreach, History and Heritage¹. Division C, like Division B², is an enabling division, and is the home for the practice of and research in astronomy education (Commission C1³), the art and science of communicating astronomy with the public (Commission C2⁴), the study of the history of astronomy (Commission C3⁵), and studying the tangible (artifacts) and intangible roles of astronomy in human societies, past and present (Commission C4⁶). The IAU's Strategic Plan 2020–2030⁷ provides a framework around which to organise the Division Working Groups' activities to prepare the foundations for the next decade. We are looking forward to the establishment of the IAU's Office of Astronomy for Education (OAE⁸), which will enable us, the IAU, to more effectively develop a community of practice with educators, teachers, curriculum developers and education organisations around the world. We will continue to support and coordinate with the activities of the Office of Astronomy for Development (OAD⁹), the Office for Astronomy Outreach (OAO¹⁰) and the Office for Young Astronomers (OYA¹¹). Consequently, with a view to the future, Division C is restructuring its working groups and refocusing its activities. For example, some working groups were originally formed to organise outreach or education programmes, activities that are now subsumed by the Offices, and other working groups completed their task, reaching a natural end. We are also seeking to broaden participation to include early career research astronomers, as well as experts at all career stages in education, history, inclusion and equity. These are truly exciting times for Education, Outreach, History and Heritage.

“Where and how did life originate?”, “How has life evolved?”, “Are there other lives in the Universe?”, “What will be the future of life?” These are fundamental questions for everybody. Astrobiology is an interdisciplinary research field aimed at solving these questions through collaborations across astrophysics, physics, chemistry, planetary science, geophysics, biology, philosophy, history of science, and other disciplines.

Astrobiology research includes:

- the search for extant life, evidence of past life, and evidence of prebiotic chemistry on Solar System bodies;
- spectroscopic evidence of life, habitability, and/or biological activity on extra-solar planets;
- the origin of the biogenic chemical elements and the search for, and analysis of, biologically relevant molecules in the circumstellar and interstellar media and in external galaxies;
- the study of biomolecules and organic solids in primitive Solar System bodies such as comets, asteroids, interplanetary dust particles, meteorites and planetary satellites;
- the search for intelligent signals of extraterrestrial origin;
- the study of the origin, early evolution, and environmental constraints of life on Earth.

Commission F3 Astrobiology¹² was established in 2015 as a successor to the former Commission 51 Bioastronomy. It aims to portray a coherent picture of the synthesis of basic ingredients of life in stars and planets, in the interstellar medium, and in the Solar System such as on Mars, Europa, Titan and Enceladus, and to study the interrelationships between these findings and the results from studies of the early Earth to obtain an understanding of the origin of life and the possibility of other life in the Universe.

It is a tradition for Commission F3, since Commission 51, to hold astrobiology conferences where researchers in the relevant scientific fields gather. The next conference will be held in South Africa in 2020. I would like to encourage IAU members to participate in this forthcoming exciting conference!

2.2

Invitation to Astrobiology

Masatoshi Ohishi

President of Commission

F3 Astrobiology

2

IAU Divisions, Commissions & Working Groups

2.3

Planetary System Nomenclature

Rita Schulz

Chair of the Working
Group for Planetary
System Nomenclature

In 1973 the IAU founded its Working Group for Planetary System Nomenclature (WGPSN¹³) introducing their resolution towards a globally acceptable approach to planetary naming. Today, there are almost 16 000 officially approved names for surface features and satellites. Being responsible for the process of planetary nomenclature the WGPSN safeguards the unique identification and naming of permanent surface features of distinct topography, morphology, or albedo so that these can be easily located, described, and discussed. Indeed the official naming makes communication about the bodies and their surface features much easier.

Nomenclature follows a set of rules, which are regularly reviewed for completeness and appropriateness. The naming is based on a certain logic and names must also not be offensive or ridiculous. To ensure unique identification, each feature receives a descriptor defining the type of feature (craters, valles, etc.) and a name. Names are not randomly assigned, but have to follow categories (themes) assigned to the various descriptors used on each planetary body; e.g., on Mercury the theme for valles is “abandoned cities”, on Venus it is “Venus in other languages” and on Mars large valles are named after “Mars/star in other languages” and small valles after “names of rivers”. Similarly, themes are assigned for naming the outer planet satellites.

If a body is visited for the first time, neither descriptors nor themes yet exist, meaning that the entire foundation for naming has to be set up before names can be proposed. Even new descriptors may be required as was the case for asteroid 162371 Ryugu for which saxum was introduced for boulders and rocks¹⁴.

