

Lessons Learnt and Challenges of Planning and Coordinating the IAU 100th Anniversary Celebrations

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The International Astronomical Union centenary (IAU100) comprised a year-long worldwide public engagement initiative that celebrated the fascinating past century of astronomical discoveries as well as the importance of astronomy for education, development, diplomacy and outreach. Through the coordination of the IAU100 Secretariat and the IAU Office for Astronomy Outreach (OAO), a combined worldwide effort from the IAU National Outreach Coordinators (NOCs) network, IAU bodies, astronomical organisations and astronomy communicators outside academia such as amateur astronomers, teachers, science centres and planetariums implemented the IAU100 ambitious goals. The approach and methodology used favoured the wide participation of grassroots organisations, which overwhelmingly responded by organising around 66% of the over 5000 registered activities in 143 countries. Moreover, the IAU 100th anniversary celebrations also benefited the IAU NOC network, both by the increase in the number of countries involved and the increased levels of engagement. An exploratory study about the impact on the network helps us better understand the impact and stress on the national representatives, highlighting the type of activities and numbers of them that could be sustainable in the future. These findings have helped the IAU OAO to plan sustainable future actions for the NOC network to keep celebrating astronomy Under One Sky.

Introduction

The IAU 100th Anniversary Celebrations (IAU100) in 2019 (Rivero, 2020) exceeded initial expectations with over 5000 registered activities in 143 countries. This facilitated the direct involvement of an estimated 5 to 10 million people, along with an estimated further reach of 100 million people through communication activities.

In this article, the IAU100 Secretariat members present some of the key factors considered behind the planning and implementation of the initiative (a full consideration will exceed the word limit for articles in the CAPjournal). Lessons learnt and challenges will be discussed.

Approach

One of the most important challenges faced in planning a transnational public engagement initiative is the development

and implementation of an approach that allows for reach throughout a global audience while maximising the efficiency of your assets (i.e. expertise, networks, etc.). Due to our previous experience of coordinating actions with large scopes — the UN International Year of Astronomy 2009 (IYA2009) (Russo & Christensen, 2010) and the International Year of Light 2015 (IYL2015) (Dudley, 2016) — the IAU100 Secretariat decided to have a mixed approach of actions that included a strong central coordination, with an extensive programme of central Flagship initiatives implemented by the IAU National Outreach Coordinators (NOCs), while providing high visibility to grassroots actions. In the following we discuss the most important aspects:

Flagship Initiatives

A key lesson learnt from IYA2009 (Russo & Christensen, 2010) was the importance

of having an exciting programme of global actions: a broad and attractive portfolio of activities that can engage the participating communities. In that sense, we had the successful experience from the IYA2009 Cornerstone Projects, global programmes of activities centred on specific themes to accomplish the IYA2009 Goals.

Initially, the NOCs and several stakeholders in the astronomical community provided various suggestions and ideas for projects that were subsequently narrowed down by the IAU100 Secretariat and Steering Committee to a programme of 11 IAU100 Global Projects (see Figure 1 for an overview of the IAU100 Global Projects) that covered the main IAU100 Goals¹. These Global Projects were designed to be mainly implemented by the NOCs and/or to use their networks to reach out to people in their countries to get involved in organising activities.

Strong National Nodes Network

Another important focus was to ensure a strong central coordination of a network of national nodes with a collaboration between the IAU100 Secretariat and the IAU Office for Astronomy Outreach (OAO) (Cheung, 2015). This central point aimed to act as a catalyst and facilitator, providing clear project framework standards, procedures and information on the results. This is important to effectively coordinate the network and to avoid engagement problems in this type of communities of practice² (Russo, 2015).

The primary IAU asset for initial implementation of a project of this scale was the NOC network coordinated by the IAU OAO. Based on the success of the established network that implemented IYA2009 worldwide, the IAU OAO was set up in 2012 to implement the Beyond IYA2009 (Russo, 2015) plan and to maintain a network of national nodes. The NOCs are responsible for the implementation of national outreach activities as well as maintaining a constant exchange with the local amateur astronomer communities. They were the base to form the IAU100 National Committees to implement and encourage participation in their respective regions.