The WGPSN is supported by 6 Task Groups: Moon, Mercury, Venus, Mars, Outer-Solar-System and Small-Bodies. Features are named only when they have special scientific interest, or when the naming is useful to the scientific and cartographic communities at large. Naming proposals are submitted electronically via the Name Request Form on the Gazetteer of

Planetary Nomenclature. The approval process takes typically 2–3 weeks.

Details on nomenclature and the naming process can be obtained from the Gazetteer of Planetary Nomenclature¹⁵.

Notes

¹ https://www.iau.org/science/scientific_bodies/divisions/C/

² https://www.iau.org/science/scientific_bodies/divisions/B/

³ https://www.iau.org/science/scientific_bodies/commissions/C1/

⁴ https://www.iau.org/science/scientific_bodies/commissions/C2/

⁵ https://www.iau.org/science/scientific_bodies/commissions/C3/

⁶ https://www.iau.org/science/scientific_bodies/commissions/C4/

⁷ https://www.iau.org/administration/about/strategic_plan/

⁸ <https://www.iau.org/education/oea/>

⁹ <https://www.iau.org/education/oea/>

¹⁰ <https://www.iau.org/public/>

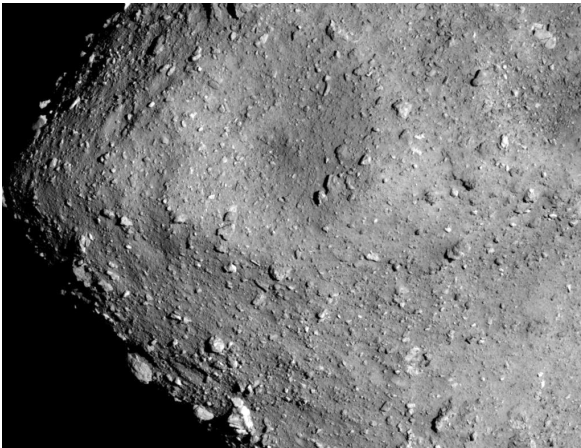
¹¹ https://www.iau.org/education/office_for_young_astronomers/

¹² https://www.iau.org/science/scientific_bodies/commissions/F3/

¹³ https://www.iau.org/science/scientific_bodies/working_groups/98/

¹⁴ <https://www.iau.org/news/announcements/detail/ann19006/>

¹⁵ <https://planetarynames.wr.usgs.gov/>



*Figure 2:
Asteroid Ryugu
Credit: JAXA,
University of Tokyo
& collaborators*

3 News



Figure 3 and 4: Almost 100 years separate these two photos. Top: 1st IAU General Assembly, Accademia dei Licei, Rome, 1922. Bottom: IAU 1919–2019: 100 Years Under One Sky, Palais des Académies, Brussels 2019.

In 1978, in Santiago, the first Latin American Regional IAU Meeting (LARIM) took place. It came back to Chile in 1992 and 2005, to Viña del Mar and Pucón respectively. Thus, even if 2019 will see LARIM returning to Chile for a fourth time, this will be the first occasion on which the participants will get to know the north of the country. We'll welcome you to Antofagasta, a region of key importance for astronomers worldwide owing to the presence of the giants VLT and ALMA, alongside several smaller facilities whose observational capabilities span a wide range of wavelengths. On top of this the world's largest telescope, the 39-metre ELT, is also under construction here, something that has ignited a lot of interest in astronomy amongst both scientists and non-scientists. In November this year, you will find a country which is not only proud of hosting this rich observational hub for humanity but in which the scientific community has become large and mature, while the society at large has grown aware of the opportunities astronomy provides for education, recreation, culture and business.

New ideas in astronomy have always pushed the boundaries of human understanding and technical capabilities to grasp what has become a continuously changing view of the Universe. Latin American researchers at different stages of their career will come together in Antofagasta to discuss their contributions to this transformation as well as the challenges and opportunities we face in the era of astronomical big data. We are genuinely excited about the ideas and collaborations that may emerge after this meeting!

The organisers are working hard to ensure that LARIM 2019 embodies some fundamental values we all believe in — integrity, excellence, diversity and sustainability (you can read more about this on our website¹) — so you will see that these concepts guide many of our decisions. We are counting on your collaboration and enthusiasm to make this vision a reality.

Notes

¹www.sochias.cl/larim2019

**XVI LARIM,
Antofagasta (Chile),
3–8 November 2019**

Eduardo Unda-Sanzana
Chair of the LOC
of LARIM 2019

5 IAU Offices

5.1

IAU Secretariat: Database Manager

For those of you who don't know me, I'm Madeleine Smith-Spanier, Database Manager of the IAU. I took up my duties as Database Manager in the IAU Secretariat in Paris nearly 6 years ago (how time flies!). I'm in charge of maintaining and updating the IAU's database and facilitating communication amongst the Union's more than 13 500 members. I'm also responsible for creating reports and statistics on the membership and maintaining the webpages in tandem with my colleagues at ESO. I focus particularly on the maintenance of the Division and Commission webpages and I respond to a variety of questions from Individual Members, National Members, Commission and Division Presidents and the general public on a daily basis. I take care of setting up the Union's internal elections, I'm involved in aspects of the administration of publications with Cambridge, and I work on the membership application process.

Another important aspect of my job is assisting with the planning and execution of our annual Officer and Executive Committee meetings as well as with preparations for the triennial General Assembly meetings. I enjoy using my French language skills as much as I can in my job as well as utilising my other strengths in communication and organising data in a systematic way to enhance the IAU's operations. I enjoy learning about new cultures and languages and I bring my interdisciplinary skills to the table, recognising the importance of developing rich, nuanced understandings of increasingly multicultural and technologically connected international environments. These are some of the reasons why the IAU has been such a great fit for me over the past few years and why I hope to continue evolving with the Union.

Arguably the greatest achievement of the IAU in the past decade, the OAD¹ is a direct result of the International Year of Astronomy 2009² and the determination and vision of George Miley and colleagues as encapsulated in the IAU Strategic Plan Astronomy for the Developing World³. The implementing Resolutions at the 2009 General Assembly⁴ were followed by an open competition to host what became, after several name changes, the OAD. The response exceeded expectations — over 40 expressions of interest followed by 20 proposals. South Africa came through the final selection and the next step was an agreement with the sponsoring organisation, the National Research Foundation, and search for a Director. This was quickly done, Kevindran Govender was appointed and the OAD became a reality on 16 April 2011 when it was launched by the South African Minister of Science and Technology, with the South African Astronomical Observatory (SAAO) as the host institution. The support of South Africa has been a vitally important contribution to the success of the OAD, but the main driver has been world-wide enthusiasm for the goals of the OAD and the practical activities of groups everywhere.

5.2

The Office of Astronomy for Development (OAD)

Ian Corbett

Former IAU General
Secretary

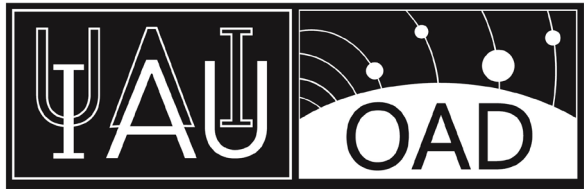
*Figure 5: The Agreement with
the South African National
Research Foundation is signed.*



5 IAU Offices

The original goal of the OAD was “to contribute globally to education ... and to enable less developed, poorer countries to participate in cutting-edge scientific research”. This has evolved to mean utilising astronomy in every country as a tool for sustainable development in its broadest sense, primarily implemented through funding and coordinating astronomy based projects. Since 2013, more than 140 projects, in addition to the OAD's own activities, have been funded through the annual Call for Proposals and there are 10 Regional Offices and Language Centres⁵ around the world focusing on specific regions. The success of the OAD and its continued strategic importance was endorsed in the IAU Strategic Plan 2020–2030⁶, and there is no doubt it will continue to make a major contribution to the role of the IAU in the future.

Figure 6: Logo of the IAU Office of Astronomy for Development.
Credit: IAU/OAO.



International | Office of
Astronomical | Astronomy
Union | for Development

The IAU Office for Astronomy Outreach (OAO⁷) is a joint venture between the IAU and the National Astronomical Observatory of Japan (NAOJ). It is primarily responsible for managing the IAU's communication and accessibility initiatives, and supporting the international network of IAU National Outreach Coordinators (NOCs⁸) in more than 100 countries. That network is composed of some of the most active and driven practitioners making a difference in astronomy internationally, the astronomers producing cutting-edge science and the outreach professionals taking astronomy to their local communities.

Since the IAU OAO was first idealised, following the success of the International Year of Astronomy in 2009, it has been redefining its actions and scope and these can now be found in the IAU Strategic Plan 2020–2030. With communication and accessibility at its core, the IAU OAO aims to take astronomy to all through international cooperation.