Participation of Grassroots Communities

Unlike international observances supported by United Nations and its agency UNESCO (e.g. IYA2009/IYL2015), which benefit greatly from institutional/political support and funding, IAU100 did not have that kind of benefit in terms of visibility and support at the higher levels. Therefore, it was very important to optimise the IAU100 initiative for grassroots communities participation.

Since astronomy is a science with immense popular appeal (Graham, 2009), there are numerous professional astronomers that try to bring it closer to the general public, driven by different combinations of factors (Entradas & Bauer, 2019), but mostly relying on their love for astronomy. This unites them with a large part of the communicators of astronomy from outside academia (Gibbs & Berendsen, 2007), including amateur astronomers, teachers, students, museum workers, science communicators, etc.

For IAU100 it was essential to engage grassroots communities outside of the IAU membership to maximise our reach. We, therefore, established the following measures:

- We moved the focus away from the IAU's centenary to a broader and more inclusive main goal (the celebration of the past century of astronomical discoveries) to include grassroots participants in the initiative;
- All Global Projects encouraged everyone to take an active role in the organisation of the programmes and events;
- Anyone could integrate their astronomy outreach activities (outside of the scope of the Global Projects) to our worldwide programme of activities, as long as these activities were aligned with the IAU100 Goals. It was, therefore, important to establish and maintain the IAU100 Event Calendar³, where event organisers could feature their activity and event information;
- The establishment of a call for funding of grassroots actions⁴ at national/local level to support the mobilisation and engagement of different communities.

Planning and Implementation

Planning a project of this scale requires a considerable amount of time to develop a solid framework and effective engagement with various stakeholders. Projects of comparable scales — at least from an organisational point-of-view such as the IYA2009 or IYL2015 — were initiated five years in advance. These initiatives also demonstrated more solid actions from their respective secretariats of at least two years prior to the main project implementation.

The IAU100 time frame was shorter, as initial considerations began two-and-a-half years in advance and the IAU100 Secretariat was established around one year prior to the project's main implementation in January 2019. This was considerably challenging, as the lack of appropriate time for developing the different phases of the projects added high amounts of stress to the coordination efforts, as we felt as though we were running while we were tying our shoes. However, we were confident about the process due to the previous experience of the IAU100 Secretariat members on organising transnational public engagement projects of similar

scale and the strong NOC network that was already in place in many countries.

Two phases are highlighted that briefly discuss the main lessons learnt and challenges that arose:

Planning Phase (October 2017 - December 2018)

The first months were focused on establishing the Global Projects and finding the right persons to coordinate them. For some, it was a natural choice, as individuals who suggested the various projects had previous experience with similar IYA2009 actions and had acted as volunteers. For others, such as IAU100 NameExoWorlds (see article in this issue), the 100 Hours of Astronomy, and the Moon Landing 50 global projects, these initiatives required full-time coordination. We, therefore, established fellowships for project managers to oversee their coordination. This period was also used to strengthen the node networks and to increase the number of countries involved.

The Communicating Astronomy with the Public Conference in March 2018, with the participation of over 400 astronomy communication practitioners (including most NOCs), served as a valuable opportunity to present the initiative, to engage our core community, and to organise co-creation sessions to gather feedback. The reaction to IAU100 was positive, however, it was important to lower the expectations, as the IYA2009's shadow is still very wide in the community. IAU100 was always an ambitious project, but also sought to be realistic, as we could never reach the level of engagement of a UN International Year. IAU100 was always therefore regarded as a spin-off, rather than a sequel, to IYA2009 — it was important to establish a singular identity. The co-creation sessions were helpful as many generated suggestions were included in our actions. However, the lack of time prevented our initial plans to follow-up with the people who participated in the sessions to gather feedback during the rest of the year.