In 2019, the IAU is celebrating its centenary, and with it the world is uniting under one sky in a truly global celebration of astronomy. With the IAU OAO network in place, and with

5.3

IAU Office for Astronomy Outreach

**Hidehiko Agata
and Lina Canas**

National Astronomical
Observatory of Japan

*Figure 7: The IAU Office for Astronomy Outreach has representation in more than 100 countries, through the international network of IAU National Outreach Coordinators (NOCs).
Credit: IAU/IAU OAO.*



5 IAU Offices

a focus on representativeness and localisation to increase impact at local and regional levels, the office is a focal point for higher visibility and impact of these IAU milestones: catering to the importance of language in reaching each community; raising the profile of dark skies protection among the general public; and promoting accessible astronomy in all its research, outreach, education and development aspects.

Astronomy communicators have play a vital role by reaching out to the public and starting a movement for critical thinking, tolerance and peace. As our fragile world faces unsettling events, the astronomy communicator has the tools to revolutionise society itself. Astronomy is indeed a unique science, and has the advantage of giving us a sense of place, a sense of scale, and a sense of wonder. Astronomy helps us to rise above ourselves and look at our planet for what it is — borderless and unique. With the OAO, the IAU hopes to provide the international community with the tools to actively work together towards building a better society through science communication.

Figure 8: The Communicating Astronomy with the Public Journal is a free peer-reviewed journal for astronomy communicators, online and in print in a joint collaboration between the IAU Commission C2 Communicating Astronomy with the Public, the IAU Office for Astronomy Outreach, the National Astronomical Observatory of Japan (NAOJ) and the European Southern Observatory. Credit: IAU/IAU OAO.



Educational activities at university level are among the essential tasks and flagships of the IAU. The International Schools for Young Astronomers (ISYA) programme was established by the IAU in 1967 and was expanded and strengthened in 2015 by a supporting Office for Young Astronomers (OYA[®]), through an IAU partnership with the Norwegian Academy of Science and Letters (NASL). An average of 2 ISYAs every 3 years were initially funded by UNESCO and later by the IAU. The operations of the ISYA programme were handled and run single handedly by a few truly insightful and dedicated individuals appointed by the IAU, in close cooperation with various local host institutions. Increasing interest and requests from previous and potential host countries demonstrated the need for an increased frequency of the Schools. Funding from the NASL in 2008 made it possible to organise one ISYA every year, which has subsequently increased to 3 ISYAs every 2 years.

An increased number of Schools per year implied a notably higher workload on the ISYA leadership, the ISYA Director and Deputy Director, which now is shared by the OYA Steering Committee (SC) members who are appointed by IAU and NASL. The OYA SC members have a background from ISYA and other relevant experience. The OYA is a supporting structure for the Director and Deputy Director of ISYAs, permitting them to devote their time and work to the educational and scientific aspects of the Schools. Meanwhile the SC is responsible for administrative arrangements associated with each ISYA, in collaboration with the Local Organisers. It is in addition responsible for a well functioning ISYA database and web portal for the Directors' communications with Local Organisers and students related to preparations and operations of new ISYAs.

The IAU will soon have four Offices devoted to its educational programmes. Whenever possible, the OYA will coordinate ISYA activities with the other IAU Offices, and also with other IAU-related international education and outreach activities, such as the COSPAR Capacity Building Workshops and NEON Schools, with the aim of strengthening the overall value and significance of the ISYA programmes.

5.4

The Office for Young Astronomers

Oddbjørn Engvold

Former IAU General Secretary

5 IAU Offices

5.5

The Office of Astronomy for Education (OAE)

Maria Teresa Lago
IAU General Secretary

The IAU has as its mission to promote and safeguard astronomy in all its aspects — research, communication, education and development — through international cooperation. In furtherance of its mission and considering the structures already operating, both scientific and partnered offices, the Office of Astronomy for Education (OAE⁹) was clearly a missing pillar and will play a major role in achieving the goals of the IAU Strategic Plan 2020–2030.

To establish the OAE the IAU launched in October 2018 an international call for Letters of Intent (LoI) identifying prospective partners to host the Office. The 23 LoIs submitted by the end of December were evaluated by a high-level ad hoc committee and resulted in 9 invitations to proficient prospective hosts, in 4 continents, to submit a proposal by the end of June 2019.

Meanwhile, the setting up of the OAE could not be more auspicious. In April 2019, the Shaw Prize Foundation and the IAU signed an agreement¹⁰ to work together to promote astronomy and to enhance astronomy for education. In particular, the Shaw Prize Foundation will provide funding for an annual Shaw–IAU Workshop on Astronomy for Education, a key activity of the new Office. The agreement covers an initial period of 5 years, with the possibility of renewal after that time.

The first workshop will be organised in December 2019 at the Institut d’Astrophysique de Paris (IAP) in Paris, the host of the IAU Secretariat. The purpose is to involve representatives from the main ongoing astronomy educational initiatives worldwide in this first workshop to share their varied experiences and practices. This will hopefully result in an inclusive set up for the activity of the new Office.

The IAU Press Office was founded by the IAU Executive Committee in early 2006 before the IAU XXVI General Assembly in Prague, Czech Republic, held in August 2006. The planet definition issue was on the agenda of the 2006 General Assembly in the form of a Resolution and as a result a significant increase of public and media interest in the IAU was expected.

Lars Lindberg Christensen was appointed as the IAU's first Press Officer in 2006 and has so far served in this role 13 years.

Under the IAU's so-called Communication Concept, the IAU seeks to communicate IAU-relevant news and information intensively to, and with, scientists, media and the public, including on controversial issues. As can be expected, practical limitations make it necessary to target communication relatively broadly to different target groups, such as:

- Media
- IAU members internally
- Other scientists
- Laypeople
- Outreach community
- Educators (formal and informal)

The public and media communication utilises a few different vehicles, most notably:

- Web pages, most notably the so-called IAU Themes¹¹
- Press releases¹²
- Announcements¹³
- Scientific Dates & Deadlines¹⁴
- Administrative Dates & Deadlines¹⁵

The main distribution channel is in the form of an e-mail Newsletter which is issued for every press release and aggregates all news written up to that point.

The IAU has seen a gradual increase in the number of main news items over the years (see Fig. 1). The GA years have more press releases, whereas the number of IAU

5.6

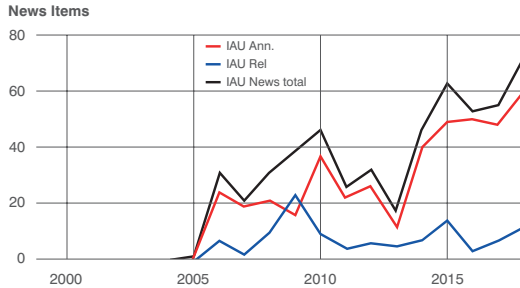
The IAU Press Office

Lars Lindberg Christensen

IAU Press Officer

5 IAU Offices

Figure 9: The number of the main IAU news items over time 2006–2018.



Announcements has been increasing fairly steadily since 2006. This can likely be attributed to the continuous “opening” of the Union with an increased focus on public communication, as well as increased activity in the IAU’s Scientific Bodies.

The IAU Press Office also works closely with the IAU General Secretary and the IAU Secretariat on developing and maintaining the IAU web site and the IAU membership database. In addition, requests from the media and public are answered.

References

- ¹ <https://www.iau.org/development/>
- ² <https://www.astronomy2009.org/>
- ³ https://www.iau.org/education/strategic_plan/
- ⁴ https://www.iau.org/static/resolutions/IAU2009_English.pdf
- ⁵ <http://www.astro4dev.org/regions/>
- ⁶ https://www.iau.org/administration/about/strategic_plan/
- ⁷ <https://www.iau.org/public/>
- ⁸ <https://www.iau.org/public/noc/>
- ⁹ https://www.iau.org/education/office_for_young_astronomers/
- ¹⁰ <https://www.iau.org/education/oaef/>
- ¹¹ <https://www.iau.org/news/pressreleases/detail/iau1904/>
- ¹² <https://www.iau.org/public/themes/>
- ¹³ <https://www.iau.org/news/pressreleases/>
- ¹⁴ <https://www.iau.org/news/announcements/>
- ¹⁵ <https://www.iau.org/science/meetings/future/>
- ¹⁶ <https://www.iau.org/administration/events/>

The 80-year old CNRS is one of the largest public research organisations in the world, comprising 10 research institutes. CNRS-INSU is in charge of coordinating and animating researches in the field of Earth and space sciences at national level. 2700 staff members from CNRS and its partners (Paris Observatory, Observatoire de la Côte d'Azur, CEA, LNE and universities), including 650 scientists with permanent positions, contribute to research in astronomy in France. France is currently the second-largest country of the IAU with around 6.55% of the membership.