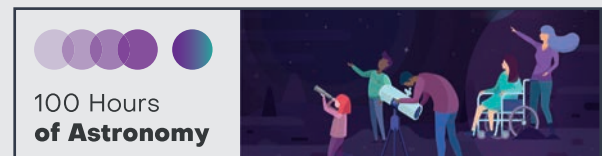
From April to August 2018, we focused on establishing the main communication platforms, such as the IAU100 website⁵, and building a communication plan.

IAU100 Global Projects

IAU100 100 Hours of Astronomy

Coordinated by Bethany Downer (IAU100 Secretariat)

1,200 astronomy activities took place on 10-13 January 2019 across **86 countries** and regions, with the direct involvement of roughly **500,000 people**.

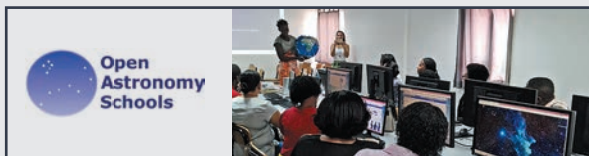


<https://www.100hoursofastronomy.org/>

IAU100 Open Astronomy Schools

Coordinated by Rosa Doran and Gustavo Rojas (NUCLIO, Portugal)

830 teachers participated in **20 teacher training sessions** in **20 countries**. The project also distributed **250 educational telescopes** for the organisation of **26 teacher training** in **22 countries**.



<https://open-astronomy-schools.org/>

IAU100 Women and Girls in Astronomy Events

Coordinated by Hannah Harris (IAU100 Secretariat)

Over **300 events** organized in **70 countries** to discuss gender equity, the role of women in science, the importance of role models and encourage the participation of girls in STEM careers.

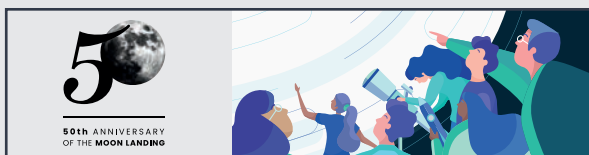


<https://www.inclusiveastronomy.org/>

IAU100 Moon Landing 50

Coordinated by Bethany Downer (IAU100 Secretariat)

The IAU100 Moon Landing 50 project was the largest coordinated action in the world celebrating the Moon Landing 50th anniversary with more than **1 million people** actively participating in over **1,000 events** in **128 countries and regions**.



<https://www.moonlanding50.org/>

IAU100 Astronomy Day in Schools

Conceived by Paulo S. Bretones (Universidade Federal de São Carlos, Brazil) and coordinated by Bethany Downer (IAU100 Secretariat)

Over **500 events** and activities were organized in **70 countries** around the world for this education-focused global project in November 2019.



<https://www.iau-100.org/astro-day-schools>

Figure 1. Overview of IAU100 Global Projects. Credit: Aneta Magraf-Druc (original design)

IAU100 Pale Blue Dot

Coordinated by *Bethany Downer (IAU100 Secretariat)*

This project celebrated the 30th anniversary of the iconic Pale Blue Dot image with **over 500 activities** conducted in **51 countries** worldwide on 13-20 February 2020.

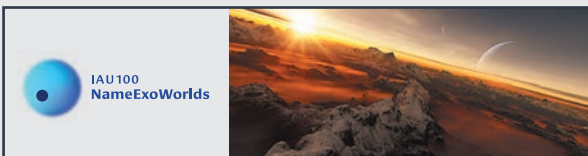


<https://www.iau-100.org/pale-blue-dot>

IAU100 NameExoWorlds

Coordinated by *Eric Mamajek (JPL-Caltech, USA), Alain Lecavalier des Etangs (Institut d'Astrophysique de Paris, France) and Eduardo Penteadó (IAU100 Secretariat)*

More than **780,000 people** participated in **113 national campaigns** to select names of **113 sets of exoplanets and host stars**.