CNRS-INSU is the main hub of a network of laboratories in France that includes active observing facilities like the OHP, Nançay and Pic du Midi observatories. CNRS-INSU currently contributes to 10 international research infrastructures and large research infrastructures whose flagship is ESO for the optical-infrared domain, and also has a strong involvement in facilities or projects like IRAM, ALMA (through ESO), CFHT, CTA and LOFAR. CNRS-INSU is working towards participating in the construction of the SKA. It is the home of the world-renowned CDS in Strasbourg which disseminates astronomical data. Together with the French national space agency, CNES, teams from CNRS-INSU are active in 41 space missions either under the ESA Cosmic Vision programme or through collaborations with other agencies like NASA, JAXA or the NSSC. All projects benefit from developments with a rich network of French high-tech companies.

The field is organised as a matrix between projects on the one side and national programmes and specific actions on the other side with strong ties within CNRS with physics, particle physics and chemistry but also with CNES and CEA. All fields of modern astronomy are covered by national programmes and specific actions. Priorities are defined through prospective exercises coordinated by CNRS-INSU at national level and consistently with the European ASTRONET science vision and infrastructure roadmap. CNRS-INSU is currently organising a mid-term planning exercise whose conclusions will be made public in early 2020.

6.1

The Astronomy-
Astrophysics division
of CNRS-INSU,
the National Institute
of CNRS for Earth
and Space Sciences

Guy Perrin

Deputy director,
Head of CNRS Astronomy
& Astrophysics Division

6.2

The Square Kilometre Array: a new era

Catherine Cesarsky

Haut Conseiller

Scientifique, IAU

President 2006–2009

Laboratoire AIM/

Département

d'astrophysique,

CEA/Irfu, Université

Paris Saclay

The Square Kilometre Array (SKA¹) is an ambitious project, aiming to build the world's largest radio telescope. The first international agreement to foster the SKA project was signed by committed astronomers from eleven countries under the auspices of the IAU at the Manchester General Assembly in 2000. Much development work followed, and in 2011 the collaboration was formalised and the leadership centralised with the creation of the SKA Organisation, run as a private UK Company located in the Manchester area.

On 12 March 2019, a new era started for SKA, as the international treaty establishing the SKA Observatory was signed by the governments of seven countries, while several other countries are getting ready to join in the short or the middle term. The SKA will be built partly in Australia and partly in South Africa. The land in both sites has been secured, the design study is very advanced and will be completed in the forthcoming year, prototype hardware has been deployed for testing and the headquarters building will soon be officially inaugurated at Jodrell Bank, UK. By 2021 the company will have been wound down and the construction and later the operations of SKA will be supervised by the SKA Observatory, a new intergovernmental organisation.

The SKA's unique sensitivity and angular resolution over a large range of frequencies, from 50 MHz to at least 14 GHz, will enable transformational science in a wide variety of areas of contemporary astrophysics. To pick just two examples: the SKA will allow the completion of the census of baryonic matter in the Universe, and its history, monitoring hydrogen 21-cm emission throughout the life of the Universe, in galaxies, haloes and the intergalactic medium. Ionised hydrogen columns will also be available through measurements of dispersion measures in the direction of fast radio bursts. The knowledge of magnetic field strengths and properties at various scales, from solar events to star-forming regions to galaxy haloes to large scale features of the Universe will, at last, make it possible to take account properly of the effects of magnetic fields in all kinds of astrophysical processes.

6.3.1. International Astronomical Union 1919–2019

“100 Years Under One Sky” — take the opportunity to revisit the programme² and the list of participants of this Flagship Ceremony and share the videos³ of the sessions of this major event in the IAU’s centennial celebrations.

There are numerous IAU centennial celebration events⁴ around the world.

6.3.2 The 1st Shaw-IAU Workshop on Astronomy for Education

The 1st Shaw-IAU Workshop on “Astronomy for Education” will take place at the Institute d’Astrophysique de Paris, from 17 to 19 December 2019.

Organised by an ad-hoc committee in charge of the selection of the proposals for the Office of Astronomy for Education, with the support of the IAU Secretariat, the workshop aims at comparing the current programmes involving astronomy for education worldwide, setting the stage for the new Office.

Those involved in initiatives related to astronomy for education anywhere in the world are invited to add the event to their calendars and to stay tuned!

6.3.3 Additional Support for Countries Hosting their first IAU Symposium

So far the IAU has offered up to €20 000 in travel grants to support any IAU Symposium. From 2021, a further €15 000 will be offered to each country hosting a Symposium for the first time. The extra funding may be used for organisational expenses, including invited speakers. The IAU will be offering this additional support for up to two Symposia per year. Prospective organisers of IAU Symposia in 2021 should take this into consideration when preparing the Letter of Intent, which is due by 15 September 2019.

6.3

Not to be missed

Figure 10: Infrared VISTA view of a stellar nursery in Monoceros
Credit: ESO/J. Emerson/VISTA.
Acknowledgment: Cambridge
Astronomical Survey Unit

References

¹ <https://www.skatelescope.org/>

² <https://www.iau-100.org/iau100-brussels-event>

³ <https://www.youtube.com/watch?v=x4sqUDrrl1I>

⁴ <https://www.iau-100.org/events>



The IAU produces a range of publications, including annual and triennial reports of the activities of the various scientific bodies, the Transactions A and B which are the proceedings of the General Assemblies as well as proceedings of the Symposia and Focus Meetings (Astronomy in Focus), brochures, press releases and announcements.

In September 2018 the IAU published the Transactions of the IAU, Vol XXIXB and 3 Symposium Proceedings. Several other Symposium Proceedings and the Astronomy in Focus volume are in the production stages.

This year there are also special publications focusing on the 100th Anniversary of the IAU. The website section IAU Publications¹ provides an overview of all publications over the past years.

The IAU Strategic Plan 2020–2030

At the XXX IAU General Assembly in Vienna, Resolution A1, the 10-year Strategic Plan for the next decade of the IAU (2020–2030) was voted on favourably and approved by the IAU membership.

The Strategic Plan provides the first comprehensive overview of the IAU, describing the different activities of the IAU, how they fit together and how they complement each other, and presents its long-term goals.

IAU 100-Year Anniversary Book

On the occasion of its centennial celebration the IAU commissioned a book *The International Astronomical Union, Uniting the Community for 100 Years*, authored by Johannes Andersen, David M. Baneke and Claus Madsen, and published by Springer International Publishing. A preview of the book can be found on the Springer website².

Practical applications of Astronomy

Some of the most visible technical applications driven by astronomy research and development were published in the booklet *From Medicine to Wi-Fi*³.

Big Ideas in Astronomy:**A Proposed Definition of Astronomy Literacy**

A proposed definition of astronomy literacy as a kind of “global astronomy curriculum” was put forward by the IAU Commission C1 Working Group on Literacy and Curriculum Development in the booklet *Big Ideas in Astronomy: A Proposed Definition of Astronomy Literacy*⁴.

IAU News

We welcome submissions for newsworthy IAU developments to be considered for IAU Press Releases⁵ and Announcements⁶. News is defined as any important development in the Union that ought to be communicated to a wider audience beyond the scope of just one of the Scientific Bodies. It is also a means of communication not only about astronomy but also between astronomers.

References

¹ <https://iau.org/publications/iau/>

² <https://www.springer.com/gp/book/9783319969640>

³ <https://www.iau.org/static/archives/announcements/pdf/ann19022a.pdf>

⁴ <https://www.iau.org/static/archives/announcements/pdf/ann19029a.pdf>

⁵ <https://www.iau.org/news/pressreleases/>

⁶ <https://www.iau.org/news/announcements/>

Figure 11: Glowing stars.
Credit: ESO/B. Tafreshi
(twanight.org)



2019 is an important year for the Earth and space science community to look into the past and to envision the future of international research cooperation. Organised international cooperation began 100 years ago with the establishment of two scientific unions under the umbrella of the International Research Council (which transformed into the International Council for Scientific Unions, ICSU, and is now the International Science Council, ISC): the International Astronomical Union (IAU) and the International Union of Geodesy and Geophysics (IUGG). One reason for the early establishment of these two unions was that in both cases “their basic studies had always required international action”. IAU and IUGG have been developing a strong interdisciplinary cooperation in relevant fields of knowledge including the variation of the latitude, Earth’s rotation, geodetic astronomy, ionosphere, and solar-terrestrial physics. They played an important role in establishing the Federation of Astronomical and Geophysical Services (today the ISC World Data System), and in setting up the Scientific Committee on Solar Terrestrial Physics. The IAU and IUGG cooperated in developing the International Earth Rotation Service and in defining the Conventional Terrestrial Reference System. In 2004, representatives of several international scientific unions dealing with Earth and space sciences established a partnership (GeoUnions) to better promote these sciences worldwide, to communicate and coordinate scientific activities of individual unions, and to gain recognition by ISC bodies, the United Nations (UN) organisations, and other global stakeholders. In the framework of GeoUnions, IUGG and IAU will continue their cooperation for the next decades, promoting scientific contributions to the solutions of challenging problems associated with the implementation of the UN Sustainable Development Goals, disaster risk reduction, and environmental protection as well as contributing to science education and outreach.