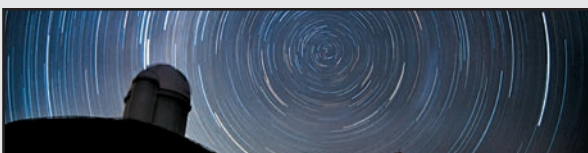


<http://www.nameexoworlds.iau.org/>

IAU100 Dark Skies

Coordinated by *Sze-leung Cheung (NARIT, Thailand) and Constance Walker (NSF's National Optical-Infrared Astronomy Research Laboratory, USA)*

A network of **123 ambassadors** organised **197 activities** in **30 countries** throughout 2019 to raise awareness about light pollution. In addition, **54 educational kits** were distributed in **41 countries**.

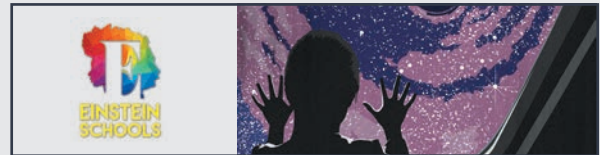


<https://darks skies4all.org/>

IAU100 Einstein Schools

Coordinated by *Stephen Pompea (NSF's National Optical-Infrared Astronomy Research Laboratory, USA)*

Around **200 schools** in **45 countries** learned and communicated about gravity throughout 2019



<https://www.einsteinschools.org/>

Inspiring Stars

Coordinated by *Lina Canas (IAU OAO, Japan), Wanda S. Diaz Merced (IAU OAD) and Rosaria D'Antonio (IAU Secretariat, France)*

Itinerant international exhibition to highlight world initiatives that address the concept of inclusion that organised **17 activities** in **10 countries**, reaching over **5,000 people**.



<https://sites.google.com/oao.iau.org/inspiringstars>

IAU Above and Beyond Exhibition

Developed by the *IAU & ScienceNow Studio*

Open-source exhibition showcasing the fascinating past century of astronomy that was present in **75 countries**.



<http://100exhibit.iau.org/>

This plan used the established IAU dissemination channels and could then be replicated by the dissemination channels of all national committees. Following the experiences from IYA2009 and IYL2015, at this stage the involvement of the National Committees was vital. They translated the primary IAU100 messages and updates to their respective languages to optimise the reach of the central actions while preparing relevant target audiences in their countries to actively participate in IAU100 actions.

The second important milestone was the IAU General Assembly in Vienna, Austria in August 2018. This event marked the launch of full promotion of IAU100 with the official opening of these centenary celebrations, the opening of the IAU Above and Beyond exhibition (see article in this issue), and the release of the IAU100 website. This event gave us the opportunity to engage in person once more with many of the NOCs and to engage with the larger community of astronomers.

For the last three months of 2018, the main focus was to engage as much as possible with different audiences to participate in the first actions of the year. During this time we also established a simple framework of evaluation for individual organisers to report feedback on their events.

Implementation Phase (January 2019 - February 2020)

The implementation phase was quite hectic, as we planned to have actions every month, i.e. Global Projects, the release of a publication/resource for the community, or the organisation of a specific event. On one hand, this was helpful to maintain the momentum of the grassroots communities participating over the course of the whole year and to attract new participants and supporters along the way. On the other hand, it caused continuous stress to the central coordination as well as the network of national nodes. This also resulted in challenges for engagement, especially at the end of the year.

As an example, two Global Projects that relied heavily on grassroots participation are discussed with regards to their specific implementation:

100 Hours of Astronomy

For the first Global Project of the year, we decided to repeat a successful activity organised during IYA2009: the 100 Hours of Astronomy (*Simmons, 2008*). For three days, the project encouraged people around the world, especially amateur astronomers, to organise activities around

astronomy. Our motivation to start with this project was (i) to use this event as a test for a prospective template with regards to the organisation and coordination of an outreach astronomy project on a global scale and (ii) to engage communities such as amateur astronomers, teachers and other astronomy communicators to be an active part of IAU100 activities throughout the year. For the latter, we opted to have an approach that was as open as possible, as any astronomy-related activity was eligible to be included in the global events list.