8.1

Centenary of international cooperation in Earth and Space Sciences

Alik Ismail-Zadeh

IUGG Secretary General,

ISC Secretary

8.2

**A Global Approach
to the Gender Gap
in Mathematical and
Natural Sciences:
How to Measure It,
How to Reduce It?**

Francesca Primas
Advisor of Executive
Committee WG Women
in Astronomy

Since early 2017, the IAU has been one of the main partners in the project A Global Approach to the Gender Gap in Mathematical and Natural Sciences: How to Measure It, How to Reduce It?!. It is an interdisciplinary collaboration of eleven partners, led by the International Mathematical Union (IMU) and the International Union of Pure and Applied Chemistry (IUPAC), supported by the International Science Council (ISC), over the triennium 2017–2019.

The project aims to better understand the problems that mathematical, computing, and natural science academics and practitioners are facing around the world. It consists of three main tasks:

- 1 The Joint Global Survey that opened in May 2018;
- 2 A detailed investigation of scientific publication patterns; and
- 3 The establishment of a best-practice/most-useful documents database, to encourage girls and young women to study and pursue education in mathematics and natural sciences, along with regional information about careers, jobs and salaries directed at parents, schools, and other relevant agents.

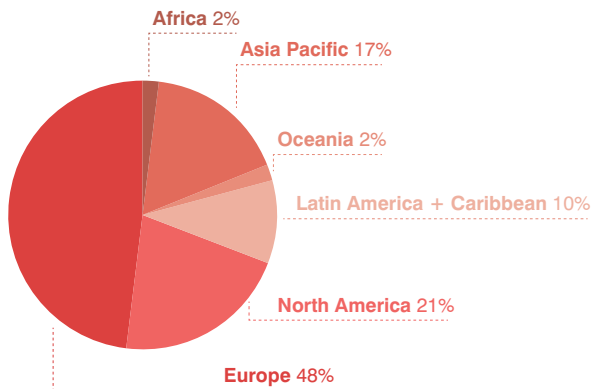


Figure 12: A total of 2691 responses to the Joint Global Survey were received from the astronomical community. The contribution from the geographical areas identified by the project is shown in the pie-chart.

Tasks #2 and #3 are on-going; the first results will become available towards the end of the summer. As far as Task #1 is concerned, a little more than 32 000 responses were received by the official closing date (31 December 2018²), of which 2632 came from the field of astronomy (cf. Figure 12). At the present time, the Project Team is busy preparing and analysing the survey data, which will soon start to be presented to the public.

The end of the project will be marked by a workshop, to be held at the International Centre for Theoretical Physics (ICTP) in Trieste (Italy), on 4–8 November 2019, during which the main findings and achievements of the project will be presented and discussed, along with final recommendations and possible future initiatives. Registrations for the event are now open!

References

¹<http://gender-gap-in-science.org/>

²The survey will remain open until Summer 2019 and will continue to record responses until then.

9

IAU Timeline: Dates and Deadlines

9.1

Important events
coming up in the next
6 months within the IAU

- By 30 June the IAU will be expecting the submission of the full proposals to host the OAE.
- 15 September is when we expect to receive all Letters of Intent for 2021 Symposia and Focus Meetings included in the programme of the GA XXXI (Bosun, Republic of South Korea) or outside the GA programme. The IAU already offers up to €20,000 in travel grants to support any IAU Symposium. From 2021, a further €15,000 grant will be offered to countries hosting a Symposium for the first time. See the details above.
- 1 October is the opening date for our annual call for the submission of Junior Membership applications. All interested prospective candidates should apply via their country of work or, in the case of candidates living in a non-member country, via a Division President.
- Additionally, 1 October marks the opening of the Gruber Foundation Fellowship Programme. The Gruber Foundation provides an amount of US\$ 50 000 for Fellowships every year, to be awarded to one or shared by two extremely promising young astrophysicists working in any field of astrophysics.
- 15 December is a date with multiple deadlines:
 - the deadline for PhD Prize application submissions for 2019;
 - the deadline for all applicants to submit applications for Individual or Junior Membership to their respective National Member countries or Division Presidents;
 - the deadline for nominations for the Gruber Foundation Cosmology Prize;
 - the deadline for full proposals of Symposia and Focus Meetings to be held in 2021.
 - 16 December marks the opening of the PhD Prize submissions for the following year, as well as the opening of nominations for the Gruber Foundation Cosmology Prize for the following year.

Upcoming IAU Meetings are listed online¹

References

¹ <https://www.iau.org/science/meetings/future/>



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▪ *Cover: This image shows Aurelio Barrera, a staff member at APEX, appearing to embrace the Milky Way as it arches above the Atacama Desert. Credit: C. Duran/ESO.*