Another goal of the project was to support and establish a framework for inclusive actions⁶. For this purpose, we encouraged organisers to follow guidelines developed for the organisation of inclusive events. This included tips for sky observation activities and outreach, and detailed suggestions for how event organisers should consider the matters of inclusion, diversity and equity in their organised activities. Furthermore, a list of outreach and educational resources were developed to support event organisers to conduct their activities. These resources, in particular, sought to support those who do not have accessible means to expensive astronomy-related infrastructure or equipment to conduct their outreach. This included low-budget activities, online resources and various activities that are specially designed for participants with various impairments or disabilities. A variety of visual resources were also developed and disseminated, such as the translations of the IAU100 and 100 Hours of Astronomy logos, and the development of a key visual. This not only supported the development of an accessible brand and visual for the event but provided event organisers with means of adapting these visuals for their own events. Many event organisers used these translated tools to create and adapt their own event visuals and posters.

A key lesson learnt was that in order to attract the engagement of grassroots actions, the organisation of competitions (including relevant prizes such as telescopes) and the dissemination of outreach and educational resources is critical. In that respect, we were able to encourage the organisation of inclusive actions, identify best practices, obtain reports of the activities, and provide materials to communities that typically do not have access to astronomical equipment.



Figure 2. Participants of the IAU100 Co-creation Sessions at the Communicating Astronomy with the Public Conference 2018. Credit: Thilina Heentigala.



Figure 3. Children look through the telescope during 100 Hours of Astronomy activities in Ethiopia. Credit: Mekbebe Tamrat.

Overall, it was a successful IAU100 start, with over 1200 activities conducted across 86 countries and regions. This resulted in the direct participation of roughly 500 000 people, and additional reach due to global media coverage.

IAU100 Moon Landing 50

The 50th-anniversary celebrations of the Moon landing in July 2019 was one of our main events of the year, with more than one million people participating in over 1000 events in 128 countries/regions. This was the IAU100 action with the largest direct participation in terms of geographic coverage. It was clear from the outcomes of the 100 Hours of Astronomy that we could accomplish our goals to reach at least 100 participating countries. The initial engagement was easier, as this was a well-known global milestone. However, it also highlighted the challenge of IAU100 being diluted into other actions organised by bigger stakeholders (such as NASA). Therefore, we focused our message and outreach for this event on topics to which our networks could bring added value with respect to other stakeholders (such as the organisations of star parties to observe the Moon landing site and the promotion of lunar science).

To increase the engagement of this event, we collaborated with organisations such as the Astronomical Society of the Pacific, the International Planetarium Society, the Space Generation Advisory Council, and NASA's Observe the Moon Night to help us with cross-promotion. However, reaching the milestone of 100 participating countries was only possible due to the dedicated efforts made in the months prior to the event in identifying astronomical organisations or amateur astronomy groups in countries who had not yet engaged with IAU100 activities. This was very demanding in terms of the coordination of the activity, however, it was deemed valuable. Not only were we able to exceed our goal of participating countries registered, but this effort also served to establish strong relations with organisations in new countries that eventually joined the IAU NOC network, ensuring the long-term sustainability of the IAU100 actions.

Response from Grassroots Communities

For the IAU100 Secretariat, it was fundamental to reach beyond IAU networks and members to engage the communities of amateur astronomers,

teachers, planetariums, science centres and individuals that overwhelmingly supported IYA2009 to participate in organising IAU100 activities. We were confident in our potential for success, as the IAU had maintained and nurtured the connections with these communities since IYA2009 through the IAU OAO and the NOC network. Moreover, as discussed in "Approach", the IAU100 approach was optimised for their active participation.

From the total of 5240 IAU100 activities registered, 2697 (51%) were organised by astronomy clubs, schools, teachers and individuals. This indeed illustrates the large grassroots response and the strength of the IAU100 actions to engage them. If we also consider the activities organised by museums, planetariums and science centres (792, 15%), we could conclude that two out of every three activities were organised by individuals/organisations without official links to the IAU. We also identified 866 activities (17%) that were organised by persons/organisations linked directly with IAU (mainly from NOCs, but also includes the IAU Commissions and Divisions, IAU Offices, and IAU members). We could also extend this relation to IAU to the activities organised by astronomical institutes and universities, of which the proportion of registered events for this demographic was the same, where the

professional astronomers are mainly based (885, 17%).

These findings validate the IAU100 approach, planning, and implementation, while also strengthening the links with grassroots communities (particularly with amateur astronomers and teachers). This will be followed-up with IAU100 legacy actions implemented by the OAO in the coming years, such as the IAU OAO Global Outreach Events⁷ and the establishment of a central platform⁸ for event organisers around the world to showcase their astronomy activities, serving as an inspiration to other event organisers.

Impact on the NOC Network and Lessons Learnt

It is clear that the success of the IAU100 initiative relied heavily on the efforts of the extensive network of IAU NOCs around the world. However, IAU100 also benefited the network. This is illustrated by the increase in the number of countries involved (from 80 countries in the spring of 2018 to 127 countries by February 2020) and the increased levels of engagement (from 80 active members at the end of 2018 to 120 active members by February 2020).

On the other hand, IAU100 also brought high stress to this network, as it demanded large amounts of work throughout the year. This was a clear increase in the engagement and participation needed from previous years. Therefore, it is important to understand its impact on the network and lessons learnt for its long-term sustainability.

Below we present preliminary results of an exploratory study to understand this impact that was performed in the summer of 2019 during the middle of IAU100's implementation⁹. We disseminated a survey to the IAU NOCs participating in IAU100 (n=122) with questions regarding their participation in the program at the time. We received replies from 47 NOCs (39%). Here we shared an overview of the most important outcomes:

- Not surprisingly, the majority of the feedback pertaining to workload and engagement in the network show that the respondents are more invested than usual in IAU100;

- 80% of respondents feel large-scale public engagement projects like IAU100 have a positive impact on engaging people in their regions;
- 87% states stated that it is important to have a strong central coordination that also facilitates the collaboration within the NOC network;
- 89% feel that the IAU100 Secretariat provided the necessary support to NOCs and that the communications from the IAU100 Secretariat to the NOCs were relevant;
- 72% of respondents indicated above-average engagement in their local activities due to IAU100 actions;
- NOCs identified that the most successful actions in their countries were the IAU100 NameExoworlds, Moon Landing 50 and 100 Hours of Astronomy Global Projects;
- Two-thirds of all respondents indicated that up to three global initiatives was a sustainable number for subsequent yearly flagship actions.

These findings support the value of the establishment of strong coordination and reiterated the clear benefit of a central coordination in terms of exchanging ideas and getting inspiration and support for the organisation of events. The preliminary study also identified the number of sustainable yearly global activities for the network and the importance to provide a framework to showcase the activities. This has helped the IAU OAO to identify follow-up legacy actions.

Conclusions

The successful implementation of a large-scale public engagement initiative such as IAU100 required the strong central coordination of an extensive network of national nodes as well as establishing the procedures to engage the large community of astronomy communicators outside academia. The IAU was in the perfect position to organise this kind of project in a relatively short time frame, due to the strong structures and networks developed after IYA2009, namely the IAU OAO and the NOCs network.

However, from a coordinating point-of-view, more time to develop the project would have helped to engage more efficiently with the community in important

aspects such as the inclusive dimension of all activities and on the assessment of the actions. On the latter aspect, future work will involve the analysis of the specific activities implemented by the NOCs and the evaluation reports received from individual activities registered on the IAU100 Event Calendar.

Notes

¹ The major goals of the IAU100 celebrations were: (1) Increase awareness of progress and excitement in astronomy over the past century, in particular: (a) The importance of collaborative enterprise of astronomy as a whole, (b) The importance of technology development for astronomical progress, (c) The coordinating role of the IAU fostering communication and exchange of ideas for the global astronomical community. (2) Promote widespread access to astronomy knowledge and observing experiences. (3) Support and improve the use of astronomy as a tool for education, development and diplomacy. (4) Support and improve an inclusive, egalitarian and diverse astronomy community. (5) Facilitate the preservation and protection of the world's cultural and natural heritage of dark and quiet skies. (6) Raise awareness and discuss prospective new exciting developments in the next 100 years of astronomy.

² A community of practice (CoP) is a group of people that share the same passion or interest and exchange ideas and knowledge learning from each other (Wenger et al, 1998, 2002, 2010). And even though the concept has evolved over time (Li et al, 2009), the three main characteristics that define a CoP remain as specified by Wenger (1998): mutual engagement in a specific domain, a community, and a practice, meaning that members of a CoP are actively involved rather than just having a strong interest only, so through their interactions they learn together and form a shared repertoire.

³ IAU100 Events webpage: <https://www.iau-100.org/events>

⁴ IAU100 Special Projects webpage: <https://www.iau-100.org/special-projects>

⁵ IAU100 website: <https://www.iau-100.org>

⁶ This was conducted under the Inclusive Astronomy IAU100 theme, which was a yearlong, worldwide initiative to celebrate and promote inclusivity, equity, and diversity in astronomy in 2019. For more information see <https://www.inclusiveastronomy.org>.

⁷ IAU OAO Global Outreach Events: https://www.iau.org/public/oao/oao_global_events/

⁸ IAU OAO Global Outreach Events Calendar: <https://www.iau.org/oao-events/>

⁹ This exploratory study was aimed to be expanded during the first half of 2020 to gather results from a larger number of NOCs after IAU100 was closed through a stay of the IAU100 Global Coordinator at the IAU OAO in Japan through the OAO Visitors Programme. However, the COVID-19 pandemic situation has prevented this action and will hopefully be accomplished as soon as possible.

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Biographies

Jorge Rivero González is an astronomer and science communicator who served as IAU100 Global Coordinator. For the past three years, he was a member of the Astronomy & Society Group at Leiden Observatory. Previously, he worked for the European Physics Society, where he participated in the global organisation of the UN's International Year of Light and Technologies based on Light 2015 and UNESCO's International Day of Light. Since 2009 he has been a member of the science outreach programme GalileoMobile.

Bethany Downer served on the IAU100 Secretariat and organised four IAU100 Global Projects. She works in the domain of science communication and outreach for various organisations, including the Hubble Space Telescope for the European Space Agency, the International Day of Light, the Space Generation Advisory Council. Bethany also coordinates the Space Scoop project.

Lina Canas is the International Outreach Coordinator for the IAU Office for Astronomy Outreach (OAO), based at the National Astronomical Observatory of Japan (NAOJ). With a degree in Astronomy and a Masters in Geophysics, Lina Canas has worked for the past thirteen years in astronomy outreach and education.

Pedro Russo is Assistant Professor in Astronomy & Society at Leiden University, the Netherlands. He was the global coordinator for the International Year of Astronomy 2009. Pedro is involved with several international organisations, like the European Astronomical Society and the International Astronautical Federation. His work has received several awards, including the Most Innovative Educational Activities in 2017 and 2018 by HundrED and 2018 Leiden University's K.J. Cath Prize.

Ewine F. van Dishoeck is professor of molecular astrophysics at Leiden University, the Netherlands. She has received many awards, including the 2000 Dutch Spinoza award, the 2015 Albert Einstein World Award of Science, and the 2018 Kavli Prize for Astrophysics. She is a Member or Foreign Associate of several academies, including that of the Netherlands, USA, Germany and Norway. As of 2018, Ewine serves as the IAU president.